SPRAT

THE JOURNAL OF THE G QRP CLUB

DEVOTED TO LOW POWER COMMUNICATION

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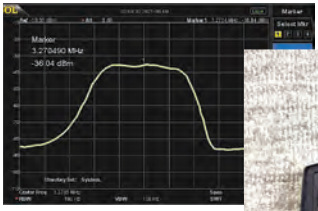

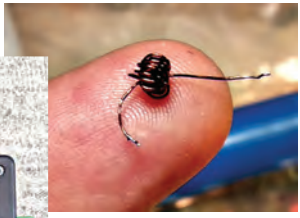

Contents

Don't forget – your annual subs are now due!

JOURNAL OF THE G-QRP CLUB

Our founder George Dobbs G3RJV (SK)

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EDITORIAL

Many will be aware that our Treasurer and Club Sales Manager, Graham, G3MFJ, spent some of September in hospital and Club Sales had to be closed down. We were all relieved when he returned home restored to full working order and was keen to reopen the shop. Three cheers for the NHS!

I received a number of e-mails expressing concern over the article about supplying mains power to a shed in SPRAT 188. Please remember that SPRAT articles are simply members sharing their ideas and experiences; the Club does not peer review articles and does not endorse any suggestions or recommendations made. Due to the numerous queries that I received, I sought professional advice on the article.

Mains power in outdoor sheds

David Holland G4LDT email: gatdi@outlook.com

There was no definitive statement on whether what was described was safe, or legal. It apppears that there are many areas where it depends on the exact circumstances. The overriding message was to seek professional advice before you carry out any such work. It is worth noting that the SPRAT article said 'If in any doubt, consult a qualified electrician!', twice. A fuller statement is available on the Club website.

Looking ahead, the Club will be involved in two QRP Conventions in 2022. The first is being organised by the RSGB Northern Ireland team and will be at the Tandragee Golf Club on Saturday 25 June. The second will be in conjunction with the Telford Hamfest over the first weekend in September. We fully intend to have an on-line presence so members who are unable to attend can join in remotely.

More info will follow in the Spring SPRAT.

Steve Hartley, G0FUW
Chairman GQRP Club
g0fuw@gqrp.co.uk

HF Crystal Filter Design

Bob Burns C Eng FIET MSE G3OOU

In order to efficiently receive specific mode (AM, FM, SSB, CW, Data etc) signals on a number of bands the receiver designer must provide adequate sensitivity, dynamic range, gain and gain control, selectivity and the appropriate mode detectors. The selectivity includes band filters in the receiver front end and mode filters in the intermediate frequency (IF) system. Good receiver design also tells us that the gain from the aerial socket to the mode filters should be as low as possible and the gain after the mode filters as high as is required to drive the various detectors.

The choice of IF will be determined by the overall frequency coverage of the receiver/transceiver and the availability of ready made filters or crystals from which those filters may be designed and constructed. If we consider the most common modes available to UK amateurs the following table lists the bandwidths required for those modes:

Mode	Total Passband Width (-3dB)
FM 25Hz Dev.	15kHz
FM 12.5kHz Dev.	7.5kHz
AM (comms. quality)	6kHz
SSB	2.1 – 2.4kHz
CW	100Hz – 2.1kHz
Narrow shift RTTY	300Hz

Filter Requirements

The modern amateur radio bands are relatively crowded during days of good conditions and extremely crowded on contest days so this should taken into account when defining the receiver and filter specifications. I suggest that for a reasonable quality receiver the filter bandwidth at –60dB should be a maximum of twice the passband width for a given mode with a minimum stopband attenuation of 80dB. For a high quality receiver the maximum filter bandwidth at –80dB should be twice the passband width with a minimum stop band attenuation of –100dB. Good layout and screening will be required to achieve these figures.

The two most common filter types are Butterworth, which has a flat passband with a relatively gradual transition into the stopband and Chebyshev which always has some ripple in the passband but a steeper transition into the stopband. Bandpass filters may be made using tuned circuits, quartz crystals or ceramic resonators in ladder, half lattice or full lattice formats:

- Narrow band mode filters are based on tuned circuits are only appropriate at relatively low frequencies, typically 50-100kHz for CW / SSB and up to 475kHz for FM. They require each tuned circuit to have a very high Q and therefore be constructed using some form of ferrite or dust iron pot or toroidal core dependant on frequency.
- Higher frequency ladder format filters may be designed using crystals or ceramic resonators of the same frequency so are ideal for items manufactured in bulk and therefore of relatively low cost. Their main disadvantages are:
    - The filter shape is assymetric with a slower attenuation slope on the low frequency side
    - The lower frequency edge of the filter is primarily determined by the series resonant frequency of the crystal so filters of different bandwidths using the same crystals will have difference centre frequencies
    - The maximum filter bandwidth is inversely proportional to the ratio of the motional inductance and motional capacitance of the crystal and is also affected by the parallel capacitance of the crystal

- Half or full lattice format filters require crystals on different frequencies for each bandwidth and a specific relationship between the series and parallel resonant frequencies so are less convenient and considerably more expensive. When correctly neutralised, these filters have a symmetrical shape.

This article will consider the design of ladder format filters as being the easiest and most cost efficient for an amateur radio application. Sources of design aids have been included in the references at the end. An IF of 9MHz has been used in the following design examples for which frequency crystals are easily avilable.

A typical quartz or ceramic resonator has the following equivalent electrical circuit for its fundamental frequency resonance:

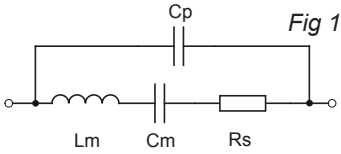


Fig 1

Rs is the series loss resistance, Cm is the series motional capacitance, Lm is the series motional inductance and Cp is the parallel capacitance formed by the metallising on the crystal and the self capactance of the connecting leads and holder pins. Lm, Cm and Rs form a series resonant tuned circuit with an impedance at resonance of Rs ohms. Adding Cp to this arrangement forms a parallel resonant that is a little higher in frequency than the series resonance.

Modern low profile crystals exhibit a much higher Lm/Cm ratio than the equivalent larger crystals made many years ago and this has a direct effect on the maximum bandwidth that can be achieved with a ladder format filter. There is a table of example crystals and ceramic resonators and their ladder filter typical maximum bandwidths on my technical website at: https://www.qsl.net/g3oou/crystalsforiffilters.html from which you can see that crystals below about 3MHz are not generally suitable for SSB filters.

Having chosen your IF and procured some appropriate crystals the first task is to measure the crystal parameters from which the motional values and parallel capacitance may be calculated. My preferred way to conduct these measurements is using the test jig shown here:

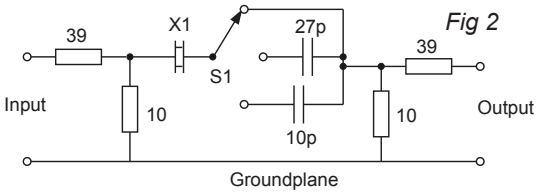


Fig 2

Switch S1 should be a low capacitance type with the absolute minimum of metal contacts. If you just need a temporary test jig then S1 can be replaced with a very short flexible lead with a miniature crocodile clip. Keep the leads short and the stray capacitances as low as possible. This jig will be used to measure the parallel and series resonant frequencies with S1 as shown and then the series resonant frequencies using the other two switch positions.

Ideally the crystals should be matched for series resonance frequencies within 100Hz. The signal source driving the input can be any form of stable signal generator with a fine tuning control, a frequency counter covering the required frequency range and the detector connected to the output can be an RF voltmeter or oscilloscope. Alternatively a spectrum analyser with a tracking generator and digital frequency display may be used with the sweep set to very slow rate and narrow width and the resolution bandwidth set to low, for example the Rigol DSA815.

These measurements are made and entered into the first of the two calculators on the Giangrandi web site [1] to obtain the motional and parallel capacitance values. The Dishal option provides the equivalent functionality using a Windows executable program that may be downloaded from the web site in reference [2]. My batch of IQD A164A wire ended crystals, as

used in the CDG2000 [5] filters, had a series loss resistance of typically 9 ohms and showed an average set of values of:

Fs = 8.99727MHz, Fp = 9.01628MHz which the Giangrandi first calculator converted to:

Cm = 20.877fF, Cp = 5.17pF, maximum ladder filter bandwidth = 10.328kHz

The maximum possible bandwidth means that these crystals may be used to construct a 7.5kHz wide filter for 12.5kHz channel spaced FM and filters of lower bandwidths for SSB and CW. The FM filter could also be used on AM to conserve space if required. Constructors should measure their own crystals to ensure accuraccy.

Second calculator

Entering the above values into the second calculator allows the component values and attenuation characteristics to be determined for filters of various bandwidths and saved using a 'print to pdf' option. My preference is for a Chebytheff design with a passband ripple of 0.5dB. Both the Giangrandi and Dishal calculators show the component values and the resulting filter frequency responses for varying numbers of filter sections so the designer can determine the minimum number of sections required to meet their particular needs. For example, the above 9MHz crystals would achieve filters with a 2.4kHz wide passband at –3dB and the following shape factors (attenuations at twice the passband width):

- three sections would achieve –23dB, typically used as a post mixer roofing filter
- six sections would achieve –56dB
- eight sections would achieve –78dB

In all cases the filter calculators will produce a series of theoretical values. When applied to a real life filter structure minor changes in these values may be required to take into account stray capacitances and the nearest standard values. I have usually managed to achieve the required values, or very close, by using two or three standard components from the E12 range of 5% tolerance components in parallel. My preferred capacitors are silver mica, polystyrene or low-k ceramic types with a 5% or better tolerance - hi-k ceramic capacitors and the very smallest ceramic plate types should be avoided if possible. SMT 1206 50V or similar NPO capacitors should be fine.

