SPRAT

THE JOURNAL OF THE G QRP CLUB

DEVOTED TO LOW POWER COMMUNICATION

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Founding member George Dobbs G3RJV (SK)

Tel: +44(0)113 267 1070
Homepage: *www.gqrp.com*

Thank you for all of your kind words and recollections about **George, G3RJV** (SK). We tried to include as many as we could in the special SPRAT. Thank you also for the generous donations to George's Alzheimer's Society Celebration Fund. At the time of writing it stands at a little over £1500. The fund is still open should anyone else care to make a donation on-line. We are all missing George every day but we are determined to keep the Club going as he would have wanted it to.

I must propose three cheers for **Chris Page, G4BUE**, who was recently awarded the RSGB G4STT Trophy for outstanding service to QRP. Chris has been compiling our Members News for over 40 years. I think you will all agree that the award is thoroughly well deserved. Later you will see we are re-advertising the post of Membership Secretary. **Tony, G4WIF**, has effectively finished his tenure in the role and we need a replacement in time for the 2020 renewals; if the membership database is not maintained members will not receive their SPRAT magazines.

Our annual Convention is fast approaching and we have decided to remember George there in two ways. Firstly, this year's Buildathon kit will be an update of a G3RJV classic using currently available parts, and secondly we are asking members to bring along a G3RJV project that they have built. There will be prizes but the main thing is to bring along a project and share your story about it. We have some great speakers lined up. More info on page 11.

Andy, G3PKW, was this year's winner of the Partridge Trophy for his excellent antenna article in SPRAT 175. Andy has kindly offered to answer any questions members might have about antennas. His details are correct on www.qrz.com.

And finally, please help us to put our Club callsign, G5LOW, on the air. We would like to see it in action for things like World QRP Day and in QRP sections of big contests. Contact me if you would like to use the callsign.

Steve Hartley, G0FUW Chairman GQRP Club
G0FUW@tiscali.co.uk

Membership News Extra

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

In the previous Sprat I announced that after 13 years I wanted to retire as membership secretary and recent problems with my vision now makes this imperative as operating a PC for long periods is now difficult for me.

So here are a few bullet points to explain in brief what the role entails:

Membership applications arrive by several methods. By post, by Paypal and via one of our amazing overseas representatives whose role you will coordinate. The bulk of your work will be at membership renewal time in January when most members renew promptly. UK members tend to either renew by Paypal, mailing a cheque, or they use bank automated payment (standing order mandate).

Worldwide it is usually Paypal or via our DX reps. This will entail a couple of months of sustained computer work recording the membership renewals for the coming year.

During the rest of the year you will take late renewals, new memberships and also dealing with any Sprat delivery issues and member address updates. Four times a year you will also liaise with the printers and provide mailing lists for Sprat delivery. For members that join midyear you will need to post to them the Sprats that they have missed.

For all kinds of practical reasons the new Membership Secretary will need to be UK based. You will also need to be comfortable using the internet and computers. If necessary I will advise you how operate so as to ensure that you should never lose records. You can imagine how vital that is.

If there is no membership secretary then Sprat cannot reach members. You will become a key member of the club and doing something really rewarding. You will be the contact point for members both new and established. You will be in contact via email and by letter with people from all four corners of the world and you will make many new friends.

Interested members should contact me and I can tell you more about the role.
email me at g4wif@gqrp.co.uk

Sinusoidal signal generator for the HF bands.

Roger Green, MW0RJG: profrogerjgreen@live.co.uk

Introduction.

Previously (SPRAT, Winter 2018), I described a sinusoidal oscillator using a modified Pierce design, which operated at 455kHz in the example given. Note that the circuit principle can be used at higher frequencies than 455kHz. I finished the article with a puzzle – as to how there could be enough gain to oscillate. The series resonance of C1 with the resonator forms a low-level overall inductive impedance, across which the output at the collector of Q1 appears, in parallel with the collector resistor R3 and capacitance C2.

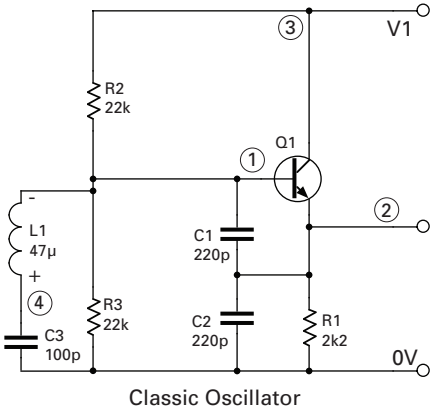
Although C1 and the resonator individually each have higher impedances, these are of opposite phase and almost cancel each other out. Therefore, even for a small voltage across the overall combination, the voltage across each can be individually large. The circuit oscillates because the voltage across C1 is large, even though the voltage at Q1 collector is around a quarter of that at its base. The overall loop gain is unity, with that gain being provided by the phenomenon of (almost) series resonance in the LC circuit, and the resonant frequency determined by this joint impedance in parallel with the capacitive reactance of C2.

Another oscillator, and how to improve it

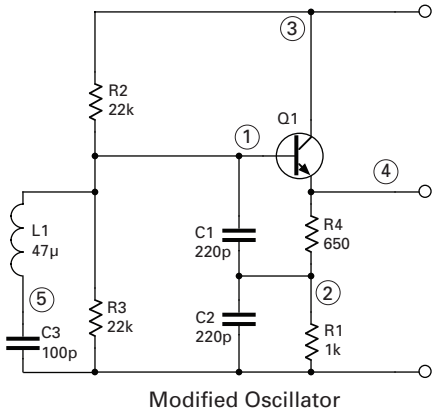
Apologising for the above technical discussion, and somewhat verbose discussion in this section, I will now discuss probably the most commonly-used oscillator in communication circuits, but which can be very simply modified to produce a reasonable sinewave output in an equivalent way to the previously-discussed modified Pierce oscillator. Let's just examine a typical version of the oscillator, and then the modified version:-

The upper circuit uses typical values for components, with the base bias resistors around ten times the emitter resistance, as is good design practice, so the bleed-off base current doesn't significantly alter the set bias point of half the supply voltage. L1 and C3 form part of the resonant circuit, completed by C1 and C2. The feedback from the emitter of Q1 feeds the junction of C1 and C2 to ensure oscillation.

The input impedance of Q1, combined with the bias resistors R2 and R3, form damping

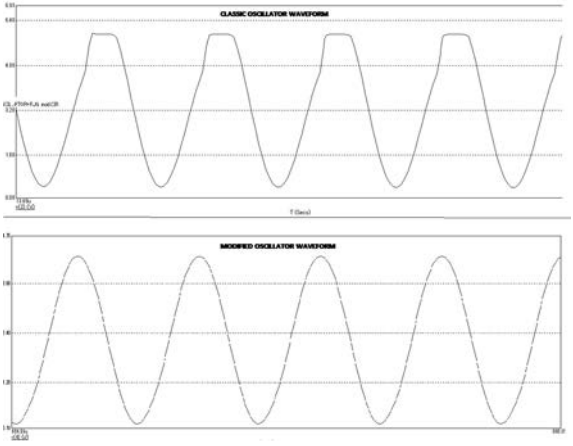


Classic Oscillator



Modified Oscillator

components which prevent any oscillations at the input until the feedback is applied. Note that C1 and C2 are chosen to be equal in the example, but they need not be. The resultant oscillator output is collected at the emitter of Q1, shown in the next diagram down as the Classic oscillator waveform, with clipping of the top of the sinewave and also overall other distortion.



So far, there's nothing I've said that isn't already very well known. However, consider the lower circuit above, with the inclusion of R4, and with R1 changed to 1k (so the sum of the two is around 2k as before). In simulation, the waveforms of the two oscillators may be compared:-

Clearly, at least theoretically, the simple inclusion of a resistance in the emitter has improved the waveform considerably, by reducing the loop gain from nearly two to unity, and consequently reducing the output amplitude so that nonlinearities are much reduced in effect. In simulation, an inductance was used for L1, but in practice a resonator or crystal can be used in its place.

In this case, the outcome is the same, with observable lower distortion for all the same reasons as above, and also by reduction of overdrive of the resonator or crystal, just as in the previous oscillator described in the SPRAT Winter 2018 edition. The loop gain in the unmodified oscillator I have just stated to be "nearly two" – why? The reason is that the feedback is injected to the junction of C1 and C2, where the voltage, before feedback was applied, would be half that across them both when C1 and C2 are equal, because they form a capacitive voltage divider. SPICE analysis using Micro-cap 12 confirms the overall idea.

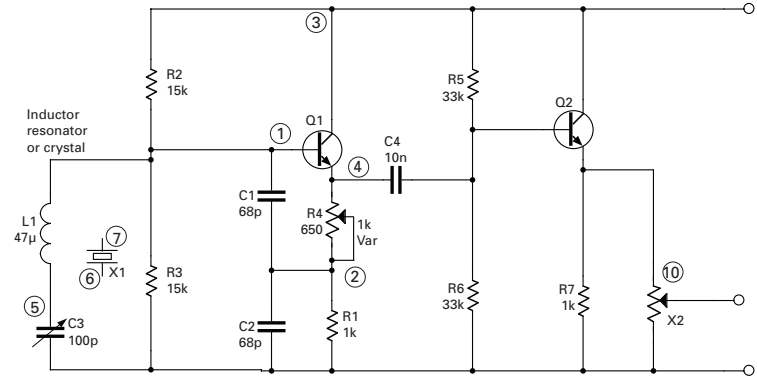
The loading of C1 by the base-emitter input impedance in the original form of the circuit without R4 is high but not infinite, and it is nonlinear. Inclusion of R4 linearises and increases the input resistance, as well as reducing the gain to the feedback point.

Use of the modified oscillator in a test signal generator.

To create a useful test signal generator for the HF bands from the above oscillator, several requirements exist:-

- A waveform as close to a sinewave as possible is needed.
- A reasonable and controllable level of output.
- The ability to control the waveform.
- Operation over as much of the HF bands as possible, with change of as few component values as possible.
- Stable and repeatable operation.
- Low drift for free running oscillators (not crystal- or resonator controlled).
- Reasonably low power consumption.
- Simple to set up.

The following circuit, based on the above-mentioned oscillator, fulfils these criteria:-



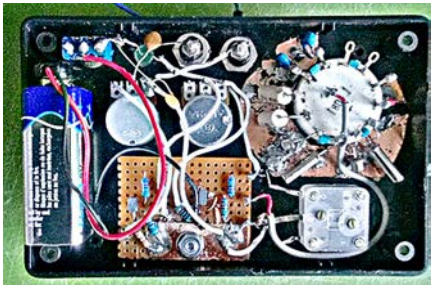
The circuit has practical changes, as the real world is always slightly different (at least!) to simulations. Firstly, the bias resistors R2 and R3 are set to 15k, and not 22k, to give slightly better DC stability to the base voltage. Secondly, C1 and C2 are reduced to 68 pF so that their impedance is not too low at the higher frequencies, which would affect oscillation performance.

Resistor R4 (”PURITY”) is made variable, as the feedback adjustment needs to take into account individual resonator/crystal/inductor characteristics. Capacitor C3 allows tuning of the resonant frequency (“TUNE”). A buffer is needed as the final output stage, which uses 33K bias resistors so that the oscillator is not severely loaded. The buffer is chosen to be a bipolar transistor type, biased half way between the supply rails, and which gives a lower output impedance than does an FET buffer.

A potentiometer allows adjustment of the output level. I am aware that the bias resistors are more than ten times the effective emitter resistance, but loading of the bias chain is less critical in the buffer than it would be in the oscillator – as the latter has reactive components all around the equivalent part of its circuit.

The practical signal generator.

I had, in the proverbial junkbox, a range of resonators, inductors, and crystals, and was able to create reasonable quality oscillations without needing to change C1 or C2. In practice, all that was necessary was to insert the device to be tested, and adjust the C3 and R4 controls to ensure oscillation. Below is the finished box of tricks :-



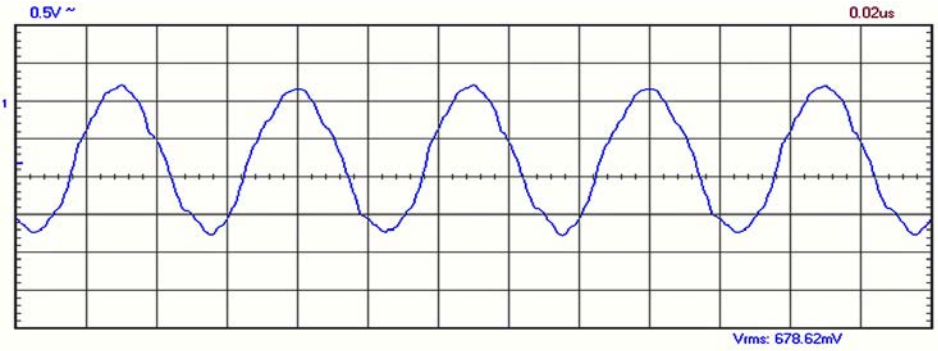
The circuit construction included Veroboard (copper stripboard) and copper tape, the latter aspect being one of my preferred prototyping techniques. I used a standard 9 volt battery to power the circuit, from which a current of around 9mA was drawn according to the set up conditions. The green indicator LED used (see photo) was in series with

the supply to be economical with battery current. The rotary switch allowed the following internal components to be switched in:-

- Resonators – 3.58MHz, 4.00MHz.
- Crystals – 10.24MHz, 14.11MHz, 15.00MHz, 20.00MHz.
- Inductors – 4.7 µH (tunes 11.6MHz to 17MHz), 47 µH (tunes 4.0 to 5.27MHz)

At the "Test" input, inductors, crystals or resonators may be tested.

The above is the trace of the oscillator output at 20MHz. It is not a bad waveform, nearly sinusoidal, with the wavy line effects due to my Velleman PC oscilloscope having to be in sampling mode, when covering frequencies from 10MHz up to 50MHz. The corresponding



spectrum is also reasonable, but limited by the PC oscilloscope spectrum analyser mode performance, whereby harmonics above 25MHz don't show faithfully on the spectrum, except by being folded back around the 25MHz mark because of aliasing, making true assessment of the full oscillator spectrum visually ambiguous for the higher oscillation frequencies above 12.5MHz. An external 28.30MHz crystal was also positively tested for its oscillation capability using the circuit.

Conclusions.

The modification to the basic oscillator of inserting R4 can produce a reasonable, generally-sinusoidal test signal, especially at frequencies below 20MHz. The circuit has been tested from 3.58MHz up to 28.3MHz with the values shown for C1 and C2. Maximum output voltages were between 2 to 4.5 volts peak-to-peak, over the whole frequency range, being less with increasing frequency.

Readers may also notice that the basic circuit can be brought in and out of oscillation by adjustment of R4, which means that the circuit could be used directly as a regenerative detector or Q multiplier, with R4 as its regeneration control, and C3 used for tuning the centre frequency.

An important observation was also that, when using an inductor as the oscillating element, rather than a resonator or crystal, the oscillator frequency drift at optimum setting of R4 was much lower, and very slow, in comparison to the standard circuit using the same inductor. This is because the effects of base-emitter junction thermal changes are more masked due to the presence of R4.

4-Valved Low-V Regenerative Receiver

Olivier Ernst F5LVG, 2 rue de la Philanthropie,
59700 Marcq En Baroeul, FRANCE *email*: oernst@free.fr

This receiver requires only a 12V 320mA power supply. It covers from 150kHz to 18MHz, in SSB AM or CW. The use of electronic 'tubes' with this voltage is unusual, which requires an adaptation of their use.

•Why a regenerative receiver (1V2)? – *Because it is the simplest technique to receive SSB, AM and CW.*

•Why short waves and long waves? – *Because I am radio amateur and sometimes I like to listen to the news on broadcast stations.*

•Why valves? – *Because I like their glow.*

•Why 12V only? – *Because I wanted to use a standard power supply or a battery*.

•Why the 6J2P (6Ж2П 6AS6) tubes? – *Because their heaters consume only 175mA, they have 2 control grids (G1 & G3) and they are really cheap.*

•Why is there a positive voltage on G1? – *Because, at 12V of anode voltage, the cut-off of 6J2P tubes is above 0V. If the command grid is G1, the input impedance is low because of the grid current. This is well suited for the untuned RF stage. If the command grid is G2, the input impedance is high. This is well suited for the detector and the AF amplifiers.*

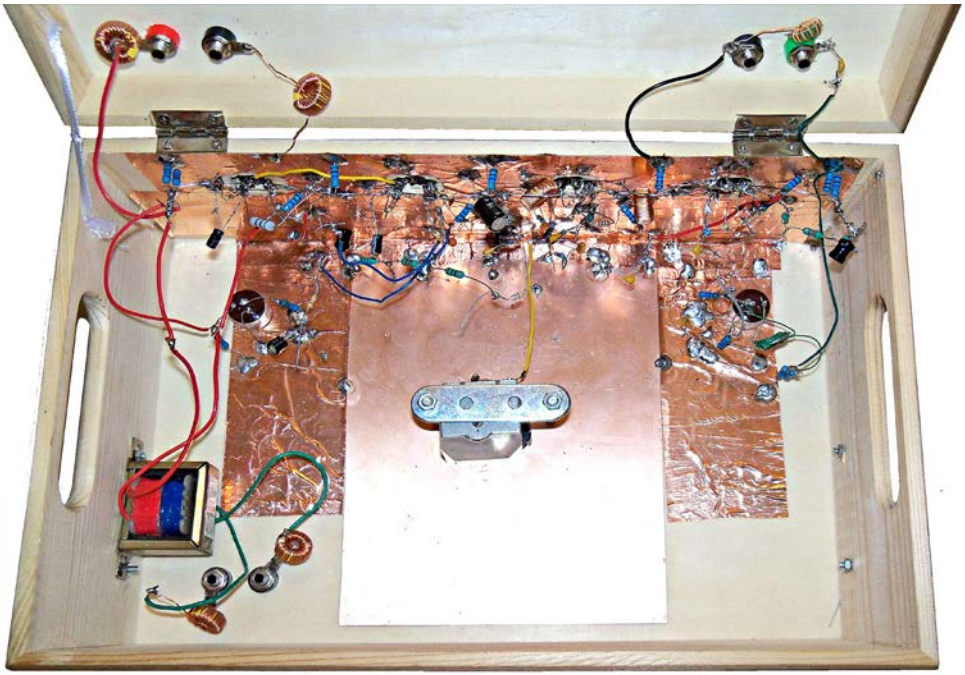
•Why is the tuning circuit on a DIN plug? – *For the simplicity of the system associated with low losses.*

•Why does it have a low L/C ratio? – *To obtain a good frequency stability and a good selectivity.*

•Why 100µH toroids? – *To avoid hand effect and common hum.*

•Why the 100k resistor and the 100n capacitor in the grid circuit of the detector (V2)? – *To minimize the induction of the mains current at the input of the audio channel.*

Why is a 47 ohm resistor in series with the V3 and V4 heaters? – *Because, with 12V of anode supply, the AF amplification is higher when the heaters are a little under powered.*



Tuning Values

LW: L1 3.3mH (miniature) / L2 4.7mH (miniature) / C1 0pF / C2 short cut / C3 0pF

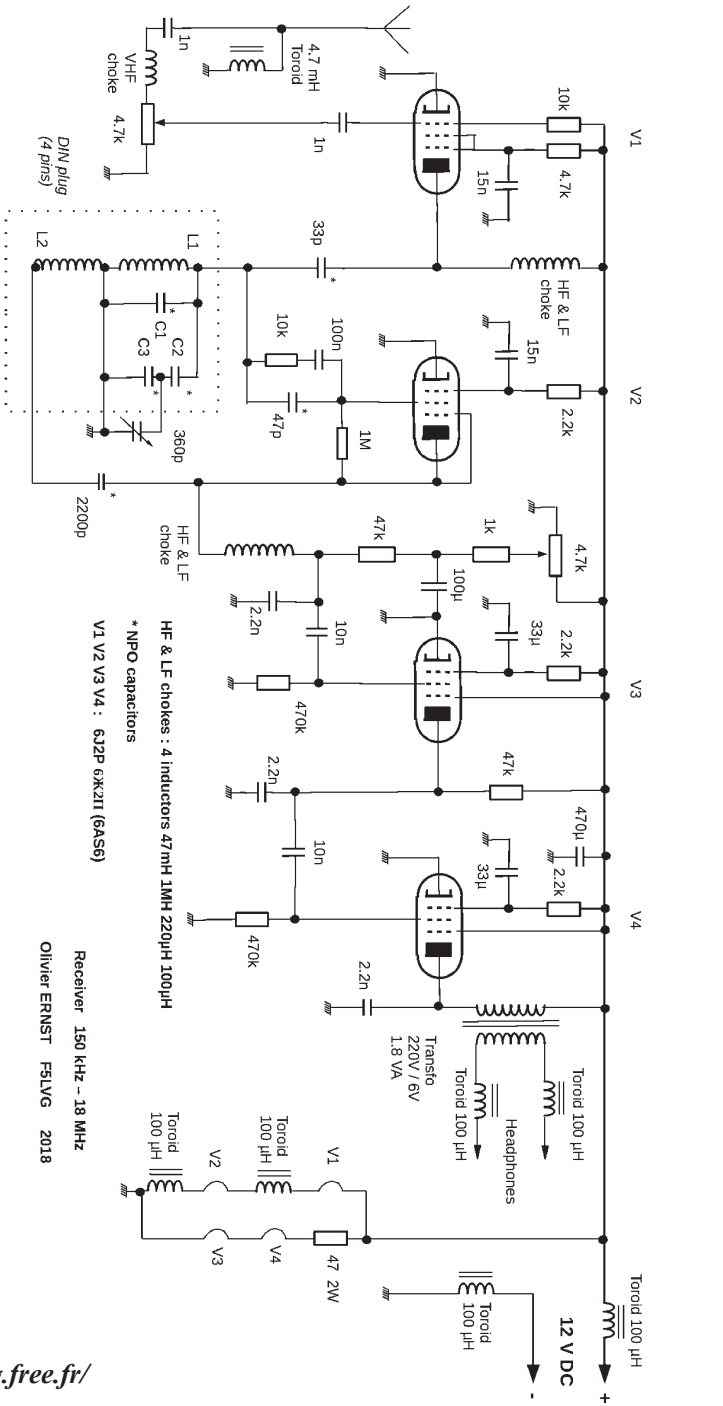
80m: L1 10 turns / L2 20 turns / C1 680pF / C2 330pF / C3 0pF
40m: L1 5 turns / L2 12 turns / C1 526pF / C2 68pF / C3 0pF

20m: L1 3 turns / L2 7 turns / C1 334pF / C2 1470pF / C3 220pF

17m: L1 2 turns / L2 6 turns / C1 360pF / C2 100pF / C3 330pF

SW: Coil diameter: 22mm

There is no adjustable capacitor. Each value is obtained empirically by assembling several capacitors to obtain the desired frequency and sufficient bandspreading.



Web site: http://oernst.f5lvg.free.fr/

G-QRP Buildathon & Rally at Telford HamFest

August 31st and September 1st 2019

Martyn Vincent G3UKV (email: hamfest@ukv.me.uk)

The weekend after the August Bank Holiday is the annual G-QRP Buildathon/Social to be held (Saturday evening) and the linked Telford HamFest on the Sunday.

After 13 years at the Enginuity site in Telford, the HamFest is moving location to the Harper Adams University rural campus (satnav TF10 8NB) just to the north of Telford. We had planned to use last year's site for the Buildathon/Social, but due to a planned refurbishment of that hotel later this year, we decided to take the plunge and combine the two events at the Harper Adams University site.

So why have we moved? Well the new venue is more spacious (see photo) and there is unlimited free parking space for all visitors as the normal student/staff population is on vacation. Lighting and accessibility are greatly improved, catering is provided by the experienced university caterers and the facilities we have booked are all at ground level. Finally, mobile phone and Wi-Fi links are far better. We think it's a winner!

The Buildathon and Convention, as in previous years, will be led by our Chairman Steve G0FUW on Saturday evening. He has written:

"The Buildathon project will be a 21st century version of a G3RJV classic. Anyone interested in joining in to contact me at this e-mail address g0fuw@tiscali.co.uk .There will also be an opportunity for you to bring your own G3RJV project to share with others. There will be a prize for the 'best in show'."

As well as the traditional traders and exhibitors at the Sunday HamFest, three presentations will take place in an adjacent area. Colin G3VTT is waterborne with "Salt Water & QRP – a tale from a radio ship", whilst following last year's successful trans-Atlantic Skype link, a similar arrangement has been made with author and QRP enthusiast Peter Parker VK3YE.

Excellent accommodation for those of you wishing to stay overnight is also available. There are single rooms at just £54 in a new hotel-style block, with en suite and breakfast included, and a few twin/double guest rooms at £78 all inclusive. Booking for these rooms has not yet been finalised, but meantime you are free to contact Heather (M0HMO) on 07802 548938 or email heather@myorangedragon.com for latest details.

Off-campus accommodation is also available in nearby Newport and Telford towns. We hope previous visitors will return to Shropshire once again, and if you've never been before, why not give it a try? A warm invitation is extended to you all!

As well as the G-QRP website: ***http://www.gqrp.com/*** or perhaps look at: ***www.telfordhamfest.org.uk*** for more information.

455kHz SWEEP & MARKER GENERATOR

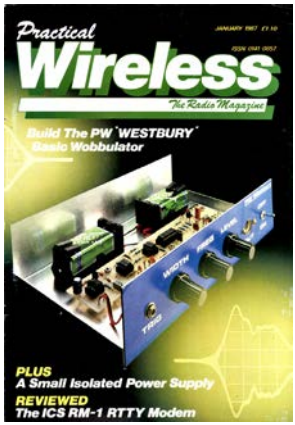
Peter Howard G4UMB pahowd@gmail.com

I have a homebrew superhet receiver for 160 and 80 metres and I made this unit to align the 455kHz IF transformers . You also need an oscilloscope and frequency meter. This is basically how it works.

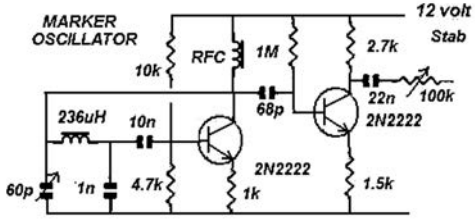
The NE555 IC generates a pulse to trigger the X axis of the Scope and also a ramp wave to the vary the frequency produced by IC 4046. The swept frequency width, and the amplitude of the signals are adjusted to suit.