When designing different bandwidth filters from the same frequency crystals you will note some common characteristics shown in table 2 below:

- As the bandwidth is reduced the required terminating impedance will also fall, causing a modest increase in the filter attenuation
- The low frequency edge is mainly determined by the series resonant frequency of the crystal so the centre frequencies will be different. Limited corrections can be made using capacitors in series with each crystal.

Examples of 3, 6 and 8-Section 2.4kHz Bandwidth Designs are shown overleaf. These three designs are based on the measured values for the IQD A164A 9.0MHz crystals.

It may be possible to increase the centre frequency of the SSB/CW filters using series capacitors as suggested in the CDG2000 articles and decrease the centre frequency of the AM/FM filters using small value high Q inductors so that they are all set to 9.0MHz. However, moving the frequencies too much may have a significant effect on the filter characteristics so some measurements must be made using a similar jig to that in Figure 2 but with a selection of fixed value capacitors or inductors. See reference [8] for some example measurements.

The 32.9Ω characteristic impedance of the 600Hz wide filter will result in an increased in-

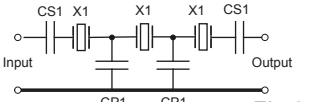


Fig 3

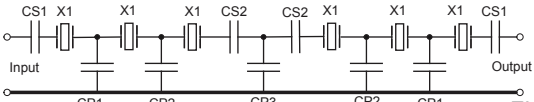


Fig 4

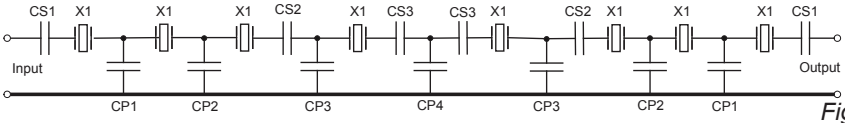


Fig 5

Table 1 - Filter Component Values in pF

Sections	CP1	CP2	CP3	CP4	CS1	CS2	CS3	Zo	Fc
3 (Fig 3)	100.7	-	-	-	100.7	-	-	145.5	8.9988
6 (Fig 4)	101.4	124.6	127.8	-	124.6	489.7	-	148.4	8.9987
8 (Fig 5)	100.8	124.4	128.9	129.9	124.4	462.1	399.1	149.4	8.9987

Table 2 - Example 8-section filters with different bandwidths (Fig 5)

-3dB Pass band Hz	CP1	CP2	CP3	CP4	CS1	CS2	CS3	Zo	Fc
600	457.8	564.9	585.6	590	564.9	2099	1812.7	32.9	8.99762
1200	219.9	271.3	281.2	283.4	271.3	1008.1	870.6	68.5	8.99799
6000	28.9	35.6	36.9	37.2	35.6	132.4	114.3	521	9.00117
7500	18.9	23.3	24.2	24.4	23.3	86.8	74.9	795.3	9.00236

Zo = characteristic impedance in Ω, Fc = centre frequency in MHz, all capacitances in pF

sertion loss compared to the wider filters and may require some corrective action in the surrounding circuits. If post mixer roofing filters are to be used for each mode then a lower number of sections in the filtersabove may provide adequate selectivity – just add the two responses together for each mode.

An L-section matching network [4] may be used with each filter to convert to and from 50ohms or whatever impedance the constructor's individual circuit provides or requires.

Another possible IF is 3.2768MHz as long as crystals with the correct motional values can be procured. Low profile crystals are not generally suitable for SSB filters as the motional LC ratio is too high and a bandwidth suitable for SSB cannot be achieved so do check first. However, older style HC6/u enclosed crystals may be suitable for CW and SSB filters at this lower frequency. Figure 6 below is a prototype 8 section ladder filter constructed in dead bug format using ceramic resonators at 3.28MHz with L section networks on each end to provide a match to 50Ω.

Fig 7 shows the frequency response of the filter in Fig 6 on a Rigol spectrum analyser with a 14kHz passband and a –50dB stopband attenuation which is quite reasonable considering the open construction. The assymetric frequency response is clearly visible.

Fig. 8 below shows a prototype 9MHz filter module consisting of two commercial filters for CW and SSB and a six section 7.5kHz wide ladder filter for 12.5kHz channel spaced FM which could also be used on AM if required.

The screened inductor assemblies on the left are L section networks to match the filters to the 50ohm source. Each filter output on the right is resistively terminated and drives a low noise J310 buffer with adjustable gain via the miniature preset potentiometers to cater for each filter's

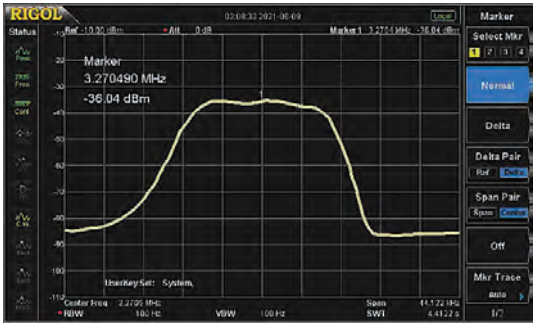


Fig. 6 (Left) Fig. 7 (Above)

insertion loss. In this design, PIN diode switching is used to select the appropriate filter.

Conclusions

I have used the above methods to design and construct crystal and ceramic resonator ladder filters from 455kHz to 37.5MHz [7] with good results but care is essential in initially measuring the crystal characteristics as these will have a major effect on all of the subsequent processes. Ceramic resonators have a higher temperature coefficient, lower *Q* and higher series loss resistance compared to quartz crystals so you should expect a worse temperature stability, much greater maximum bandwidths and a higher insertion loss. Crystals used on their overtone modes show a much higher motional L-C ratio compared to their fundamental frequency so expect much lower maximum bandwidths. Modern low profile crystals also show a much higher motional L-C ratio compared to the same frequency units made many years ago in larger case sizes.

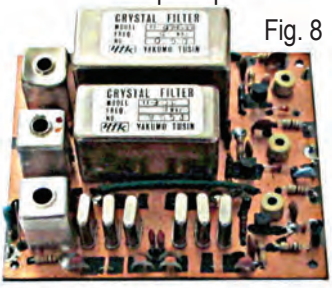


Fig. 8

All of my filters have been constructed on home designed and etched double sided G10/FR4 fibreglass printed circuit boards with the component side being an almost continuous ground-plane.

References:

[1] Giangrandi: *https://www.giangrandi.org/electronics/crystalfilters/xtalfilters.shtml*

[2] Dishal: *https://warc.org.uk/?page_id=387*

[3] G3UUR Crystal Inspector:
https://kk9jef.wordpress.com/2016/04/25/g3uur-crystal-oscillator/

[4] Matching networks:
https://www.analog.com/en/design-center/interactive-design-tools/rf-impedance-matching-calculator.html
or *https://www.daycounter.com/Calculators/L-Matching-Network-Calculator/*

[5] CDG2000 web site: *https://warc.org.uk/?page_id=81*

[6] G3OOU Technical website: *https://www.qsl.net/g3oou/*

[7] RSGB *RadCom* February 2019

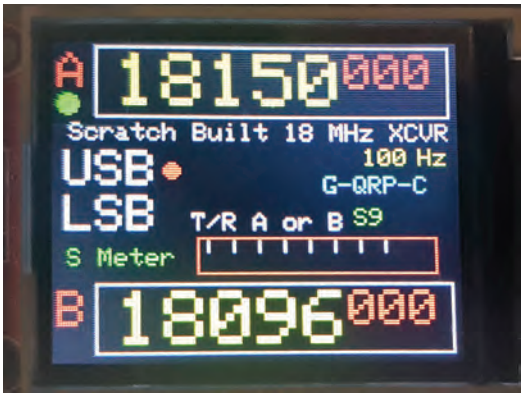
[8] Example crystal pulling ranges: *https://www.qsl.net/g3oou/crystalpulling.html*

[9] Google “PDF995” or “PDF24” for a free Windows Print-to-PDF utility.

G-QRP Scratch Build Group

Steve G0FUW

Following a request for help with moving on from kit building, on the GQRP IO Group, Chairman, Steve, G0FUW, offered to set up a small group work together on a scratch build project. As a result, 13 members from three countries signed up and Nick, G8INE, a seasoned scratch builder, also joined to help out. The proposal was to build the N6QW Sudden SSB Transceiver. With Pete's encouragement, the scratch built radios will be on 17m, getting ready for when Cycle 25 really kicks in.