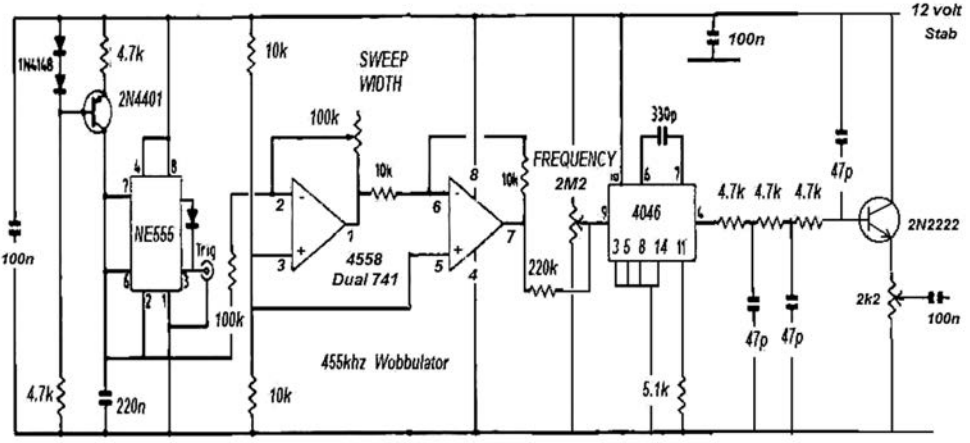
The frequency counter is used to set the IC 4046 oscillating around 455kHz. The IC 4046 produces a square wave so a RC filter is added to change it to a sine wave. Both the marker oscillator and the sweep generator outputs can be mixed to produce a 455kHz marker reference point on the oscilloscope display.

What you see here is the response of the receiver IF transformers /filter without the marker. The local oscillator of the receiver should be disabled when doing this. This circuit is based on the 'PW Westbury Wobbulator' by Robert Penfold from January 1987.

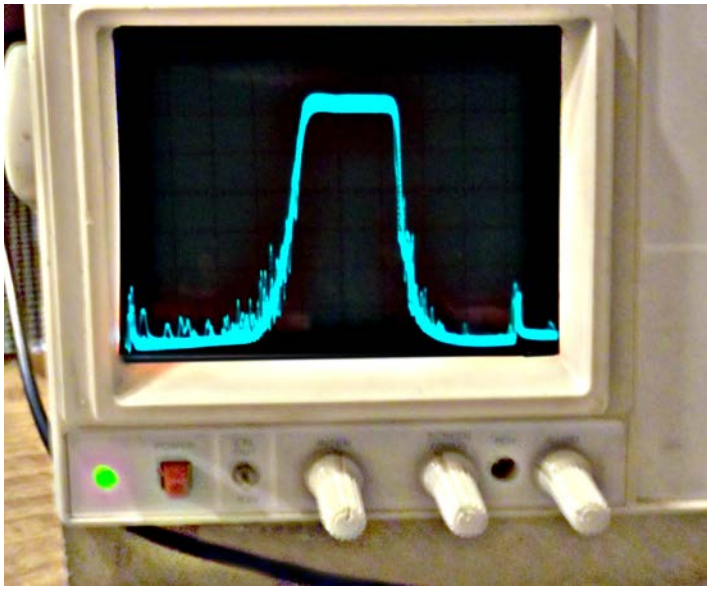


An article which explains in much more detail how to use the unit. I have made it with fewer components and then added a marker generator. I built in on stripboard as you can see layout is not critical.





The layout of the project, as it's basically only at a relatively low frequency, it may be built on a piece of Veroboard as shown above.



After passing through an aligned 455kHz IF strip the 'scope shows a good representation of the shape factor of the stage. Note that I use an 'old' analogue 'scope so, getting a stable pattern initially took a little practice.

AMATEUR RADIO LOG KEEPING

Chris Osborn G3XIZ

Older members will recall a time when it was mandatory to keep a station log book. This had to be non-loose leaf, indelibly written and available for inspection if requested. Contacts and even CQ calls had to be logged, with all times in GMT plus notes kept on to ensure that one's station was conforming to the regulations.

My first log book goes back to 1968 and is a trip down Memory Lane as visiting amateurs (alas some now SK) would sign my log.

I had 5 full log books before I decided to computerise the lot and to continue logging directly on to my shack's PC.

This has a wealth of benefits. Apart from containing almost all of the information which had been required of the originals I can now easily find any call sign which has been worked and can list those contacts in date order.

Detailed information may be placed into a PC log and this gives a more personal approach to the hobby.

It is satisfying to tell a chap who answers your CQ that it is good to meet him again after 45 years and to ask whether he is still using his valve AT5 transmitter (it's probably best not to enquire about his cat or his wife though!)

There are proprietary logging programs out there which I am sure are excellent

No	CALL	Suff	DATE	day	ST	END	Dur	NAME	QTH
7567	OK2BVG		20-May-06	Sat	06:40	07:56	01:16	Bob	
7568	DQ2006V		21-May-06	Sun	09:20	09:58	00:38		
7569	G3AHS		21-May-06	Sun	14:55	15:12	00:17	Dawson	Tadley
7570	G0GSY		21-May-06	Sun	16:29	16:58	00:29	Bryan	Cleethorpes
7571	PA3FTJ		21-May-06	Sun	19:34	19:44	00:10	Hielke	Oldemarkt
7572	G3DXZ		21-May-06	Sun	19:55	20:17	00:22	Chas	Retford
7573	DL1RNT		21-May-06	Sun	19:51	19:55	00:04	Ben	Berlin
7574	G3UAA		22-May-06	Mon	17:30	17:52	00:22	Alf	Leicester
7575	2E0JEN		22-May-06	Mon	18:57	19:05	00:08	Pat	Deal
7576	G3EUS		24-May-06	Wed	18:00	18:37	00:37	Joe	Hitchin
7577	G4JLP		24-May-06	Wed	18:00	18:45	00:45	Derek	Shefford
7578	M0FMT		24-May-06	Wed	18:07	18:46	00:39	Peter	Holwell
7579	G3JNB		24-May-06	Wed	18:07	18:35	00:28	Victor	Campton

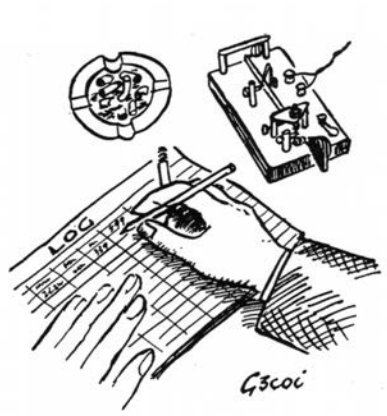
however I have always used an 'Excel' spreadsheet. This is quick and easy to use and can have a wealth of supplementary information on other 'pages' e.g. ATU settings, the aerial's impedance at various frequencies and statistics of stations worked e.g. I have worked my local pal Dennis M0JXM 1304 times!

I also have a useful 'information' page containing licence details and renewal date, club membership data and passwords, band plans, maidenhead locator, latitude and longitude etc. etc.

My log, being in Excel which is a spreadsheet it is easy to do calculations so I so have a few pages of the log dedicated to electrical and radio related calculations. One page calculates local stations' azimuth and distance from their map reference; handy on VHF.

I have been told by several amateurs that they no longer bother with log keeping and this is sad.

They are losing part of their radio history and for a relatively small investment of time and effort they may have their radio



***courtesy of Short** Wave Magazine*

BAND	MODE	R	S	T	R	S	T	TX	AER	Pwr	1	MY PWR	QSL
136	**QRSS**		**M**			**O**						150	
136	**QRSS**		**O**			**O**					**1**	150	
80	CW	5	**6**	9	5	**6**	9					5	
80	CW	5	**8**	9	5	**8**	9			35		5	
80	CW	5	**7**	9	5	**7**	9			50		5	
80	CW	5	**9**	9	5	**9**	9			70		5	
80	CW	5	**9**	9	5	**5**	9				**1**	5	
80	CW	4	**3**	9	5	**8**	9	TS570	G5RV (broken)	100	**1**	5	
80	CW	5	**9**	9	5	**9**	9	IC745	Doublet			5	
160	AM	5	**9**		5	**8**						4	
160	AM	5	**9**		5	**9**						4	
160	AM	5	**9**		5	**9**						4	
160	AM	5	**9**		5	**9**						4	

Planar Iambic Paddle

Peter Morris, G1INF pete.g1inf@gmail.com
131, Littlehampton Road, Worthing BN13 1QX

The problem with mice

Most computer mice contain at least two small microswitches. These can be repurposed in making telegraphy keys of various kinds, but they always have the sprung detent which is wonderful for most switching applications, but not appropriate for a pleasant fist-feel when sending. Here I present a simple solution, and incorporate it in a sample design for an unusual iambic paddle.

Switch modification (Fig.1)

- Break open an old mouse. They often come apart when two screws (found under the slick-pads underneath) are removed.
- Remove the microswitches by either desoldering the three pins, or flooding the pins collectively with molten solder and yanking the switch.
- Pry off the switch cover; a thumbnail or small screwdriver is used to defeat the latches at either end. Take care not to lose the little nylon plunger.
- Drill a 3mm hole in the cover between the plunger and the end of the cover. This is usually necessary; most Omron switches so far encountered have a moulding feature which warns the assembler that the cover is the wrong way round, this fouls the normally-closed contact. In this application, we intend to reverse the cover.
- Restore the switch cover and plunger, having first turned it around. This puts the plunger over the far end of the spring, which now no longer acts as a fast-acting over-centre device; it just gets pushed against the normally-open contact.

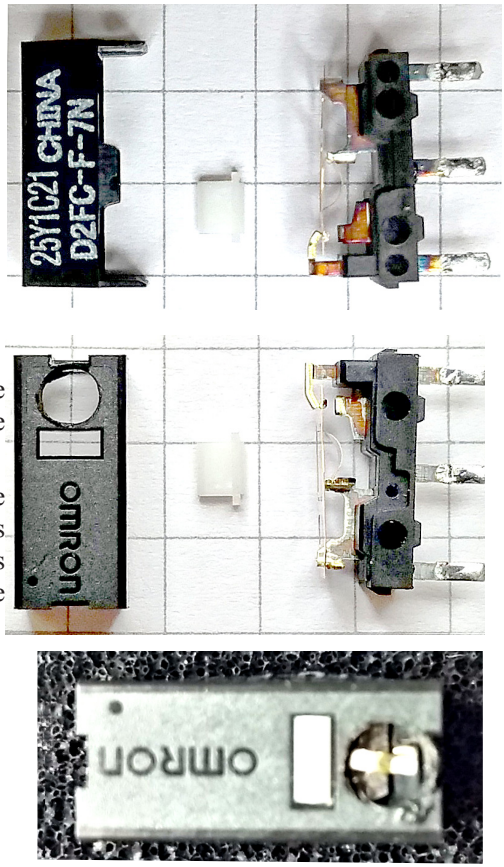


Figure 1 – Mouse switch modification. For scale, the squares are 5 mm.

Iambic paddle: Lying like a flat fish

I've been a straight-key person all my life, but a weakness in my right wrist now makes sending a pain, so change was necessary. Not only did I wonder if the gentler motion of the thumb and finger used to operate a pair of paddles would be easier on my aging frame, but

I took the bold step of learning to send iambically with my left hand, releasing my right hand from all duty except for taking notes or eating. Many paddle designs looked fragile, and because I operate out-of-doors (hill-tops are my thing), it needs to cope with rough handling. So, I took one bolder step and decided to try conflating my telegraphy with a lesser passion, guitar.

Junk-box scramble: The parts list

- A small plastic enclosure, one which fits the operator's hand. About the height and width of a guitar neck. The author uses Bud Industries' potting boxes (1x1.5x2in), and I've also used an old plastic IC box.
- A piece of sheet material, perhaps a lump of polycarbonate, thin FR4 or an old stainless solder-paste template. Look for thin, springy and able to be cut and drilled.
- A piece of strip-board to sit within the enclosure.
- Four M3x20 bolts, with washers and 12 nuts.
- Two modified mouse switches (see above).
- A scrap earbud cable (the end with the 3.5mm stereo connector).
- A grommet or gland to suit the cable.
- Some way of securing the springy plate to the open side of the enclosure. The my potting boxes have a flange, and a complete (i.e. six-faced) enclosure will have a lid which could be replaced or have an opening made into it.