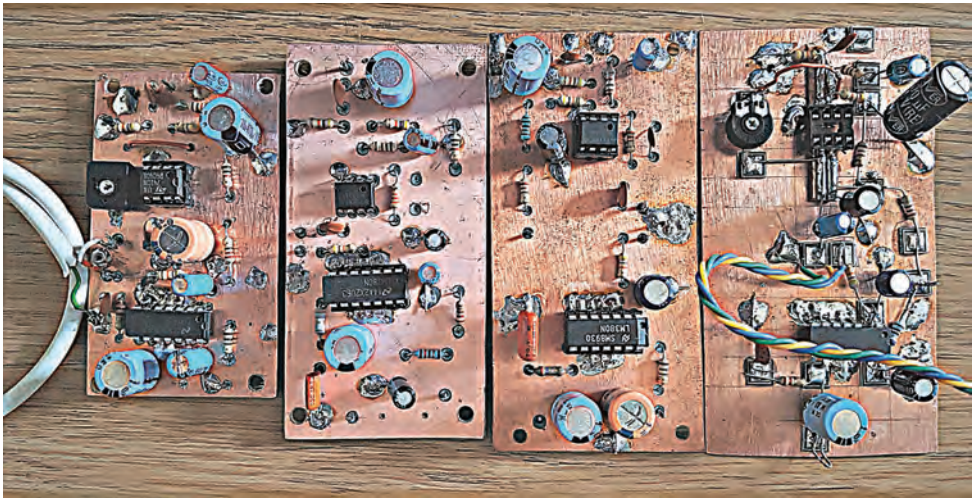


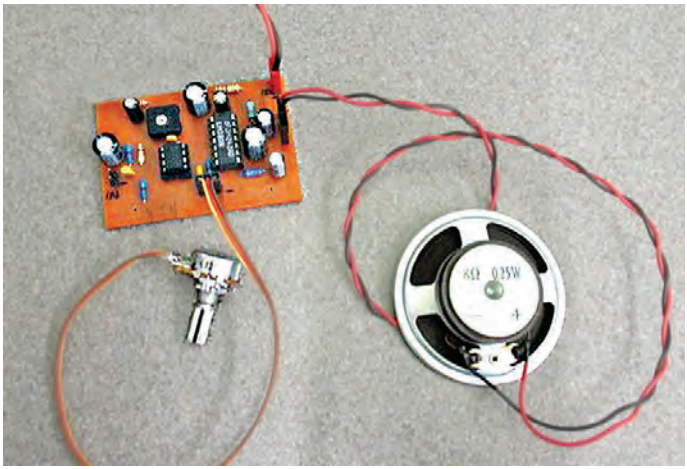
The display TFT on 18MHz

A quick survey confirmed that all group members had built a number of kits so soldering equipment etc, was not an issue. Not everyone had a full test equipment suite so that was noted and some homebrew signal sources and an RF probe were included in the project.

First off, a guide on a number of scratch building techniques was pulled together and shared. Options offered for the build included Ugly, using 'MeSquares', Vero Board, Top Ground Plane and CNC milled 'PCBs'. We also shared N6QW's excellent paper 'Make things work', which is available online.

A shopping list was provided and the builders were advised to use Club Sales for as many of the parts as possible. Graham, G3MFJ, was warned to expect incoming orders.





A photo of the completed amplifier put together by Nigel G4ZAL

Other recommendations for parts included CPC, Rapid, Mouser, JAB Electronics, Bowood Electronics and BitsBox.co.uk

Steve and Nick compared notes and once they were happy they issued a guide on how to build the first module, the receiver AF amp. First to complete that was Nigel, G4ZAL, with his first ever home milled PCB, and it worked!

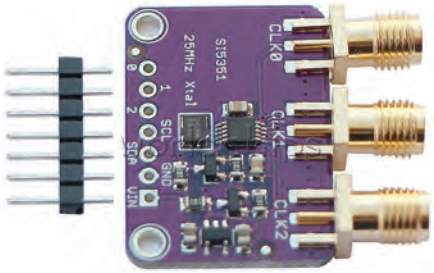
Future Modules

Future modules to be designed and built will be the Arduino Nano and Si5351 VFO/BFO, the product detector and a band pass filter. They will be combined as a Direct Conversion Receiver as a stepping stone with some audible reward for the building effort, we have yet to see if the RF amp is needed or not. The superhet IF and mixer section will follow and then the transmitter boards.

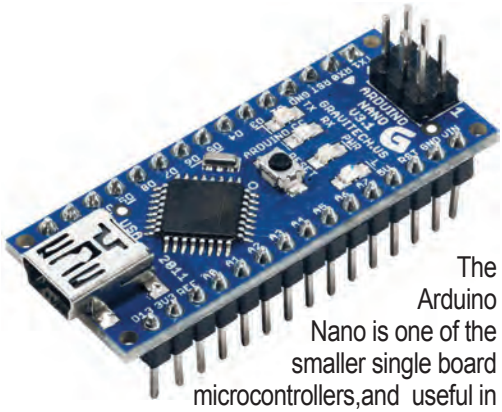
The group are not rushing to a specific deadline but hopefully, some of the new scratch built radios will be operational come the Spring, or Summer at the latest. How amazing would it be to have them all active on International QRP Day, 17 June 2022?

If this first scratch build group proves to be a success, we will look to run a second group, or maybe we will just publish our notes and videos etc on the Club website? All things are possible.

More info on the N6QW Sudden can be found in SPRATs 176 & 177 and at:
https://www.n6qw.com/Sudden.html



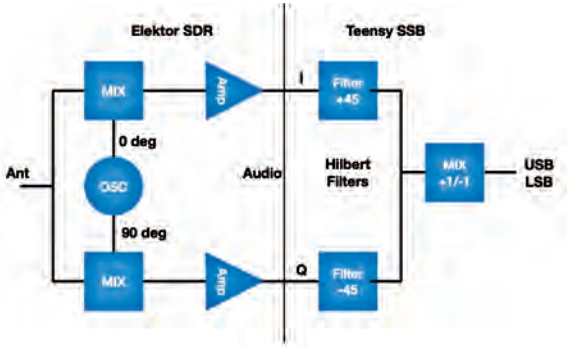
The Si5351A module is capable of producing three separate frequencies over a very wide range



The Arduino Nano is one of the smaller single board microcontrollers,and useful in homebrew equipment. Featuring many pins that can control various other modules and displays.

SDR Phasing Receiver

Antony M0IFA email: antonywatts@me.com



Everything seems to be Software Defined Radio these days. With analog VFOs also banished in favour of digital synthesisers. In this article I will show you how to build an SDR radio including digital tuning and SSB filtering and decoding, capable of covering the 1-30MHz HF bands. Today's "phasing receivers" look like this

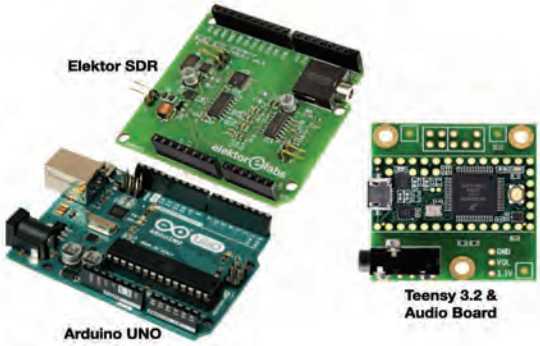
The incoming RF is mixed twice with the same frequency local oscillator, but at 0 and 90 degree phase shift, producing In-phase and Quadrature audio signals. These are filtered and phase shifted again by +45° and -45°, a then mixed (±) to output either USB or LSB audio.

The receiver uses building blocks consisting of:

1. An SDR receiver board from Elektor. This has an input buffer to give a high impedance input, not the usual amateur 50Ω input, but suitable for low cost long wire untuned antennas or home grown loops. It has an on-board Si5351 digital synthesiser driving a Tayloe detector with amplification provided by a couple of op-amps. The outputs of this module are two audio channels called I and Q which feed the SSB digital filter and decoder.
2. The SDR receiver board plugs directly into an Arduino UNO microcomputer board. Also connected to the UNO are a rotary encoder with tuning step button and an OLED display.
3. The third part is a powerful microcomputer called a "Teensy". This is a super, faster 'Arduino Nano' with much larger memory capacity. The Teensy sits on an A/D and D/A encoder/decoder board to convert the audio input/output to the digital realm at the CD quality of 16bit/44.1kHz. The fast Teensy is the key to this receiver and is used to build digital filters and audio phase shifting for SSB USB/LSB decoding.

Software

This is a Software Defined Radio, and there are two computing parts, the digital synthesised tuning and display, and the decoding in the Teensy digital phasing SSB decoder. These two sets of code (called sketches in Arduino language) need the installation on your PC/Mac or the Arduino and Teensyduino development systems (available for



Windows and MacOS). Go first to www.arduino.cc/en/software and download the appropriate Integrated Development Environment. Then go to:

www.pjrc.com/teensy/teensyduino.html

and download the software add-on for Teensyduino and follow the installation instructions.

You will need some specialised libraries which can be downloaded from my code site m0ifa.me. Download the "libraries.zip" file and un-zip the contents into your Arduino/libraries folder. This will install a number of libraries, those that will be used are in these folders,

Etherkit_Si5351 - the routines to program the frequency synthesiser

Oled - a header to initialise the display and a set of display functions

Rotary - to read and decode the rotary encoder

U8g2 - an open source graphics library for displays

In addition, for the Teensy audio digital signal processing you will need this library

Audio - a set of audio functions used for many different Teensy audio functions

Receiver

The Arduino UNO tuning sketch can be downloaded from

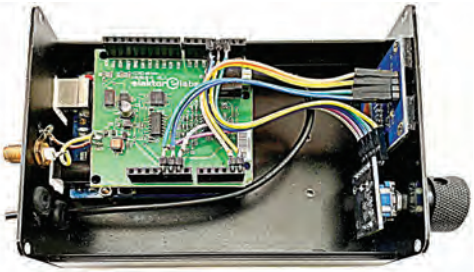
m0ifa.me/ELEKTOR_SDR/SDR_STEP_HOLD

simply highlight the sketch code and copy and paste it into a new Arduino sketch and save it! Then upload it to the Arduino UNO board. If you are not familiar with Arduino sketches or programming take a look at my Arduino Course at:

m0ifa.me/ARDUINO%20COURSE/

or follow the introduction at www.arduino.cc/en/Guide

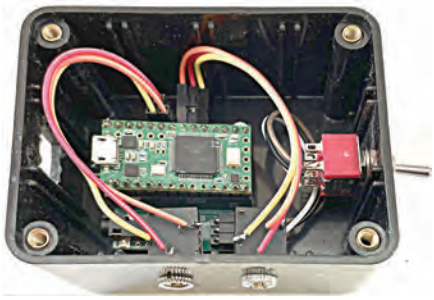
Rotary Encoder



The sketch enables you to press the rotary encoder button to select the tuning step 10Hz to 1MHz to tune the radio's centre frequency and, with a long hold on the button, 'hold' the current frequency which will then be used on future start-up.