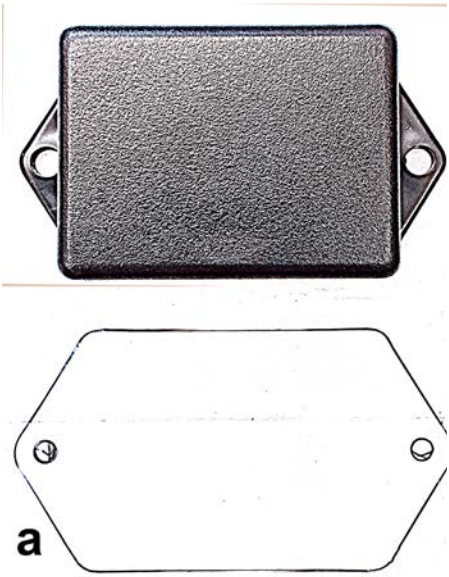


Figure 2a a suitable plastic box and its template

Cutting and shutting: Making a pair of paddles

- Cut and fettle the strip-board to fit comfortably within the enclosure.
- Take the springy plate material, place the enclosure over it and draw around the periphery (Fig.2a). Cut out the shape with a hacksaw or tin-snips (as appropriate) and file the edges smooth and rounded.
- Locate the strip-board over the springy plate, and loosely assemble the switches at one edge. Mark where the four M3 bolts will be used to connect the two sheet items.
- Bind the two sheet items together with tape, and drill 3mm holes through them (Fig.2b).
- Remove the tape, and assemble the two plates with the switches in place. Mark the

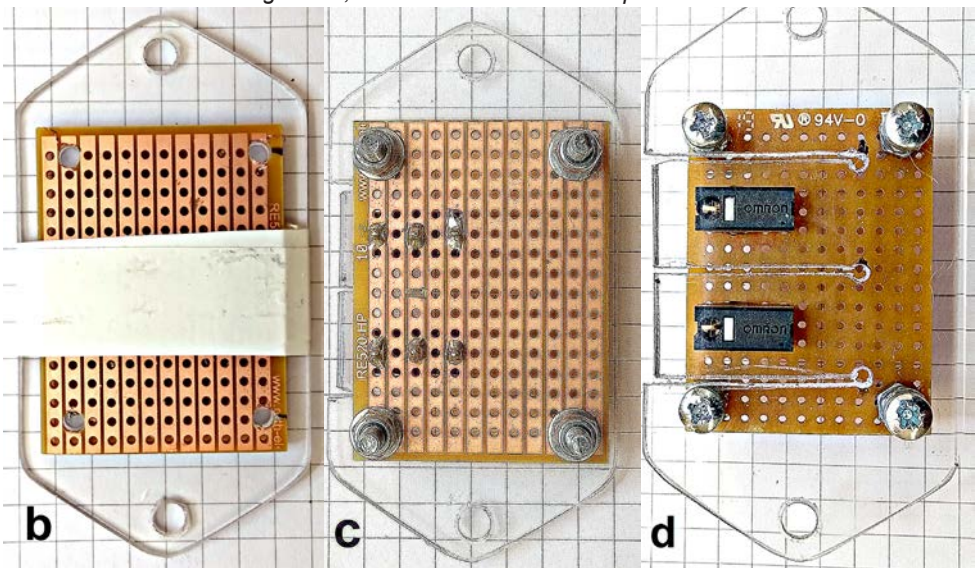
springy plate just to the inside of the mounting bolts, and in the central line, with three lines which extend back from the switch edge of the plate to 10mm from the far side.

- Disassemble, and carefully cut three slots along the marked lines with a hacksaw.
- Solder the switches in place, noting that the plungers need to be at the outside end. Make a track cut between the switches to separate the two normally-open contacts (Fig.2c).
- Assemble the springy plate and strip-board with the M3 bolts and nuts (Fig.2c), arranging them so that the springy plate just touches the plungers (Fig.3).
- Drill a hole in the enclosure for the cable. The best place is where the cable would run away to the keyer / radio inside the curl of the pinky.
- Fit the cable, leaving a good 50mm inside the enclosure for ease of maintenance and tuning.
- Solder the braid / drain-wire of the cable to the common contacts of the switches (centre of the strip-board); solder the tip and ring wires to the normally-open contacts (centre of the switches). Consult your radio / keyer documentation for arrangement of the dit and dah contacts; if you get it wrong or desire a change of fingers, just open the paddles and swap the wires. The QRP-Labs QCX uses the tip contact for the dah paddle.
- Use a DMM/ continuity tester /code practice oscillator to set the action of the paddles to the desired height with the nuts on either side of the strip-board.
- Close up, and enjoy.

Further thoughts

I have made three of these paddle sets, and two have incorporated extra electronics. There

Figure 2b, c & d: see text for the steps involved



is space inside for an electronic keyer, and most of the many good designs from previous Sprats would be suitable. One of my paddle sets (Fig.4) has a complete radio HMI (human-machine interface) inside it, comprising the paddles, a centre-biased SPDT toggle switch, an Arduino Nano and a tiny OLED display.

This controls an Si5351 clock generator, and via an MCP 23008 I/O expander it keys the transmitter and I intend to try polling digitised data such as signal strength. Pipe dreams, courtesy of I2C.

I suppose this cannot truly be called a paddle device, as it more closely resembles a piano keyboard or the gubbins on the neck of a hurdy-gurdy. Readers are invited to suggest (polite) names for the device by emailing the author.

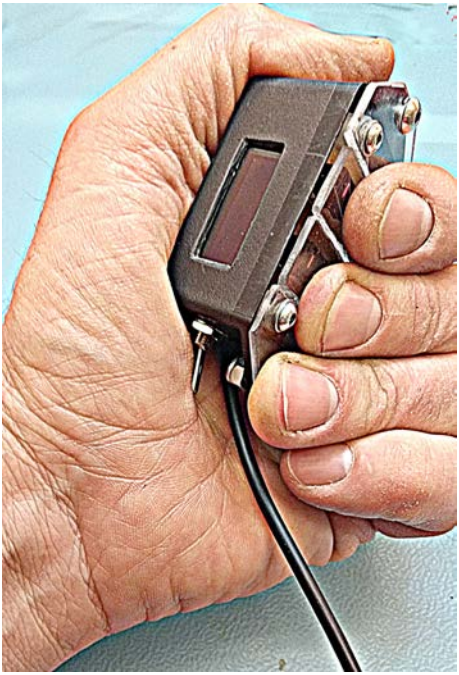
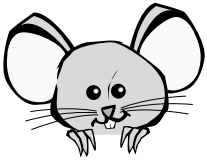


Figure 4: This version has a complete human-machine-interface inside. See text.

Figure 3: To 'Tune' the switch action. Use the nuts to move the switches towards, or away from the spring plate..



PEREGRINO (Pilgrim)

A basic transceiver for 17m 'phone

By Joan EA3FXF and Eduardo EA3GHS

During the 2012 Sinarcas EA-QRP convention,we held a lively terrace discussion with several colleagues about design of simple equipment for p/expeditions and field days, and these ideas were the result-

- It must be original, not a copy
- should have low consumption-battery powered
- Using a daytime band
- Stable, strong, simple, light and cheap
- Uusing a fishing pole antenna since there are not always handy trees
- phone- as not everyone knows CW

We tried to design the rig so that lovers of radio and travelling can enjoy working DX while on the road. True pilgrims know the strain of carrying even one extra gramme, and even with frequent rests it can be some days before batteries can be recharged. And of course, the charger means extra weight so dry batteries are a better bet.

It should use a 'daytime; band and have a manageable antenna. Such an antenna defines the working frequency which needs to be high. We thought about 20m but after listening for some time concluded that 17m is ideal, being quiet and contest free, this should allow long distance working with low power.

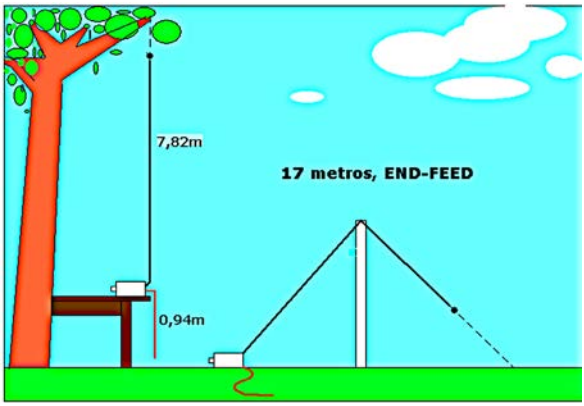
Originally, double sideband (DSB) was considered but we decided that it is inefficient and wasteful of power with the extra sideband, SSB allows for a classic crystal filter based design. This rig has only 84 components, its simplicity being due to the use of bidirectional NE602s switched by relays

A neat layout for the original pro-

Transceiver Specification

Mode SSB
Tune 18,110-18,158kHz (see note 1)
Tuning VXO
Sensitivity 1μV
Antenna end-fed
RX consumption 26mA (32Ω)
TX consumption 150mA
Selectivity 300Hz-2500Hz

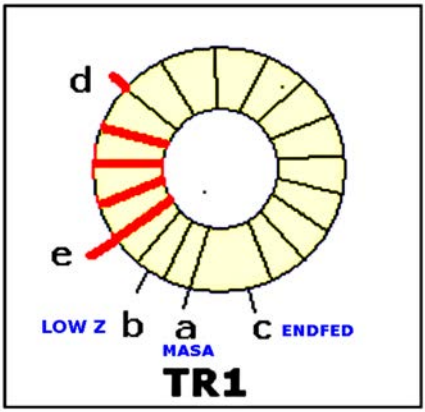
Antenna



The half wave antenna used with this project, is not new, Zeppelins used them, hence the antenna type is often named Zeppelin. But it's otherwise known as an end-fed. Its great advantage is that it doesn't need an earth and when resonant as a half wave has at least 3db gain, more over favourable ground giving free power gain. The radiator is 7.82m and needs a counterpoise of 0.94m-though in practice the headphone cable may provide this.

Final Stage

The final output stage, uses a 2N5109 UHF transistor working in class B thanks to the base bias (but see Note 2).The collector is loaded by the primary of transformer TR1, Its secondary is resonated so there is an impedance of 2.5kΩ between points a and c, An impedance level suitable for matching to a half wave antenna. In TX the LED lights at maximum at resonance- which allows best matching between the load (antenna) and collector with minimum loss. As the second harmonic is 30db below the fundamental it was felt that at QRP power, little more was needed.



The Components

Tuning capacitor – polyvaricon 140 + 60pF sections in series
Auxiliary capacitor CV-see VFO adjust, see note 1 not required in modified version
Antenna tuning capacitor C6 – small section of polyvaricon 60pF

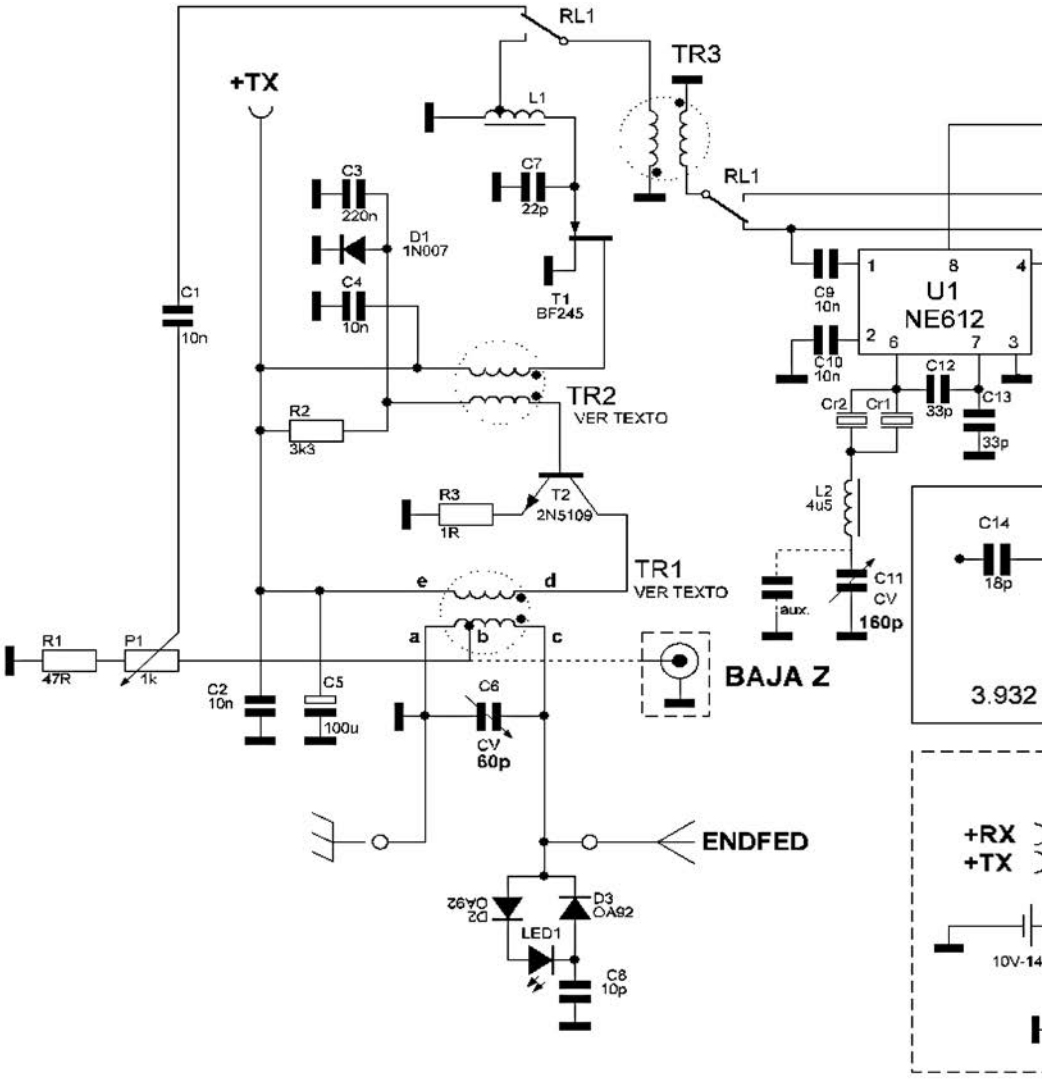
Note that this is subject to high voltages despite the modest power so use a good quality one, the same goes for all fixed capacitors in the power chain.