The receiver IQ audio outputs are wide band audio 0-96kHz or more. If you feed them into your PC, with a 16bit/96kHz stereo input sound card, and run the popular *HDSDR* program then you will be able to see and tune to any stations up to ±48kHz around the centre frequency. But I digress.

SSB decoder



The "Teensy" part of the circuit is a Teensy 3.2 processor www.pjrc.com/store/teensy32.html mounted on the audio in/out board www.pjrc.com/store/teensy3_audio.html The two I & Q audio channels go the audio board Line inputs and the Line outputs go to the amplifier and loudspeaker. You may need a volume control on this output.

This was built as a separate unit as it can be

used with an IQ front end (for example the popular QCX). The Teensy sketch can be downloaded from:

m0ifa.me/_TEENSY%20SKETCHES/TEENSY_ELEKTOR/

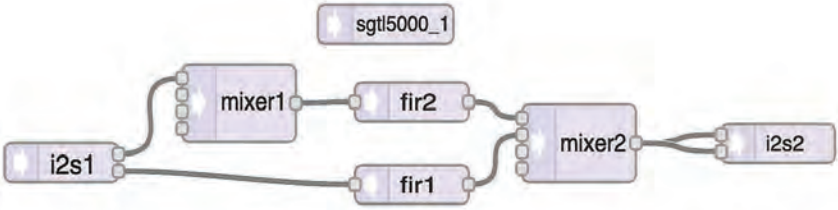
Copy and paste the code into a new Teensy sketch using the Teensyduino IDE. Then upload it to the Teensy 3.2 board.

How does it all work?

The receiver board sits on top of the Arduino Uno and makes the correct connections to drive signals SCL & SDA for the Si5351 through the Arduino I2C bus on pins A4 & A5, This I2C bus is also connected to the OLED display. Power can be supplied either to the UNO USB input or to its 12V connector as the UNO has built-in 5V regulator.

You can follow the software flow chart through in the Arduino Elektor sketch. The Teensy provides digital signal processing, the analog input signals I & Q are converted by the audio board to I2S serial digital signals and fed to the Teensy. At the output I2S signals are fed back to the audio board for conversion back to analog.

To build SSB Filters and a phasing decoder the Teensy needs digital processing blocks. The blocks are chosen in the app at www.pjrc.com/teensy/gui/index.html. Here various processing blocks on the left can be dragged to the open area, and joined by “patchcords” to build the process,

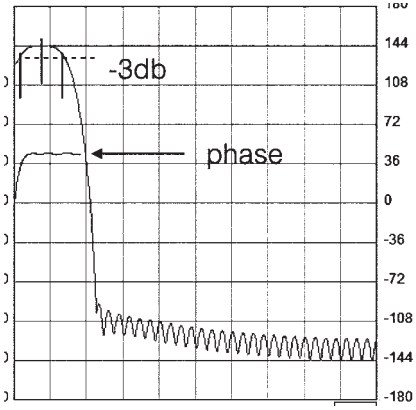


The on-line software produces a processing block and patchcords described in code showing the blocks used and the interconnections, This code is pasted into the SSB decoding sketch,

- AudioInputI2S i2s1;
- AudioMixer4 mixer1;
- AudioFilterFIR fir2;
- AudioFilterFIR fir1;
- AudioMixer4 mixer2;
- AudioOutputI2S i2s2;
- AudioConnection patchCord1(i2s1, 0, mixer1, 0);
- AudioConnection patchCord2(i2s1, 1, fir1, 0);
- AudioConnection patchCord3(mixer1, fir2);
- AudioConnection patchCord4(fir2, 0, mixer2, 0);
- AudioConnection patchCord5(fir1, 0, mixer2, 1);
- AudioConnection patchCord6(mixer2, 0, i2s2, 0);
- AudioConnection patchCord7(mixer2, 0, i2s2, 1);

It is easy to follow the generated code and Teensy sketch to see how the phasing SSB decoding works. An external switch is used for LSB/USB switching.

Filters



The principle behind the phasing decoder is fairly easy, two “Hilbert” filters are used to provide +45 and -45 deg phase shift, and at the same time set the audio bandwidth. One output is fed to a mixer, which has a gain of +1.0 or -1.0 this has the effect of changing this channel’s phase for decode of USB or LSB. The outputs are then added to decode the required sideband.

A set of “coefficients” are generated for the two (+45° & -45°) FIR (Hilbert) filters and this is done with the on-line app you can download at:

iowahills.com/8DownloadPage.html

The coefficients or “taps” of the filters are converted to short integers and used directly in the sketchto be found at:

m0ifa.me/_UTILITY%20SKETCHES/MAKE_HT_FILTER/

for this conversion.

Have a look through the Teensy sketch to understand how it all works together. Later you might want to experiment with the filter definitions and code functions, or you could go all the way and add Teensy code for the Si5351 tuning and OLED display, thus avoiding the need for the Arduino UNO all together. Another possibility is to display a waterfall and spectrum.

Conclusion

Not so difficult is it? With a bit of study of Arduino, Teensy and digital signal processing and an SSB receiver can be built by anyone.

NORTHERN AMATEUR RADIO SOCIETIES ASSOCIATION

Come and visit our stand at the NARSA rally

NORBRECK

on Sunday, May 1st, 2022

NARSA Rally at the Norbreck Hotel – 1st May 2022

Those members who are going to this may be interested in a free exhibitor admission ticket. This gives you entry before the rally opens!

There is, of course, a catch. To get it you must make yourself available to do an hour’s steward duties sometime during the rally, and you also get to go on the club stand where you can store your purchases rather than carry them around all day!

Interested?

If so, contact **Roy GM4VKI** at rkavampsev@aol.com or on 0156 385 0976.

I will be there with club sales as well of course.

73 Graham G3MFJ

This and That Receivers

Philip G4HOJ email: G4HOJ@yahoo.co.uk

Alternative one valve – low(er) voltage 80m receivers

I received much correspondence about previous SPRAT RX designs, and mentored a few constructors to success. Feedback has been very positive but the odd person (I don't mean 'odd', odd….but you know what I mean!) said that they want to try a simple valve RX but didn't have an HT supply, or they (or their kids) are worried about 'high voltage'. I also received a specific lower voltage design request earlier this year so, if I failed you so far in my quest to encourage QRPers and others to achieve the ultimate high of hearing signals on a simple homebrew receiver, I offer these ideas.

So, the challenge: a valve receiver, relatively simple circuit BUT reasonable performance - not just a 'toy'!? How about one valve only, low(er) voltage, simple but good-enough performing, and with comfortable headphone volume?..... for 80m…. my favourite listening band.

Experimenting

One can use low B+ on common valves but experience shows such receivers tend to be quite fiddly to use and don't perform well but hey ho! The main reason for this is the 'space charge' effect. Although some valves were designed to work with low voltages, I don't have any at my disposal.

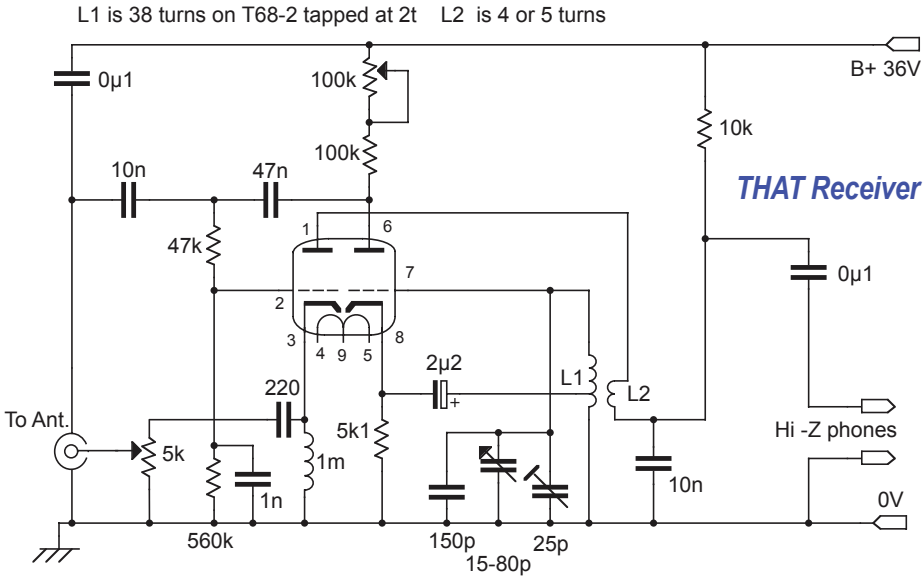
However, undaunted, I fearlessly pressed on! I found 12AU7 (ECC82), 12AT7 (ECC81) and ECF80 as possible candidates in the little box of valves in my wireless room and began tacking things onto my testbed chassis.

My first attempt used the ECF80 (6.3V at 430mA heater) and I developed ideas and checked operation (sometimes none) at B+ of 12V up to, a widely considered safe, 45V. At higher voltages, there was no problem in achieving the usual astounding regen sensitivity but, initially, I was disappointed in overall gain/audio output. Clearly, one can't expect speaker output with low anode voltage and one valve. But I wanted good headphone volume. Eventually, after experimenting and optimising, I arrived at a satisfactory ECF80 design (hereinafter referred to as **THIS RX**).

But, there's more! My testbed chassis has several valve bases. THIS design took up so little space, there was easily room to try another idea for comparison. Ahah! A double-triode? These operate with either 6.3V @300mA or 12.6V @150mA heater supply, plus, I have seen 12AU7 designs on the interweb also using 12V on the anodes, although most are for medium wave and have complaints that they don't work well. I've even seen an LM386 tagged on to boost performance! Anyway, long – short, eventually, adapting some ideas from THIS receiver, and going through similar voltage and performance comparisons and optimising, I achieved good 80m performance with reasonable volume. While both double-triode types worked, the 12AT7 gave more output than the 12AU7 – and so I arrived at another optimised RX design (hereinafter referred to as **THAT RX**).

Some Detail

You will recall from previous notes, my 'aerial' is 118ft of low inverted L, with L match at the



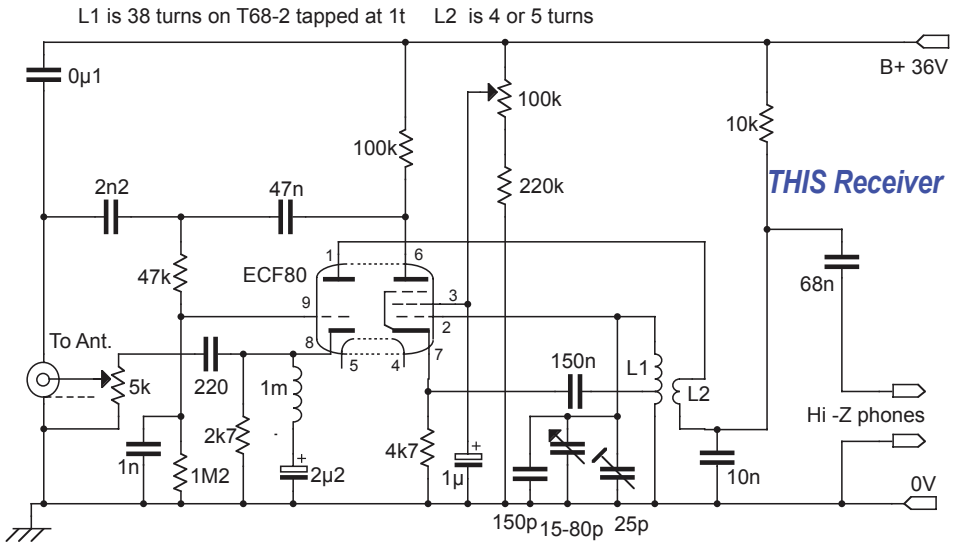
base, so it is OK but not excellent on 80m. My experiments found that 12V is not really sufficient to achieve good-enough performance on SSB/CW. With both receivers, while 45V produced a little more output, 36V was sufficient. 27V was marginal (but worked with a minor circuit changes) and I wouldn't bother with less. So I adopted and optimised for 36V.

In both final designs, I used the cathode-bias *Q*-multiplier/Oscillator/Detector I developed for the 'Anoder' design in *SPRAT 182*. I did compare with grid-leak detection again but my method still seemed to perform better. With this bias method, the Regen control can just be pre-set for SSB and/or CW, certainly across 80m, and it is slightly more tolerant of any RF stage gain ahead. I usually include an RF buffer to address any fears about radiation from a regen and on these designs, I use a trick where I use one valve section twice by 'reflexing' so that the grounded-grid RF buffer stage is also the audio stage to improve overall gain ….so both receivers are '1V1's in old money.

The result? Both receivers are sensitive, hearing signals with just a 10ft wire strung across the wireless room. All well designed regens can be staggeringly sensitive but that feature can mean that they don't like very strong signals so much. Strong signals become too loud for comfort anyway, so I thought it sensible to deal with both issues at the same time with a simple variable attenuator on the aerial input.

Your choice

The simplest way to achieve the safe 36V B+ is to click together four PP3 batteries in series - cannibalising old batteries for connectors as you go. These batteries are often only around 80p, especially if buying a few – although I wouldn't mind paying more when I realise that even a basic PP3 has up to 400 milliamp hour capacity…before the voltage drops too low. At 36V B+, THIS RX draws 2mA and THAT RX draws a mere 1.2mA….so, potentially, around 200 or 300 listening hours respectively?! Of course, you could make a dedicated supply or use a voltage multiplier from the heater voltage….but I aimed for 'simple as possible'.



THIS RX consumes a little more heater current, 430mA @ 6.3v, but that is not demanding for any 6.3V heater supply. One could use a 6V rechargeable battery for this supply, if preferred.

For THAT RX, 12AT7 heaters can be wired in series or parallel, so both 6.3V (300mA) and 12.6V (150mA) are options – depending on your available supply. A suitable rechargeable battery could be used. Another option might be to use a shack 13.8V supply with an 8 to 10 Ohm 2 Watt resistor in series….or a couple of suitable diodes?

THAT RX draws a little less B+ current and, with my headphones, it produces good-enough volume. THIS RX is capable of producing more output than needed for sensitive headphones (and even more if the triode emitter resistor is reduced – but at the expense of greater B+ current of course). Also, the pentode detector in THIS RX has more 'go' than the triode in THAT RX, so less feedback is needed and toroid tap can be at just one turn up from ground.

I used some old Racal headphone inserts for simplicity but if you don't have higher impedance headphones, you can use reasonable sensitivity, lower-impedance, earphones with either receiver by using an output transformer. In THIS RX, I placed the primary in series with, and in THAT RX, it replaced, the 10K anode resistor - with a little less volume into my earbuds than the high imp. headphone arrangement shown. Whether you choose THIS or THAT RX design (or any approach to powering or connecting headphones) is up to you! I think both are educational to build and enjoyable to use. There are slight differences between the two (THIS RX is, arguably, better?) but they both produce comfortable audio output levels for me and my headphones on 80m CW and SSB….choice might even be down to which valve you can lay your hands on first. I will even allow you the choice of connecting an LM386 or other device and speaker in place of the high impedance headphones…..if you really must!.....but beware too much volume!!

Conclusion

If you have never tried a valve 'Genny' receiver, or have only experienced a poor-design, poor-performing, MW regen receiver, I encourage you to try either 'THIS' or 'THAT' RX. The connec-

tion between the listener's ears and the 'ether' is so clear with this type of receiver and these designs will perform well-enough on 80m SSB and CW to be worth building, plus you will get to enjoy the thrill of hearing signals coming out of the headphones of a receiver you have built yourself! Of course, the pros and cons of such simple receivers are well known but I continue to celebrate and enjoy both!

Construction and cautions

The 36V B+ supply level, especially when supplied by PP3 batteries, is generally regarded as safe but just be careful where mains supply to heater transformers is concerned and take the usual precautions.

Keep wiring as short as possible, try to build reasonably robustly and use short, rigid, wiring for all connections around the tuned circuit. As with any receiver, it helps to have a shield between the tuning components and your hand - a panel made of aluminium, steel, tin, PCB material…or even foil glued on a wooden panel!

My THIS and THAT examples cover a little less than 400KHZ from end to end of the tuning capacitor but a slow-motion tuning drive (or perhaps an additional band-spread capacitor, depending on your preference) still makes it far easier to tune SSB and CW.

If you wish to experiment with 27 volt B+, the changes I had to make to my examples were as follows: THIS RX: reduced triode cathode resistor to 1K and moved the toroid tap from turn 1 to turn 2. And on THAT RX: changed the fixed resistor in the detector anode from 100K to 56kΩ.

Searching For a Good Home

Tim Walford G3PCJ email: electronics@walfords.net

It's about time I had a bit of a clear out now we have not got quite as much storage space as we used to have, so I would like to find a suitable home for my 'historic' electronic items. These are the bits of kit that I think are worth preserving and should be 'on view' in a public type museum of some sort (and which I doubt our family will wish to deal with in years to come!). So far I have failed to find a suitable place and hope that asking the Club members might produce some useful suggestions. I am not keen on private collections because their owners are likely to be faced with the same problem in years to come!
The items are:

- **WS17 set** - like new apart from a modern PL459 antenna connection! Early 1940s semi-portable super-regen RX + AM TX for about 65 MHz. With modern battery/mains PSU by G3PCJ.
- **The Plank**. A crystal controlled 40/80m CW TX (6K7/807) set built by G3GC in the 1950s (pic attached), as a replica of what he built and used in 1936/7, with PSU. Tidied up by G3PCJ! (Also various 'modern' valved adjuncts like xtal mixing VFO & modulator by G3PCJ if wanted.)
- **Two of the 100KHz ref oscillators** that were down 30ft deep tubes at Somerton Radio Station from early 1960s onwards. (Were subject of PW article Jan 2007 by G3PCJ!) One opened up to reveal connections & insides, other intact. The third is at Porthcurno museum (probably not on show now).
- **An AR88** - apparently original and with matching loudspeaker.

All of them are in good order and were fully working when last exercised about 5 –7 years ago.

Many thanks, Tim Walford G3PCJ

Low cost (No cost?) EMI beads & tubes.

F4IET Alain Prevost email: alain@f4iet.fr

In our ham radio designs, we use a lot of FTxx-43 toroids or BN43-xxx binocular cores.