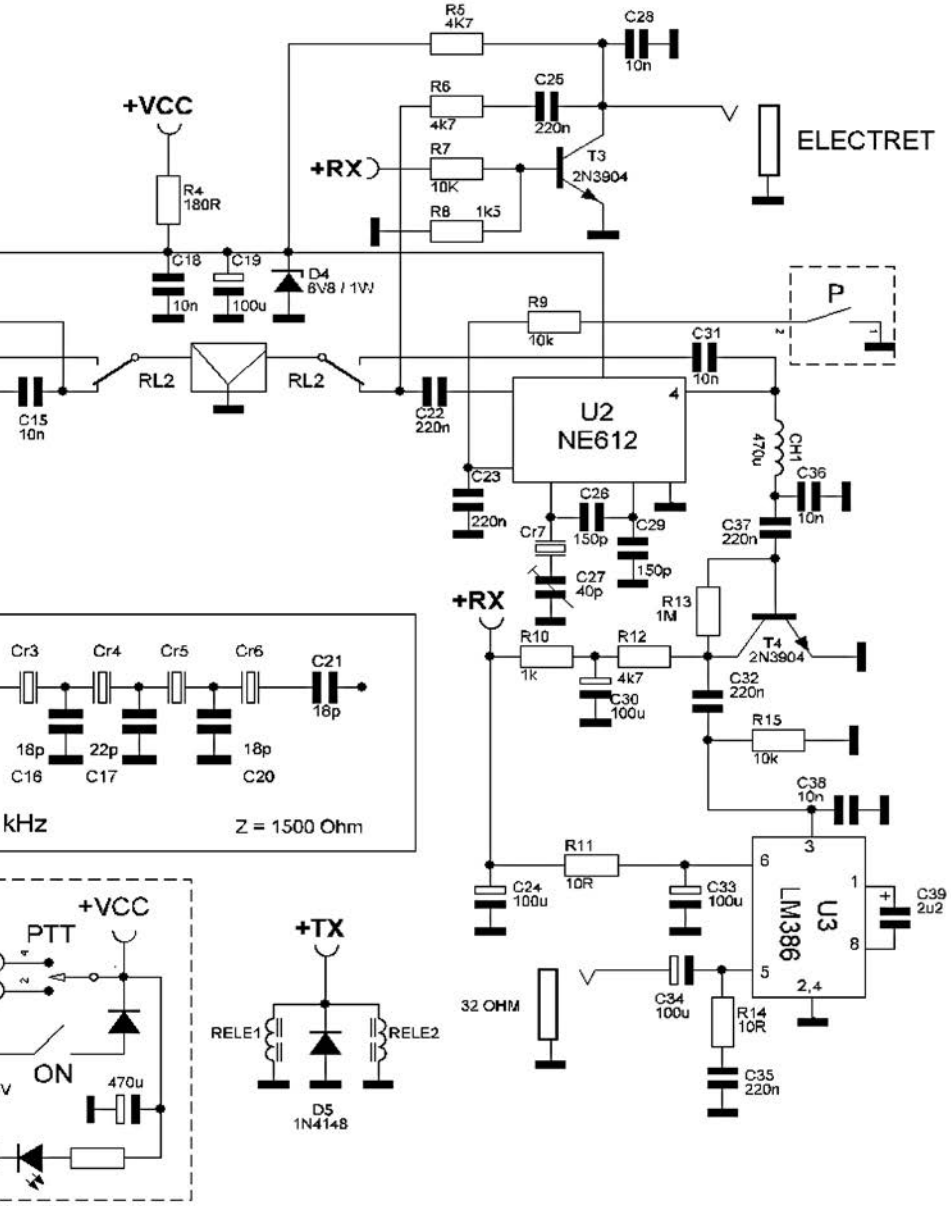
Transformer TR1,the antenna matching transformer, the tunable secondary is 24t

PEREGRINO

17m SSB RTX, QRPp

EA3FXF, EA3GHS 4 - 8 - 13




R5
4K7
C28
10n
+VCC
R6
4k7
C25
220n
ELECTRET
+RX
R7
10K
T3
2N3904
R4
180R
R8
1k5
C18
10n
C19
100u
D4
8V8 / 1W
P
R9
10k
C31
10n
RL2
RL2
C15
10n
C22
220n
U2
NE612
4
CH1
470u
C36
10n
C23
220n
C26
150p
C29
150p
C37
220n
Cr7
C27
40p
+RX
R13
1M
Cr3
Cr4
Cr5
Cr6
C21
18p
R10
1k
R12
4k7
T4
2N3904
18p
C16
22p
C17
18p
C20
C30
100u
C32
220n
R15
10k
C38
10n
kHz
Z = 1500 Ohm
R11
10R
3
6
1
C24
100u
C33
100u
U3
LM386
C39
2u2
8
5
2,4
+VCC
PTT
+TX
32 OHM
C34
100u
R14
10R
ON
470u
RELE1
RELE2
C35
220n
D5
1N4148

on a T37/6.Starting at point a wind 3 turns then make the tap b, then wind 21 more to c making 24 in total. The link is 6 turns in the same direction wound over the cold end (see diagram)

Transformer TR2 primary 5 turns, secondary (base of T2) 2 turns on an FT37/43 Transformer TR3 matches the 1500R of the NE602 to 50R input, primary 27 turns to the IC and secondary 5 turns in the same direction for the input, on a FT37/43

L1 and L2 come from the EA-QRP Club – but see Note 3

Headphones 32Ω - if using an 8Ω speaker, wire a 15Ω resistor in series. There is no need for an audio gain control since P1 controls the volume of the rig.

Adjustment and biassing of the final PA stage

Although the design uses a 2N5109 transistor, you can experiment with others in the final and with the bias used (see note 2). Making a break in the track you can measure the collector current and vary the value of R2 to optimise for each transistor. In the prototype we measured currents of 20-30mA with excellent linearity. Adjustment of the VXO is not really required, see Note 1.Though, the VXO needs about 10 minutes warm-up time to be properly stable.

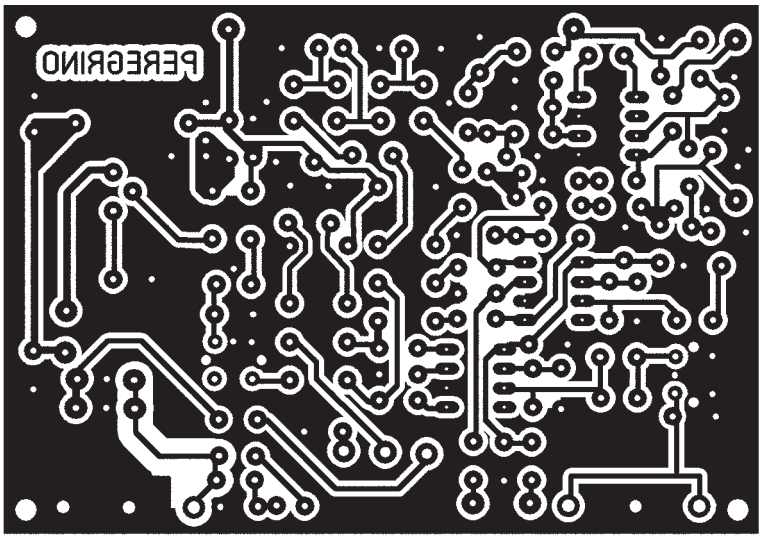
Testing

First apply power, check for audio signal on receive and that VXO is on frequency.

Now put a 47Ω resistor between points a-b on TR1 (marked low-z) and connect a probe for making measurements. With no microphone connected switch to TX and switch P to on, and monitoring the final stage current, peak C7 (see note 3) and C6 for maximum output/LED brightness. Connect a microphone, and adjust C27 for best audio quality in a monitoring receiver. Switch P allows tuning up without having to whistle into the mike

Antenna

As the rig is not designed to work into low impedance loads, harmonic suppression when using a low impedance feeder cannot be guaranteed. You



Note:
This track pattern is shown as if 'looking' through the PCB from the component side

may find unwanted signals may be received, the 50Ω facility is just for testing.

PCB

A pcb design measuring 100 x 70mm is shown. As this rig, is not a kit, it will depend on your building skill to work properly. To build and adjust the rig a degree of experience is assumed. There's no kit offered, nor is a final version but the designs is offered as a basis for further experimentation.

Additional Notes – Nigel G0EBQ

NOTE 1

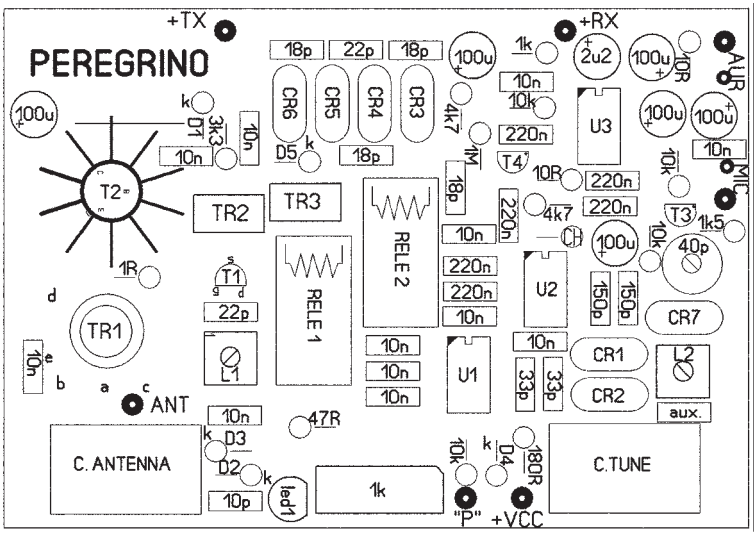
The original design used a 3.932MHz IF and 22MHz VFO. I was unable to find cheap 3.932MHz crystals in the UK, I used an IF of 1.8432MHz with a 20MHz VXO, both of which the GQRP Club sell very cheaply. The downside of this though is that it only tunes to about 18.158MHz so you lose the top 10kHz of the band.

On the other hand it was possible with the prototype values to tune out of band hence the need for the adjustment capacitor CV that will not be required in this version.

One important point, due to the change of the IF, is that you will need to change the capacitors in the crystal filter from 18p to 39p (C14,18,20,21) and 22p to 47p (C17) to maintain the correct filter response.

NOTE 2

The original authors later found that the Motorola 2N4427 transistor, which GQRP Club Sales give away as a 2N3866 equivalent, will work just as well in the final; I used one in my prototype (apparently 'proper' 2N3866s don't work though).



Note:
This overlay is shown as seen from the component side, and should be imagined as if it is laid over the top of the track pattern.

NOTE 3
The coils L1 and L2 for the original design came from the EA-QRP Club and are no longer available. For L1 wind 20 turns on a T37/6 with a tap at 5 turns for the input, and replace the 22p capacitor C7 with a 60pF trimmer. L2 can be a fixed inductor of 4.7µh which will allow plenty of “swing” on the VXO.

Construction
There are a couple of mistakes on the pcb silkscreen component layout. The capacitor marked 10n to the right of T2 and left of the 3.3k resistor at the top left is C3 and should be 220n. Also the resistor marked 10k at the far right to the left of the 40p trimmer and T3 is R5 and should be 4.7k.

There are a few little mistakes in the circuit diagram.The circuitry in the inset box at the bottom of the circuit diagram for changeover from receive to transmit isn’t included on the board and needs to be wired separately, I suggest though that since you will probably use a Poundland computer type headset/mike without a PTT switch to just use a simple single pole changeover switch to switch the power from R to T, and take 12V to VCC which is on all the time and decouple that with the 470uf capacitor.

The 470µf capacitor is shown the wrong way round in the circuit diagram,– should go to earth, as is C34 in the output to the speaker. Except for the 220n and 4.7k mentioned above the PCB silkscreen is correct and as long as you follow that you should be ok. Not though, that the PCB track layout in the diagram above this is shown the wrong way round, ie its as it would appear from above if the board was see through. Confusing I know!

Finally see my Note 1 - the 3.932MHz crystals were not readily available so I have used a 1.8432MHz IF with 20MHz VXO. And to maintain the correct frequency response of the filter C14,18,20 and 21 are changed from 18p to 39p and C17 from 22p to 47p.

And as stated in Note 3, the coil L2 is a fixed choke of 4.µh and L1 is wound on a T37/6 toroid. Capacitor C7 is now a trimmer capacitor to resonate that stage.

Testing and Alignment
Connect speaker/headset/electret computer type microphone (as sold by Poundland etc), the halfwave antenna and counterpoise, power as previously described and a switch between point P and earth. As there are no earth points on the PCB, you will need to scrape off a small area of groundplane, tin this and make the earth connection there.

As stated if using an 8Ω speaker, wire an 18 resistor in series (I used 10Ω one which worked fine). This precaution, is otherwise audio will be unstable. No need though if using a normal cheap 32Ω headset.

Set the RF gain P1 to minimum resistance and apply power to VCC and R.

Using a counter or receiver check for a signal from the VXO at around 20MHz and that C Tune shifts this by about 15/20kHz.You could try a larger value choke for more shift though that could compromise stability which is excellent.

With an antenna connected you should hear a distinct peak in noise level as you adjust C, antenna, noise will then decrease as you turn P1.

If there are any signals about you should now hear them, adjust the trimmer C27 for best audio-too much one way will sound muffled, the other shrill. The receiver should now be working.

Apply power to VCC and T and switch in P. I tuned up by connecting a basic power meter between the antenna output and earth, using a 2.5kΩ resistor which is roughly the impedance of a half wave as a dummy load, (I used 2 x 5.1K in parallel) into a germanium diode decoupled by a 47n capacitor into a voltmeter. (Slowly) peaking C7 and C6 should give 30V+ peak which is about right; the LED will light at maximum brightness when correctly tuned.

Please do make sure that it's peaked to 18MHz and not the sum frequency of 21.8MHz which is quite close, also the two capacitors interact to some extent and tuning is very sharp. I had to take a couple of turns off the C end of the output transformer TR1 to achieve resonance but other constructors haven't had to, so must be something I did!