The small ones can be low cost, but the middle and big sizes can be 'not so cheap'. I had a project to build a longwire antenna system for the winter. The multi-band is so flexible for the winter trafic. For that I studied a lot of articles and I felt on an article of ON5FM* about a 9/1 transformer. He was successfully using electromagnetic interference (EMI) ferrites for his transformer…

What what what ? I had to try...and it was working perfectly for my LongWire antenna. It was working with big EMI ferrite tubes ? Why not with smaller form factors ones, small tubes or toroids ?

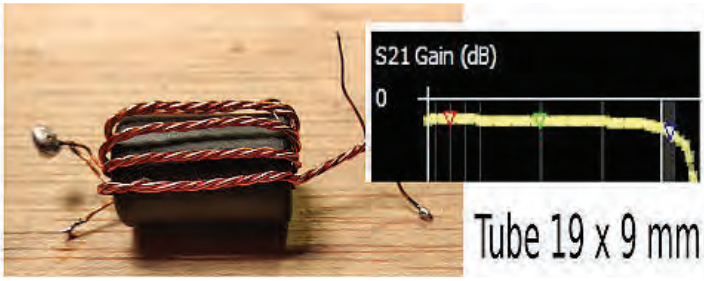
A quick look at a famous 'Asiatic bargain' online shop and I found a lot of these EMI beads or tubes at...so low cost that it's nearer 'no prices'. These parts are not sold as '43 material', but as 'EMI filter parts'.

As ever in a hurry, I ordered a set of different forms and sizes. The sizes were from 4mm beads to 28mm tubes. And the pricing was from 0.02 to 0.3$ (US) each. That's really no price as I was saying…

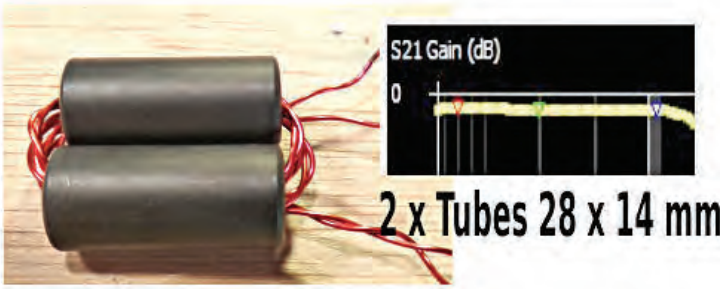
As soon as I got the parcel I switched on my beloved NanoVNA and did some measurements. What can I say, I don't know if these low cost parts are in 43 materials, but the measurements results were amazing.

1: Single tube 9x19 and 14x28mm

I used a bi-filar twisted wires for that test. The 3 markers are at 3.5, 14 and 28MHz. The losses are going from 0.42 to 0.7dB



As near as I can measure, it is very similar to an 'official *f* FT67-43 toroid. Moreover, the 'Official' FT67-43 is 0.15dB more lossy. But the FT67-43 has a greater bandwidth.



I got exactly the same results with tube of 12 x 21mm. That one will be a very high efficiency 4:1 transformer between a driver and a PA stage.

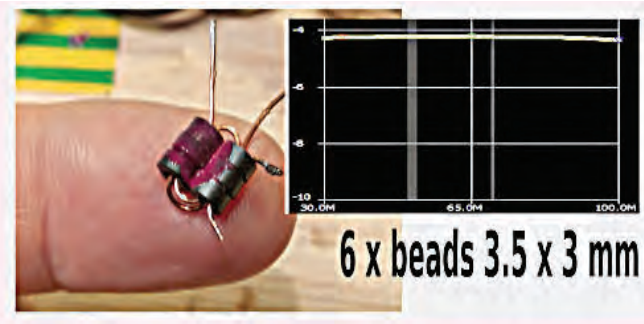
2: Tubes assembled in binocular form.

I like a lot that one: looking at the readings this time, the loss is from 0.41dB at 3.5MHz and 0.54dB at 30MHz. It is absolutely comparable to my tests on a 'not so cheap' BN43-7051. BUT ! I am sure that the BN43-7051 is better at higher frequencies, in other words for the 50MHz. But for a 50 W PA output transformer, it will work...

3: More peculiar, the pearls!

Yes, you are seeing that, I am crazy enough to try a possibly stupid test. I assembled together six (3.5x3mm) beads and built a 4:1 impedance transformer. Look at the losses: they were flat from 30 to 100MHz!

I guess that that transformer is a bit light for a 1kW amplifier, but for a preamplifier transformer. Why not? Such a layout would be more than adequate. However, one important remark: For in this case you will need a little glue. Should you not have that to hand, then the help of the YL, or at least for her nail polish :-)



4: What about choke ?

Keeping the ideas as simple ones, all these beads and tubes will act perfectly as chokes. But this one filled me with joy, I just used 10 turns of small enameled wire into a EMI pearl of 3.5 x 3mm. Here the 'back-to-back' results, from 2 to 30MHz.
Interesting!

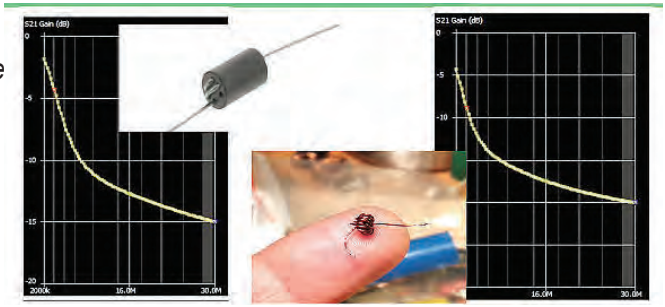
5: The VNA will be your friend, in other words but take care

All that is really fun, and it shows that these cheap EMI parts can be used as pseudo 43 transformers, BUT! You have to take care and to measure any EMI part that you want to use with a VNA. Because, sometime you will have a bad surprise, for example :

I had one EMI toroid 14 x 8mm, that looked absolutely the same as the others, but it was also absolutely unusable, with a loss figure of -15.5dB :-(

I hope all that can help someone, but remember, all that is only fun. Enjoy !

* References:
ON5FM Transfo 1:9 *Revue QSP* Jan. 2013

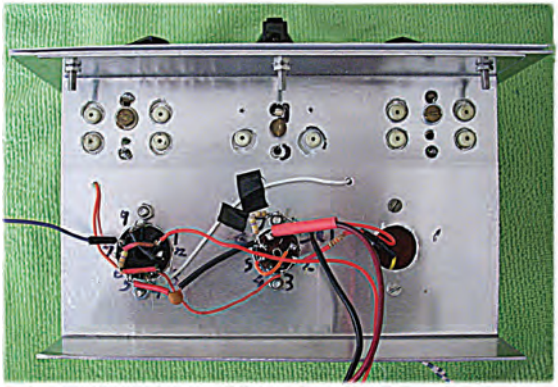


A ‘New’ Codar Mini Clipper

Richard Smith email: diaspar4711@gmail.com

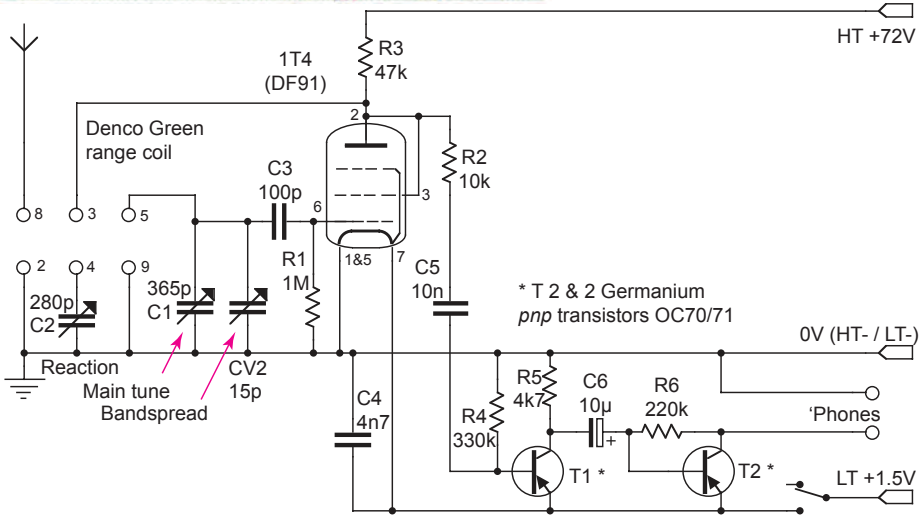
This is my latest project made from the downloadable instruction¶. The front panel is 1mm alloy 7x3.5in, the chassis is 6x3.75 x1.25in deep 1mm alloy too. Parts and aluminium came from eBay. The front panel markings were printed onto card.

All metal bashing was by hand, following the kit instructions, though there are some modern parts due to unavailability of vintage parts. Luckily I had a suitable 1T4 valve and the two OC71 transistors. The coils used are from the Denco green series and work well.



Due to minimal plans of the layout, I had to scale/guess the sizes (later confirmed correct) using pictures and comparing parts on the pictures to ones I had.

I was helped as my son took an angled picture from an online source, and corrected it so it would print full size on A4 paper or card so that it fitted the front panel size ok



Membership Secretary News
Daphne G7ENA (g7ena@gqrp.co.uk)

Hello and welcome to membership news, another year has flown past despite all the Covid restrictions, let us hope 2022 will return to some sense of normality. I would like to congratulate and welcome all those new members who obtained their Foundation Licence this year, please remember to let me know your new callsigns as you progress up the ladder.
I omitted to update Fabio's email address in the last issue, if any of our Italian member need to contact him his new email address is; fabiobonucci68@gmail.com .

As usual, this is the issue of Sprat that reminds you it is time to renew your subscription. Please go and find that label on the Sprat packaging and see if it says "expires end of 2021". For the various membership rates and method of payment please refer elsewhere in this issue to the "Subscriptions for 2022 are now due" page (or look on www.gqrp.com).

UK members with existing standing order arrangements with their banks need do nothing until your Spring Sprat arrives. If your expiry date (on the label) hasn't incremented by then, assume something has gone wrong and contact me. Your standing order mandate must quote your membership number or we won't know who has paid.

In the UK you send your payment to me. If you write by post please always include a stamp (or an email address) if you expect a reply. If you send insufficient funds you will receive only one Sprat in 2022 with an underpayment notice on the label. You will receive nothing more until you make up the shortfall.

All members should be aware that the club will not accept payments that take your subscription beyond 2022. PayPal will be returned less charges, cheques will be destroyed and excess standing order payments will be assumed to be donations - but will be returned on request (at your cost).

UK Members: All cheque payments should be to "GQRP club" and not in the name of any club officer. For UK members who wish to switch to automated payment there are details on how do this in the autumn issue of Sprat (page 39). The form should be sent to your bank (and not me) in time for your payment which must execute on the 15th January 2022. As well as ensuring the continuity of receiving SPRAT you also help reduce the thousands of letters which I will otherwise have to open in the New Year.

As always please no stapled cheques in letters. They do not get lost in the envelope if you don't staple - but they do stick in my fingers while removing them. Also quote your club number as well as your name and callsign in all correspondence - it really does help.

Overseas members: Please refer elsewhere in this issue to the list of DX representatives to whom you can pay in your local currency. For the remainder of the world without PayPal access you can pay by international bankers draft (in UK Pounds) or cash in UK Pounds (to me). Only local currency to your local rep - and I can't accept Euro or U.S. Dollars. Cash is sent at your own risk.

You can also save me much work if you pay using PayPal. Please see www.gqrp.com/paypal for more details. We do automatically add a little to cover PayPal administration charges- but only what it would have otherwise cost you to buy a stamp to post your subscription.

Club Information – Who Does What

(email & postal addresses are on the club website)

Sprat		
	Editor	G1TEX
	Any non-membership comments & queries	G0FUW
	Members news for news column	G4BUE
	Communications news	G3XJS
	VHF news	G8SEQ
	Sprat Delivery	G7ENA
	Sprat Index	K7WXW
	Sprat advertising	G3MFJ
Membership		
	Membership queries, subscriptions (+ any QTH & call changes), Sprat distribution.	G7ENA
General		
	Secretarial	G0BPS
	Chairman	G0FUW
	Treasurer	G3MFJ
	EUCW representative	M1KTA
Sales		
	General items & back issues of Sprat.	G3MFJ
Services		
	QSL Bureau - in, out & sorting	GM3VTH
	Antenna advice	G3VTT
	Awards	G5CL
	Circuit & construction advice	G3ROO
	Club Trophies	G0EBQ
	Internet GQRP club reflector & web site	G4WIF

Thank You

My sincere thanks to all the overseas representatives who give up their time to deal with local members throughout the year.

Daphne – G7ENA

SUBSCRIPTIONS FOR 2022 ARE NOW DUE

Your SPRAT label tells you your current status. Your receipt is the updating of your status code on your Spring 2022 SPRAT address label. The labels for your SPRAT are printed 4/5 weeks ahead of publication so if you pay promptly your Spring Sprat label will be correct.

SUBSCRIPTIONS FOR 2022 – please see options below.

UNITED KINGDOM	EUROPE	DX
• £6.00 Cheque / Postal Order sent to G7ENA (payable to "GQRP") • £6.00 - Standing order • PayPal	• £12 sent to G7ENA (Cash in GBP [no Euro or Dollars] *2, Cheque or money order*1) • €15 (to Euro rep.) • PayPal	• £13 to G7ENA (Cash in GBP [no Euro or Dollars] *2, Cheque or money order*1) • Send to DX rep. (see list) • PayPal
PayPal - (**Mandatory**) - only use www.gqrp.com/paypal. Notes: (*1 Payable to "GQRP"- drawn on a UK bank). (*2 At own risk)		

*You can pay by direct transfer but you **MUST** provide your membership number as a reference. Our bank account details are:- G-QRP CLUB NO. 1 ACCOUNT, NATIONAL WESTMINSTER BANK PLC, ROCHDALE BRANCH (SORT CODE 01-07-44 a/c 04109546).*

UK *members can use the form from the website or from the membership secretary if they would like to pay by standing order or to amend their existing standing order for the 2022 subscription rate of £6.00. This payment must be in place with your bank to execute on the 15th January.* ***If your standing order does not quote your membership number then your payment can only be treated as an anonymous donation and your membership will expire.***

All UK cheques must be made payable to "G-QRP CLUB"
EU & DX cheques – see "Overseas Subscription" page.

✂- -

Please **enclose this form with your payment write your callsign & number on the cheque do not staple your cheque to this form. Send to GQRP Club, 33 Swallow Drive, Louth, LN11 0DN**

Membership Number _____ Callsign _____

Name _____

Number and road _____ Name used on air _____

Town _____ Post code _____

Country _____ Email _____

NOTE - by joining, or renewing your membership, you are agreeing to the Club Constitution, which is available on the website, or in hard copy, upon request to the Secretary.

Changes or additions

. . . . . .

. . . . . .

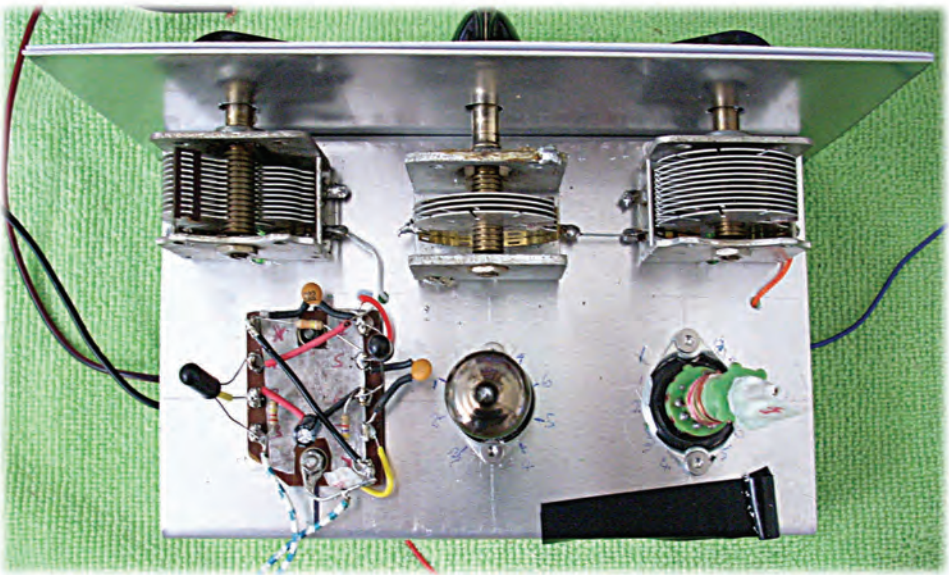
Checklist for UK Cheques:
- Did you make your cheque out to the GQRP club?
- Did you date it correctly?
- Did you sign it?

OVERSEAS SUBSCRIPTIONS FOR 2022

Please send your subscriptions to the following overseas representatives:-
(for representative email addresses see www.gqrp.com – membership renewals page).
Please provide your email address and club number to overseas representative with payment.
Also check the GQRP website for updated information on renewals/subscriptions.