Component listing

C = 1 x aux. VERTEXTO C8 = 1 x 10p
C27 = 1 x 40p TRIMER
C39 = 1 x 2u2
C1,C2,C4,C9, C10,C15,C18, C28,C31,C36, C38 = 11 x 10n
C12,C13 = 2 x 33p
C14,C16,C20, C21 = 4 x 18p
C26,C29 = 2 x 150p
C3,C22,C23,C25, C32,C35,C37 = 7 x 220n
C5,C19,C24,C30, C33,C34 = 6 x 100u
C6,C11 = 2 x CV VER TEXTO C7,C17= 2 x 22p

CH1 = 1 x 470u

Cr7 = 1 x 3.932 kHz Cr1,Cr2 = 2 x 22.118 kHz Cr3,Cr4,Cr5, Cr6 = 4 x 3,932 Kc.

D1 = 1 x 1N007
D4 = 1 x 6V8 / 1W D5 = 1 x 1N4148
D2,D3 = 2 x OA92

IC3 = 1 x LM386
IC1,IC2 = 2 x NE612

L1 = VER TEXTO L2 = 1 x 4u5

LED1 = 1 x ultra-bright, 3 mm

P1 = 1 x 1k

R1 = 1 x 47R R2 = 1 x 3k3
R3 = 1 x 1R
R4 = 1 x 180R
R5 = 1 x 4K7
R7 = 1 x 10K R8 = 1 x 1k5
R10 = 1 x 1k R13 = 1 x 1M
R11,R14 = 2 x 10R R6,R12 = 2 x 4k7
R9,R15 = 2 x 10k

RELE1 = 1 x RELE1
RELE2 = 1 x RELE2

T1 = 1 x BF245
T2 = 1 x 2N5109
T3,T4 = 2 x 2N3904

Search for "Peregrino QRP" to find the original article (in Spanish),circuit and photos,this is a (rough!) translation with help from Google translate.

2019's Valve QRP Day & G5LOW Activity

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

Let me start by saying what a dreadful year it has been so far for QRP. Apart from losing **George G3RJV** in March, I have since learnt that **Adrian G4GDR** has passed away in April and **Jim G6IZQ** in February. Jim was a keen collector of AM valve equipment and Adrian was a prolific constructor of old time equipment and very active during the Valve QRP Days. He supported many a constructor by providing parts for projects.

I will miss them all of course but I think the message is to 'keep on keeping on' remembering them and continuing to undertake our part of the hobby as best we can. Having said that the conditions over the first part of the weekend of April 20th and 21st were dreadful with very few stations heard and QRM around 3560 apparent from commercial or military data transmissions. What with a continuous carrier on 3560 at my location from the Openreach VDSL2 fiasco life was tough at times. I managed to work PA, G, ON and a number of these were old friends so the whole exercise from that point of view was worthwhile.

The transmitters here were the infamous 12A6 single valve transmitter and the two valve 12BY7 driving an LS50 German WW2 valve which is an excellent device. My usual antenna is the ZS6BKW 93 foot six doublet, which I can recommend, which has a feeder section about 39 feet long. Look at http://www.nc4fb.org/wordpress/zs6bkw-multi-band-antenna The doublet is only 27 feet high and is fed via a one to one balun at the 50 Ohm coax feed point.

Valve QRP Day Reports

Valve QRP day for 2019 was on April 20th and 21st and as usual afterwards, I've had a good response. I've had an email from Lou N2JPR, a non-member of GQRP but very welcome, who has a similar interest in tube/valve equipment and QRP and he has sent me some information on a transmitter he used. He only has one contact due to conditions in the US with N8AFT in Ohio, (my house is called 'Ohio' by the way!), and Lou has sent me some pictures.

Lou tells me 'I was using my Homebrew 832 VFO and 829 Hartley with 5W to my G5RV antenna up 45ft. I was running about 200V DC Plate at 75mA to get the 5W output. I chose chassis construction over breadboard to render a more stable output over the 80/40/20M bands. The receiver was a homebrew 4 tube regen. Recording was done with a standby Sangean ATS-818CS portable SW receiver and a dedicated Sony MP3 Recorder. I did send CQ later, from about 00:00 to 02:00 UTC, but no takers'.

G3NKS Derek faired very well in the poor conditions. 'Another very enjoyable weekend on QRP with my usual pair of 6V6 CO/PA TX and Drake R4C receiver. A total of 16 contacts were made miinly on 80m but with three on 60m. Of the 16 stations worked only six

declared valve transmitters: G4XRV (CO/PA), G4ZXN (Paraset), G4GIR (AT5), GW3UEP (CO/PA), G4HWK (CO/PA), and G3MCK (CO/PA). I missed a few of the regulars, perhaps because I was away overnight Saturday so wasn't on the bands on Sunday morning. On 60m my signal had a distinct chirp even though the TX had a crystal oscillator. When apologising to stations for the chirp, the usual reply was it sounded "great" and added an air of authenticity!'72, Derek G3NKS

'Hi Colin, a quick report. I decided to operate in the garden /P style from batteries and a low 80ft wire antenna. The rig was my usual CO/PA transmitter and a regen receiver. It was not a conspicuous success! On 80 I worked ON4ADI and G4ZXN, 60m produced G4OEC and a 239 report from Martin G4ZXN. Working from indoors with a better antenna and my spy Mk 119 transmitter and Eddystone 830 yielded a QSO on 160 with G3XIZ on Saturday evening' 73 John G3TYB

Gerald G3MCK was active with his 5W CO/PA and inverted vee dipole over his house and worked 15 stations. Gerald does not use an antenna tuner but has a specific dipole for each band including a 30/20m dipole in the loft. He lengthens it and shortens it with wire links. Gerald considers these activity periods as 'real radio' - he's quite right of course.

'Hi Colin I had good weekend of activity and it seemed like 80m was open all day! Operated on 80m using my one valve CO/PA and regenerative transceiver (12AX7) with 1.5Watts output and the AT5 with an Eddystone EC10 MK II RX on 160, 80 (5 W) and 60m (1W). The AT5 has been modified for 60 you can see a band pass filter on top of the AT5.

I'm pleased to say I worked most of the regulars with one QSO on 160, 9 on 80 and 5 on 60, with seven Valve to Valve QSO's. Unfortunately I missed G5LOW and sadly our recent SK friends. What a shame the weather was so nice - would have spent longer in the shack. See you in the upcoming new events.72/73 Ian G4GIR

'Hello Colin, despite having domestic duties I managed a few hours in the shack over the Easter holiday. Using my home made valve transceiver I had 23 QSOs with 16 stations, all except 4 running QRP and 6 of these were using valve equipment: G3MCK,

G3TYB, G4GIR, G4XRV. G4ZXN and G5LOW (G3VTT).

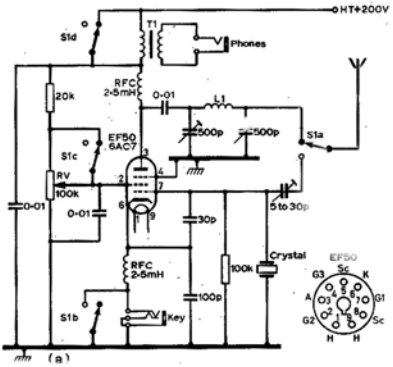
I'm finally getting the hang of my simple regen RX and with careful adjustment of RF gain, reaction and tuning I can pull in almost anything (QRM permitting!). I called CQ on Top Band (1836 kHz) for quite a while on Sunday evening and despite having the CW end of the band all to myself. I only had a single QSO with Ian G4GIR. Top Band can be superb for inter-G QRP rag-chewing and more ops would benefit from giving it a try. Activity seemed down on usual but no surprise as it was Easter, there were several contests running and the weather was extremely fine'. 72 Chris G3XIZ

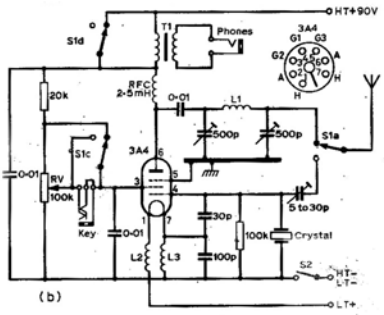
'Hi Colin, I had only a limited time to participate in Valve Day activity, there were several contests on, and I also participated in EA QRP contest with an old FT901DM partly valve rig. There was also very bad propagation on the bands with noise and QSB. In the Valve Day activity I used the good old tested Telefunken SEM-78 spy radio, built in 1955, with 2x EL84's in PA giving about 15W out. After the first QSO I used only one EL84 in PA and with about 7W output into an Inverted Vee antenna, and the receiver was a WWII German TRF Torn EB built in 1943 using 4 valves type RV2P800. On Sunday night I had three QSOs, OK1GS, HA8EB and OK1HFP. During the activity enjoyment was had with them anual switching from receive to transmit, zero beating and regeneration feedback control on reception. Greetings from YU 72 de YU7AE Kare G QRP #11798

It's probably a good time to mention the contacts in the activity periods should be five watts or less to retain QRP status but I'm sure we recognise the value of keeping the old equipment on air. I can fully sympathise with the amount of receiver adjustment Kare would have to make using a TRF receiver!

'Hi Colin, I only had about an hour on the Saturday morning as we had to go to the airport for a trip to Berlin but I fired up the Drake line-up: T4XC and R4B. I stayed on 3560 and worked (with 5W into my doublet) the following stations: G4GIR, G4HMC, G4GMA, G3VRU and G4ZXN. I was glad to have joined the fun but wish I could have stayed longer!' 72 de Peter G3XJS.

From Mike G4AQS I've had: 'Hi Colin, I emailed you regarding the attached simple one valve transceiver in Technical Topics, from the original in Short Wave magazine back in the 1950s. The question was did anyone get it to work? I didn't have much success with an EF80, the single channel RX being stone deaf. Finding time, a pristine looking EF50 and a more suitable audio transformer, I tried again. The same results, no output on receive and 200mW or so on transmit. Experimenting, (fiddling about), with the circuit I found that replacing the crystal with a suitable coil gave signals from all round Europe albeit at a low level. However this only was achieved by detuning or disconnecting the PA circuit. The TX gave a similar, usable 200mW as the EF80. My conclusion is that it was a pipe dream circuit that was never tried by its designer and could only function with more switching. If anyone knows better I would like to know. It seemed a good idea at the time though. maybe I should try a ceramic resonator before I take the lot apart' 72 Mike G4QAS.





Our thanks must go to Mike for trying the circuit. The only successful one valve transceiver I have used was made by Geoff G3YVF using a 6V6. Working like a wall paper hanger with one arm and a box of crystals I was able to make an entry in the DL AGCW Minimum parts QRP contest a few years ago gaining a credible score. Geoff's circuit had appeared in Sprat 137 as the 'Minimal Art -mark 5' transceiver and was subsequently sold. I wonder who has this transceiver now? Please email me if you are the new owner.

The next Valve QRP Days are the weekend of July 6th and 7th. This date coincides with the 'Original QRP' contest on the Sunday. I'm no fan of contests but you might pick up some extra contacts. See the rules at www.qrpcc.de/contestrules/oqrpr.html

And Finally

Finally from Robert SM0YSR 'Since I hardly get anything done without a deadline the Spring Valve QRP Day provided an opportunity to finally try building and operating a valve transmitter. As a first step I browsed through the big box of valves purchased at a rally 15 years back. I wanted to avoid messing with high-voltage supplies and so settled on a DL73 (CV2299) battery valve designed for portable VHF applications. These are live-fast-die-young devices, rated for only 200 hours of operation but allowing up to about 20mA anode current. After trying just about every single-valve power oscillator circuit I could find I settled for a variation of the modified Pierce circuit from the 1968 ARRL handbook with a pi output network. This provides stable operation and a tuning range from 7030 to 7032 kHz with an output power of about 300 mW with very good harmonic suppression. For the power supply, I use ten 9 volt batteries in series, and a 1.2 volt NiMH cell for the filament (200mA). Unfortunately 40 meters was busy with contests on the actual Valve Day, but the most important thing is that I finally got around to completing this project!

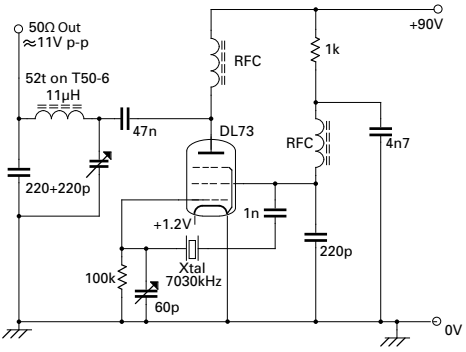
Notes:

I use small 1mH inductors for the RFCs.

About 50 pF is needed for the variable capacitor in the output network at 7 MHz Voltages is high so I use an air spaced variable.

A polyvaricon is sufficient for the VXO tuning capacitor. If its value is too high oscillation may stop at the lower end of the tuning range.

Current consumption is about 14mA at 90 V, or 1.25 watt input power. Any advice on improving power efficiency is welcome.



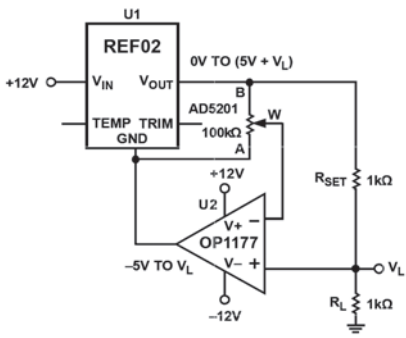
Precision Current Source

Phil Stevens G3SES (philg3ses@gmail.com)

Having already built a very useful precision voltage source (with the design sent to SPRAT for publication) I decided that a companion precision current source would be a useful addition to the shack test equipment.

Like many old-timers I have collected a number of moving coil analogue meters from scrapped equipment and rallies. Often these are not calibrated in the basic meter sensitivity and this needs to be checked before use.

Also I have a few analogue and digital multimeters which need occasional checking for accuracy.



Programmable 0 mA to 5 mA Current Source

Like the voltage source this instrument is based round the PMI REF01HP voltage reference chip as I have a large number but any suitable alternative could be used. The chip produces a highly accurate 10V output and PMI data shows a circuit that can produce a precision current source. The output 10V is connected across a known resistor and a current I = 10/R is obtainable from the output terminals. The second chip, a voltage follower, is necessary to isolate the reference from the load. I used an old OP07 which has a low input offset voltage but there are many alternatives.

Supplies to the instrument of ±15V were obtained from an external stabilised power supply. A number of standard currents were decided upon from 25µA to 1mA although the instrument can provide up to 10mA. The values for R were calculated and these were made up from series or parallel combinations with the values checked on my Peak LCR45 and a 7055 precision ohmmeter to obtain values with errors much less than 1%. A rotary switch was used to select 12 currents and a pair of terminals for an optional external resistor.


ANALOG DEVICES

Precision 2.5 V, 5.0 V, and 10.0 V Voltage References

Data Sheet REF01/REF02/REF03

FEATURES

High output accuracy
REF01: 10.0 V, ±0.3% maximum
REF02: 5.0 V, ±0.3% maximum
REF03: 2.5 V, ±0.6% maximum
Adjustable output: ± 3% minimum
Excellent temperature stability
REF01: 8.5 ppm/°C maximum
REF02: 8.5 ppm/°C maximum
REF03: 50 ppm/°C maximum
Low noise
REF01: 30 µV p-p typical
REF02: 15 µV p-p typical
REF03: 6 µV p-p typical
High supply voltage range: up to 36 V maximum
Low supply current: 1.4 mA maximum
High load-driving capability: 10 mA maximum
Temperature output function

APPLICATIONS

Precision data systems
High resolution converters
Industrial process control systems
Precision instruments
Military and aerospace applications

GENERAL DESCRIPTION

PIN CONFIGURATIONS

Table 1. Selection Guide

Device Number	Output Voltage	Input Voltage Range
REF01	10.0 V	12 V to 36 V
REF02	5.0 V	7.0 V to 36 V
REF03	2.5 V	4.5 V to 36 V

Precision resistors can often be salvaged from the attenuators of scrap instruments. The completed instruments was checked against the current ranges of three digital multimeters with maximum errors of much less than 1% which is typical of the instruments in the radio shack.

Just because your 3 and 1/2 digital read-out resolves to 0.05% this does not mean you can get that sort of accuracy. My Fluke DMM specifies ±0.75% ±2digits on the current ranges.

If you have any queries please contact me by email.

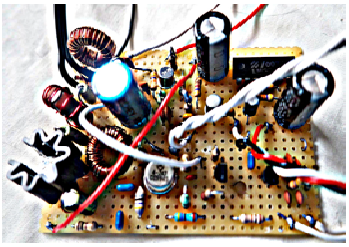
MEMBERS' NEWS

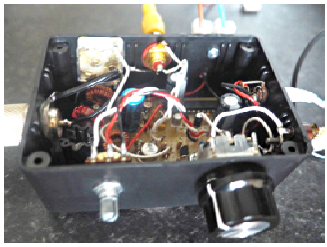
by Chris Page, G4BUE

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

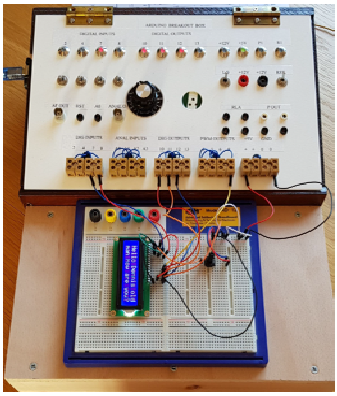
I start this column with a combination of sadness and joy. Sadness because of the passing of our founder **G3RJV** on 11 March. My thoughts about George were published in the special tribute edition of *SPRAT*, so I will not repeat them here, except to say that I first met him in April 1979 at the Leicester Exhibition. That meeting led to me writing the first *Member's News* column in *SPRAT* 19 (Summer 1979 edition), which means this column completes 40 years of writing. I was very surprised in April to receive a letter from the RSGB telling me I should receive the Don Cameron, **G4STT** Memorial Award for 2019 'to recognise outstanding contribution to low power amateur radio communication, in your case for nearly forty years of continous service, and your devotion to low power communication'. The trophy was presented to me by RSGB Board member **G3YSX** at my QTH on 7 April. I feel very humbled to have been awarded the trophy for merely doing what I enjoy doing, and thank the G-QRP Committee for submitting my nomination to the RSGB.

As a tribute to **G3RJV**, **GØEBQ** decided to build the SCD pictured right, the original 'old school' version from *Short Wave Magazine* with a 40673 and metal BC109, which he found in his junk box. Nigel says the TX gives a clean 1W and by putting various junk box resistors and capacitors in series and parallel, he only had to buy one resistor and an LM380. He says, "I would like to think that George would have been proud! The RX is amazingly hot, though obviously wide open, with just the one tuned circuit. Output drops to 500mW when you connect it to the RX input via a capacitor but hey, that's plenty, and full break-in too! It's working on 20 and 30m so I can get away with one filter; 20m is just noise lately but I've got 559 back from **IZØXZD** on 30m. Most importantly it's fun! Thanks George for everything".





G3XIZ has finished his Arduino interface unit pictured right which he started two years ago. Chris says, "It's a very handy piece of kit as it allows easy prototyping using the Arduino without the necessity of having the fingers of a safe cracker and the eyes of a hawk". He says a few of the local Biggleswade area stations (the 'Biggles Triangle') have been experimenting by sending SSTV via QRP on 4m FM. He uses the MMSSTV program and has built an interface unit to be used between the PC sound card and the 4m TRX. This is the first time in over 40 years of writing this column I have reported SSTV QRP!



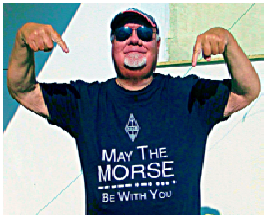
DXCC in **GM4CXP**'s 'QRP no FT8 10 April 2018 onwards log' at 30 April 2019 were 160m 1, 80m 9, 40m 18, 30m 3, 20m 15, 17m 2, 15m 0, 12m 2, 10m 9, 6m 17, 4m 1, 2m 2 and

70cms 1; total QSOs 215, nearly all CW with 'just a sprinkling of SSB and FM'. The figures for Del's 'QRP FT8 21 June 2018 onwards log' are 160m 12, 80m 41, 40m 24, 30m 21, 20m 24, 17m 28, 15m 12, 12m 2, 10m 19, 6m 14, 2m 5 and 70cms 2; total QSOs 1126. Comparing the two logs, in my opinion, illustrates a worrying trend in that the traditional modes, especially CW, are slowly being replaced by FT8 and similar modes. Having had FT8 demonstrated to me, I just cannot see the personal satisfaction of using it, compared with making QSOs, especially with CW, where everything is done by yourself, albeit you may have had the other station's presence on the band indicated to you through the DX Cluster or the RBN. Perhaps I am getting too old! What do others think?

G4CIB and Leta, **G4RHK**, spent a lively five days on a very windy Lundy in the Bristol Channel on 4 March, flying from Hartland Point in an Agusta 109E Power helicopter operated by Castle Air, pictured right. Keeping the weight down is a priority, 10kg per person the maximum allowed, and so the FT817ND, a three element 2m SOTA beam, 80m dipole, collapsible telescopic 'roach pole' and ancillary equipment, along with personal items, just crept in under 20kg for the two of them. Brian planned to be QRV in the 2m UKAC Contest on Tuesday evening and on Thursday evening in the Gloucester ARES 'Club on the Air' 80m net (pictured right). The wind was so fierce at the start of the UKAC event that after 20 minutes he took the 2m beam down after just two QSOs. The wind and rain continued, precluding any outdoor antennas and he had to be content with 2m FM QSOs via the **GB3NC** repeater. The wind dropped about an hour before the Thursday evening net and the 80m dipole was put up, enabling Brian to be heard by most of the club members on the net. After the net he QSO'd **F5NZY** on two-way QRP. Their next visit to the island is 21/28 September when hopefully they will have more settled weather. Also QRV in September will be **DDØVR** as **A35JY** and **5WØVR** with his KX3 (SSB), KX2 (CW), Juma 1000 amplifier, **MWØJZE** Hexbeam, DoppelZepp vertical and Palstar AT-500 ATU.

G4TGJ activated Great Whernside for SOTA in February and QSO'd 17 stations on 20, 30 and 40m CW, the best DX being **RV9DC** in Asiatic Russia. After some negative comments about band conditions on the G-QRP mailing list, Richard went on 40m with his FT450D set to 5W and had no trouble working around Europe. He also dug out his 30m QCX and had plenty of contacts with just 2W. "Well, there is life in it" says **G3TYB**, who on 8 May QSO'd **EI5HJ** on 160m for a two-way QRP natter. John intended being on 1836kHz for the following week hoping to make more QRP QSOs.

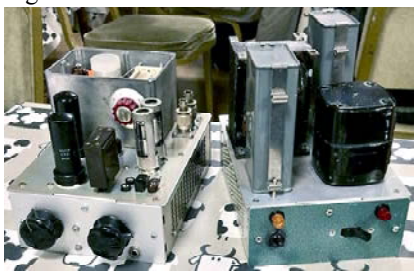
Pictured right is **G4UDG** in Mellieha, Malta in March/April for another 'winter warmer' where he was QRV as **9H3FC** with his KX2 (3W), Emtech ZM-ATU, Palm Pico paddle and EFHW antennas for 30, 20 and 17m. With casual operating, Chris made 327 QSOs (including your scribe on 20m), of which 65 were two-way QRP, with 46 DXCC, the furthest being **VE9CB** and the most memorable cracking the pile-up calling **5V7EI**. **M1KTA** was QRV in March as **C6AKT** in the QRP Section of the RSGB's BERU Contest, which he won last year.. **G3LHJ** made 281 QSOs with his 5W on all bands in the ARRL DX CW Contest in February.



ON4BCA has upgraded his station to a LDG Z11 Pro II tuner that he says works very well with his new outdoor antenna, a Chameleon hybrid mini vertical + Mil whip. Patrick says, "The antenna is superb for this type, top quality construction and 1:3 SWR on all bands 80-6m without a tuner. It is normally used for

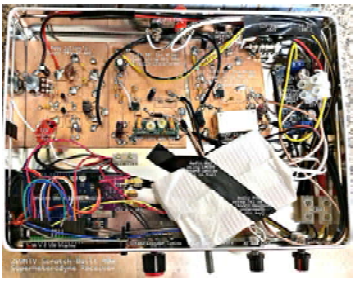
/M and /P operation but is mounted on my flat roof". He mentions QSOs with **GM4HBG**, "a very fine G-QRP gentlemen" and **IK2RGV**, also, "a very fine QRP gentleman" and a long two-way QRP QSO with **G4ZXN**. **F5NZY** got back on 40m in March after raising one leg of his 40m inverted vee dipole that dramtically reduced his noise level. In April Steph bought a Heathkit HW8 in mint condition.

Pictured left is **G4FGJ**'s ECL86 breadboard XTAL/VFO TX which also shows the GZ34 HV PSU; the chassis of which was constructed using flat aluminium sheet and angle - no bending! Gordon constructed and operated it on his small work table. Pictured far left is his main shack built into a 22 inch wide cupboard. At the top are 473kHz PAs, one of which was given to Gordon by **G3XIZ** to get him going on MF (he often joins the MF net on Sunday mornings with **MØJXM**, **G3DXZ** and **G3XIZ**). Beside the MF PAs is a 4m transverter and lower down the K3 is often used for QRP. The table holds his keys. **PU2CLR** has made a video of the construction of his VFO (530kHz-160MHz) and BFO (400kHz-500kHz) controlled by Arduino, using the Si5351A. See the video at <https://youtu.be/pFDvcIk5EAk https://youtu.be/pFDvcIk5EAk> and the documentation, schematic and source code at <https://github.com/pu2clr/VFO_BFO_OLED_ARDUINO> and <https://github.com/pu2clr/VFO_BFO_OLED_ARDUINO>. **G4TGJ** has continued with his Arduino based TCVR project and tried to do the phasing and filtering within the ATMega processor (ie using it as a DSP) but, not surprisingly, it doesn't have the processing power to do this. Richard switched back to using op-amps and that works nicely. He says, "I have found home brewing to be a succession of frustrating problems followed by great satisfaction when they are overcome. I'm pleased to say that it's going well and I have had my first QSOs with my homebrew rig. There's plenty more hardware to build and sofware to refine, but it's a very rewarding obsession!".



The Echelford ARS held its annual Construction Contest on 29 May and **M1GWZ** entered the 'Laughing Gravy' Top Band AM transmitter, based on the 'Poppet' circuit with a simple IRF511 linear PA (pictured above left). The final rig puts out about 4W and QSOs and "clear, readable" reports have been received up to about 10 miles distance, more than sufficient for use on their local 160m net. Phil says the carrier is clearly visible on the Wheathampstead SDR, 35 miles distant. Sadly he didn't win, the prize went to **G4GJL** for his use of valves and superior build quality in his 80m TX (pictured above right). Phil says, "The important thing is that homebrewing to a high standard is alive and well at Echelford". At the end of March Phil reported **G4GSC**, Social Secretary of Echelford ARS and G-Club member, sadly became a Silent Key. On 11 April **G3VTT** reported senior Club member **G4GDR** (373) a Silent Key.

2EØNTV has just completed his scratch-built 40m superheterodyne receiver by adopting a modular approach of building and testing a section at a time (pictured top of next page). The first two mixer stages are based on the 'Colt 80' design in the RSGB's *Radio &*



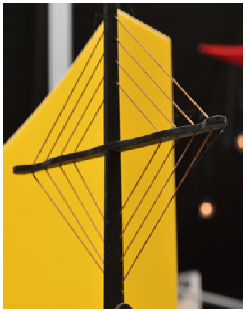
Electronics Cookbook and a QRP Labs 40m BPF which Nick says works really well. He also added some impedance matching transformers and is indebted to **N6QW** of *Soldersmoke* fame for his really helpful advice in this respect. The transformers are built to Pete's specification in his Sudden Transceiver design published in *SPRAT* and on his website. Nick also added another of Pete's circuits - a tuned IF Amplifier for 9MHz and says, "It is enormously satisfying to listen to 40m on a radio that you built yourself. It might not win any design awards but it does work and I've learned a lot through the process". More details about the RX are on **2EØNTV**'s website at <https://www.qrz.com/db/2E0NTV>.

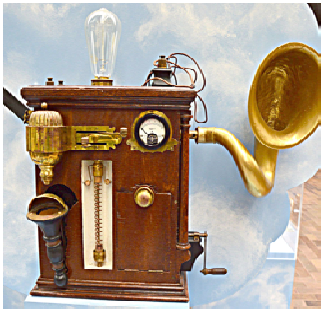
MØCYX spotted a touch switch eight pin IC from *Hobbytronics* at £1.99. Graham says it will switch two inputs and can be set for momentary or latching. He has made three touch paddles with it with an NPN transistor on each output. Pictured

above left is his touch key intended for use with his 817. Graham says, he has seen "anything and everything" used to make a Morse key and is always looking at new options. Recently, he had a number of old ID cards and his inspiration is pictured above right. He writes, "I have not seen this option used before and anybody into construction would grasp it from the picture. It's about six layers with two old relay contacts, the main construction is with a pair of scissors and impact adhesive".

About 1985 **G4LZD** had to give up amateur radio and through **G4VHL**, who he has known for years, has just returned to the hobby. Stephen says, "Unfortunately, after operations and anaesthesia, much of the past is hazy but I still retain the skills particularly in CW. As apparently I was a member of G-QRP I have just rejoined. When operating QRP I will be using the Xiegu X5105, either 2.5 or 5W, through my newly erected Windom antenna at the side of the house or if portable, then the MP1C Super Antenna".

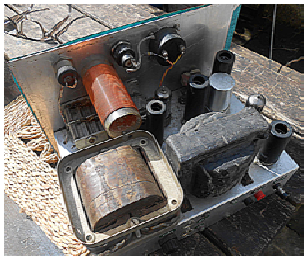
G3UGF went to the National Motor Museum at Beaulieu recently and spotted the small frame antenna pictured right. It turned out to be connected to the 'Spy Phone' from the film *Chitty Chitty Bang Bang*, pictured far right. "Now there's an interesting project for someone to build a replica", he says. What Richard didn't expect to find, in another part of the estate, was a genuine Mk3a Special





Operation Spy set complete with 10x crystals, original key and spares. It was donated by the Whitworth family and Richard says, "There was also, what looked like, a Kent Key next to it, so I wonder if its provenance includes a licensed Amateur?". **GM4CXP** now has a 160m inverted L antenna, with a 40 ft vertical section that **GM7NVA** "somehow squished into my 'postage stamp' garden", that has greatly improved his performance.

On 7 May **MØUAW** spotted that *Aldi* are selling 180cms tall, 10mm diameter, aluminium garden canes, at two for £2.99. Clint says, "They are rather unusual in that they are wound into a lazy corkscrew shape, but that just means they're electrically longer than the advertised 180cm. May be useful, certainly unusual".



On 28 May **G3MFJ**, **GM3WIL** and **GM4VKI** manned the stand at the NASRA (Blackpool) rally. They had G-QRP and QRP-LABs stock and Kanga kits and Roy says all three sold well, as well as G-QRP renewals, 43 members signed in. Roy took home the 160m TX pictured above to work G3VTT's Valve Days, linked to his HRO RX. Their next rally is at Braehead, Glasgow on 16 June.

GØFUW was very pleased to be reacquainted with **PA9RZ**, Chairman of the Benelux QRP Club, when they met at the Yeovil QRP Convention in April. Both Chairmen were keen to maintain our links across the Channel, whatever flavour of Brexit we end up with. The Club stand had over 30 visitors and trade was pretty hectic at times with kits, components and books all in high demand". Steve says in addition to meeting Robert, it was also great to see Rob Mannion, **G3XFD**, (*Practical Wireless*) in attendance too. **MØDDI** thought members might be interested in a website he came across at <www.americanradiohistory.com> that contains many books and magazines scanned into it, including a section on 'Books-Hobbyist & Construction' that contains many radio related books including some by **G3RJV**. Pat says there are also many magazine, including *Practical Wireless* from the 1930s to December 1999 and *Short Wave Magazine* for the same period.

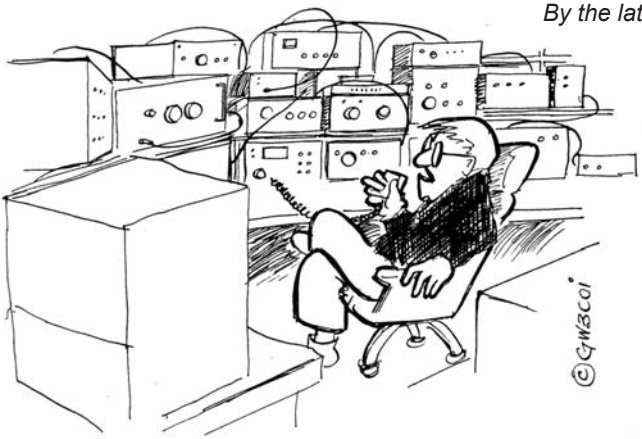
MI5MTC reports on the 38th Lough Erne ARC (LEARC) Rally held on 12 May that included three busy stands promoting QRP and the G-QRP Club, and a fourth, from Mid-Ulster ARC, sold intriguing home-brew QRP-VHF Moxon antenna kits. "Ah go-on, you know you want the home-brew QRP radio, you do! you do!" says **EI5EM** picture below left to a customer at his EI/QRP stand (*thanks photo GI1BZT*). Tony's park-portable QRP station, pictured below centre was much admired; a well thought out and practical rig. **GI1BZT**, in tribute to the late **G3RJV**, displayed George's Sudden TX/RX and Z-match

modified from G-QRP Limerick kits, all stacked with a common earth, very neat. Mint Tins with Pixie radios, dummy loads and audio filters, audio amplifiers and signal testing equipment to *SPRAT* designs, all attracted interest. **MI5MTC**'s stand promoted QRP books, the G-QRP club and *SPRAT* DVDs and a few new members and renewals were collected. A notable sale was a heritage DC30-P transceiver with data from *SPRAT* 42, Spring 1985. Michael says, "This was an enjoyable successful QRP and G-QRP promotion. Sources of further information are **EI4JR**'s rally video at <https://www.facebook.com/peter.homer.5/videos/2204714416250434/ >, LEARC website at <www.learc.eu> and the EI/QRP homebrew Facebook group at <https://www.facebook.com/groups/512665235739928/?ref=search>, more members welcome".

Finally, pictures of two birthday cakes! Pictured right is the cake the ladies at **G3YMC**'s church baked for his 70th birthday on 6 May. Dave says, "It seems they had done a bit of research; the rig, a Viking Valiant, is a 275W AM/CW transmitter from around 1958, not sure if **G3VTT** knows anything about them but I certainly never had one. Certainly not QRP! It created a bit of conversation among our church members". Pictured above right is **G3KJX**'s 90th birthday cake. Brian says he is very busy with ATV just now but has not foresaken QRP.

Thanks to all the contributors of this column. Please tell me how your summer goes for the Autumn 2019 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 home during the autumn and winter months, especially in the Winter Sports, so I can let members know to listen out for you.

A cynical outlook on QRP?
By the late John Worthington G3COI
Courtesy of SWM



"I've always tried to keep a simple set-up. . . ."

Club sale special offers

Graham Firth - G-QRP Club Sales - sales@gqrp.co.uk

Here are the new Club sales special offers. We had this offer in the last issue, and it was very successful – we hope that members are getting their soldering irons out and doing some serious construction. Since then, we have had a few more parts donated (I must add, with previous permission), and George's wife has donated some of his stock of parts that he was taken away from, so we have another small list.

I must repeat, that these offers are for you to use in your projects, not for putting on your shelf 'just in case'. And certainly not to be immediately sold on any of the selling platforms. We are hoping that this will stimulate more home brew! This stuff is cheap, and for members only, and we would like an indication of what you plan to do with them. Also, I do not want any more except by pre-arrangement and with my full agreement.

All parts are £2 each. Postage is as normal club sales for most orders, as there are a few crystal filters here, then the postage for them will be as crystal filters from Club sales. Again, if we are over-subscribed – and we really were over-subscribed for the last lot, my club hat will come out and my wife will show her skills in drawing the winners out again. I will wait a reasonable time after this Sprat appears to give everyone a chance.

Please do not send money until I have told you that an item has your name on it. I must emphasise that I have not tested these, but I have no reason to believe that they are not OK. I have shown everything that is written on the part.

The items available this time are:

- **ICs** - SL630C; SL640C; SL641C; SL1640C; SL6440C; SL1430C, Plessey SP8515
- **Mixers** - TDK Corp DB mixer CB314M1A; MCL TAK893
- **Crystal filters** - HTK Yakumo Tusin 9MHz YF-90F; STC 10.7MHz 455/ LQU/914VB; Collins 8T61411-7 – I have -62 – 4.996977 and -63 – 5.001926 and -P4 – 5.000830 versions of this; ITT 10.7MC ±16kC; Midland 8161411-7G2 5.0MHz 1.1Kc BW; Icom FL-34 10.75MHz AM filter
- **Mechanical filter** - Collins F300Z4 and F300Z5
- **Crystals**
  HC49U pins - 10.101; 10.106; 10.111; 10.116; 10.130; 180180 all MHz
  HC6U pins – 7017.7kHz

A holiday home to combat stress *and help Combat Stress*

John, F5VLF/G3PAI, 19 rte des etangs, Mare le Bas 58800 Cervon
Tel +33 386 202550

G3PAI's cottage in rural Burgundy.

There's no charge - just donate what you feel able to either: Combat Stress:

www.combatstress.org.uk

or Help for Heroes:

Bandofbrothers@helpforheroes.org.uk

or the Alzheimer's Society:

www.alzheimers.org.uk

See www.charity-cottage.org.uk for details.

Plenty of space for antennas including 136 kHz. We've recently

G4GDR SK Equipment Sale

Mrs V. Heath Email: vheath195@btinternet.com

The following items are for sale by the family of Adrian G4GDR. Please contact Mrs V. Heath via e-mail: vheath195@btinternet.com

FT101E with mains lead, mic and handbook. Working condition with original front plastic covering fitted. £150

FT767GX HF transceiver. Complete in working condition although 2m module is faulty. Has its handbook and microphone and original box. £200

Other items include:

- KW101 SWR Bridge £30
- Yaesu 1B8 Desk Microphone never used £40.
- Heathkit HW7 working with handbook £50
- Heathkit HW8 working with handbook £80

GQRP Club Sales

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

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

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

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

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

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

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

HC49U (wire) crystals for all **CW** calling freqs – 1.836, 3,560*, 7.015, 7.028, 7.030* 7.040, 7.045 7.122, 10.106, 10.116*, 14,060*, 18.086, 21.060, 24.906 & 28.060 all are **£2 each** } plus **postage** } **(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 5.00, 6.00, 7.2, 7.6. 8.0, 9.0, 10.0, 10.70, 11.0, 12.0, 13.50, 15.0, 16.0, 18.0, 20.0, 24.0, 25.0MHz 26.0, 27.0, 28.0, 28.224, 30.0, 32.0, 33, 40, 48MHz – **all 35p each** (Some of these are low profile) } £1.20p (UK), or } £3.50p (EU) or } £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 } Post free

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

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

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

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

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

TDA7052A - 4.5 to 18v, 1W 8pin **DIL** low noise & DC volume control – **£0.60 each** } polyvaricons.

TDA2003 - 10w audio amp – 5 pin **£0.25 each** } or filters

TDA2822 - 1.8 to 5v stereo amp – can be bridged. 0.5WAudio amp 8pin DIL – **£0.20 each** } Use just

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

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

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

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

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

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

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

BF981 – dual gate MOSFET – 40p each } postage

Pad cutter - 2mm shaft: 7mm o/s, 5mm i/s diam, gives a 5mm pad with 1mm gap **£6.00** } as books

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

Magnet Wire – 18SWG – 2 metres – 60p; 20 & 22 SWG – 3 metres - 60p; } do not

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

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

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

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

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

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

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

3.3, 4.7, 6.8, 10, 15, 18, 22, 33, 39, 47, 56, 100, 150, 220, 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; 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 FT50-43 - £1.20 ; FT37-61 - £1.20 ; FT50-61 - £2.40; Ferrite beads – FB43-101 (3.5mm dia x 3.2mm long, 1.2mm dia hole) – 40p for 5: BN43-2402 - £1.20; BN43-202 - £2.00; BN43-302 - £2.40; BN61-202 - £3.40. } **Postage for toroids includes postage for all 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 pads. £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 - £3.50, EU - £5.40, DX - £8.00

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

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

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

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

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