Country & Representative	Amount
U.S.A Dave Yarnes W7AQK, 10541 SW 63rd Drive Portland, OR 97219, USA. **Cheques to be made to "David Yarnes".**	$20
Germany: Dirk Krause, DL1GKD, Hauptstraße 4, D-78597 Irndorf**.** Konto: Sparda-Bank Baden-Württemberg, Dirk Krause. IBAN: DE17 6009 0800 0107 9124 16 BIC: GENODEF1S02 In der Zeile Verwendungszweck bitte unbedingt angeben: NAME, VORNAME, CALL, GQRP Nr. Schecks und Bargeld werden nicht entgegen genommen!	€15
The Netherlands Henk Smits, PE1KFC, Storm Buysingstraat 30, 2332 VX Leiden, Nederland. Tel 06-13267146. Maak voor 1 Januari 15 Euro over op rekening ABN NL62 ABNA 0450 4063 34 t.n.v. H.W.Smits te Leiden. Vergeet uw call en uw G-QRP nummer niet te vermelden! Een email ter bevestiging wordt op prijs gesteld.	€15
Belgium Jos Warnier ON6WJ, Kalendijk 28, B-9200 Dendermonde, Belgium. Tel. 052 220996. Vergeet niet Uw call en clubnummer te vermelden! N'oubliez pas d'indiquer votre indicatif et votre numero de membre! Contributie/cotisation: 15 Euros voor/avant le: 1 Jan op nummer/ au numero: BE21 9796 3930 7403	€15
Austria Johann Auerbaeck, OE6JAD, Kirschenhofersdlg. 120, Bitte den Beitrag bis Ende Jänner A-8241,DECHANTSKIRCHEN, Tel: 3339-23335 IBAN: AT82 3804 1000 0001 5156 BIC: RZSTAT2G041 In der Zeile Verwendungszweck	€15
France. Richard Sayer, F5VJD, Vignouse, 35380, Paimpont, France (cheque perso [SAYER Richard] avec votre indicatif, numéro de membre et adresse E-mail indiqué au verso).	€15
Denmark. Ole Rasmussen OZ1CJS: Fornyelse af abonnement af GQRP: Venligst foretag en kontooverførelse af 115 Kr. senest d. 1. Januar til : Ole Rasmussen Danske Bank, Haslev Reg. nr. 0575 Konto nr. 3531127749 Venligst vedhæft følgende information: navn, call, medlemsnummer Undgå venligst at fremsende kontanter og checks. Har du et problem mht. bankoverførelse, så kontakt mig så vi kan finde en løsning. Nyt abonnement af GQRP: Ønsker du at blive medlem af GQRP og modtage medlemsbladet SPRAT, så send mig venligst en email med dit navn, adresse og evt. kaldesignal. Så skal jeg med glæde sørge for at du bliver kontaktet.	115DKK
New Zealand, Phil Tarrant ZL2NJ, 77 Romilly Street Westport 7825 New Zealand. cellphone 0224031096. Account details :– Kiwi Bank -Account name:- P Tarrant G-QRP, Account No 38 9003 0186315 02	NZ $28
Australia Norm Lee VK5GI, The Vineyard, 28/170 Main Road, MCLAREN VALE, South Australia 5171. Account name: Norman Joseph Lee GQRP Club Account, Bank: ANZ Bank McLaren Vale. BSB number: 015 627, Account number: 1812 – 51764. Cell: 0402 446 453 (Call - don't text).	AUD $25
Italy. Fabio Bonucci - IK0IXI. Via Umbria 4, I-00053 Civitavecchia Italy. "La quota annuale per l'iscrizione al GQRP Club dall'Italia è di 15 Euro. I pagamenti possono essere effettuati tramite: 1) Direttamente sul sito GQRP tramite PayPal. 2) PostePay - €15.00 3) Diretto (contanti €15.00). Rischio di smarrimento a carico del socio. Si può effettuare la ricarica PostePay in ogni Ufficio Postale al costo di 1 Euro, oppure tramite le ricevitorie Lottomatica al costo di 2 Euro. Per informazioni inviare email a Fabio fabiobonucci68@gmail.com oppure SMS 320-4839771	€15
España. Jon Iza, EA2SN, A. Gasteiz 48-7 izq, 01008 Vitoria-Gasteiz. Cuota: 15 euros. Ingresar en: BBVA IBAN ES05 0182 1629 8802 0151 3020 BIC BBVAESMM. Envía email con la info o pon como concepto tu indicativo y número de socio.	€15

Any other overseas to Daphne Newsum G7ENA, GQRP Club, 33 Swallow Drive, Louth, LN11 0DN, England [Europe: £12 GBP / DX: £13 GBP]



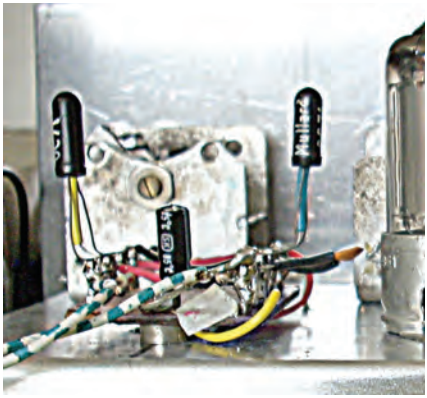
My bending 'bench' to create the aluminium chassis was merely two pieces of angle iron, The finished chassis and front panel were joined together with 3mm nuts and bolts. The same as I used to bolt the valve & coil bases in place.

The three capacitors had ceramic protrusions on the bottom side, so needed clearance holes to allow fixing them to the chassis. There are also clearance holes required for the trimmer capacitor holes. The transistor audio amplifier was put together on old tag strip.

Both this amplifier's supply and that for the valve's heater, is switched on or off via an old style on/off switch. there's no switch needed for the HT supply as when the heater is off, all HT current flow stops.

The HT supply itself, is made with multiple 9V 'Pound Shop' PP9 batteries, with a large 1.5V battery supplying the heater power. The number of 9V batteries affects how much feedback is obtainable at the low frequency end of each Denco coil's range, so be sure to read the operating instructions.

I calibrated the bandset control using a signal generator, making a paper chart of numbers with frequency as the other axis. The bandspread capacitor is rather big, but has slow motion, and was used it with the plates slightly engaged and set the knob half way.



I found that replacing the 'phones with a 3k9Ω resistor it will drive a small LM386 amp/speaker.

Any questions, please email me.

¶ http://vintageradio.me.uk/kits/codar_miniclip.htm

A Solder Pot (that didn't cost a penny!

David Smith. G4COE email: davecoe@blueyonder.co.uk

Many of us are aquainted with HRO receivers, did you know that HRO really stood for– 'Helluva Rush Order.' And I wanted a solder pot quickly so, perhaps, this could also be called an HRO Solder Pot! But solder pots are not cheap to buy. Suddenly, it hit me like a halogen light on over-voltage, I had a soldering station with a defunct transformer .

So, I put the soldering iron to good use – remember a good radio ham never chucks anything out – never ever! Use the soldering element I thought, I quickly junked the rest including the tip and ended up with just the soldering iron element and it's mounting base with three screws.

Careful here:

Now there is a reason to be careful at this point. Ensure the element is fully sealed some may well not be we don't want molten solder dripping out do we? I applied about 24V DC volt from my variable supply and let solder drip in to fill the hole to the brim where the soldering tip slides in.

Eureka, it works.

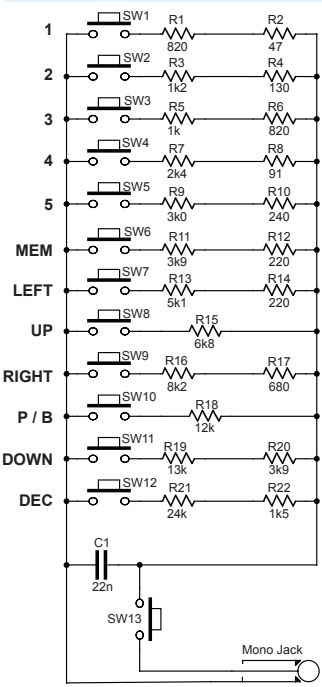
With my defunct Solomon station I had four wires from the element, two were for the sensor and the other two was the heater, we only need the heater wires which should be easy to pick out, don't solder the wires to the element use a connector block.

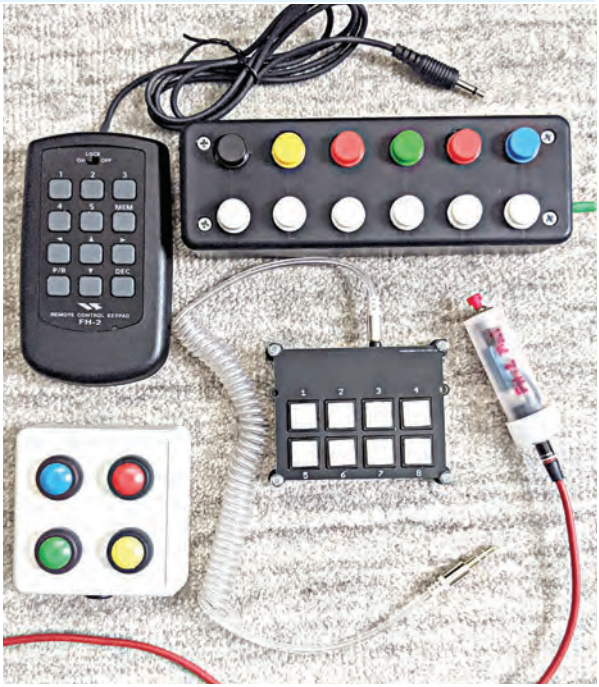
When filling with solder it will produce smoke so keep 'ya snout' away, I used multi-core solder because I was given a big drum of it and didn't want to waste my 'no clean' solder, there's only smoke when filling but when not when using it.

David G4COE. G-QRP 8621

Memory Feature Keyboards

John Leonardelli email: VE3IPS@gmail.com

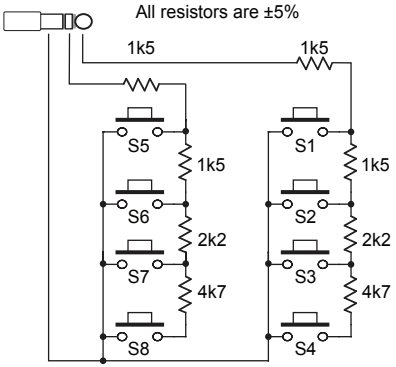




Both the Icom 705 and Yaesu FT-891 provide for a keyer memory feature for both Voice and CW. This allows the use of pre-programmed messages to be played at will, by using a keyboard interface. The interface does nothing more than switch in different resistors and the resulting voltage change triggers the appropriate 'canned' memory.

Beyond your typical CQ messages, I use 60 dashes and my callsign for 1296.1MHz to allow others to zero in on my position as well as well as a beaconing message.

My first scenario was deemed too big when I saw the design by **George KJ6VU** and was lucky enough to receive an extra set of boards that he had. George uses his typical PCB sandwich enclosure for his projects.



The project went together very simply and I did need to sort through the correct spacer height to make it all come together.

Schematics above left for the Icom version and left for the Yaesu FH-2 versions. For super simple field ops a small pill bottle and a switch would allow 'memory 1' to trigger the CQ message in voice or CW. This is a perfect rainy day project that can come together very quickly with an inventory (ie junk-box) well stocked with resistors and switches.

Re-purposing a Camera PSU

Andy Eustace, M0RON, Cheltenham, aeustace@sky.com

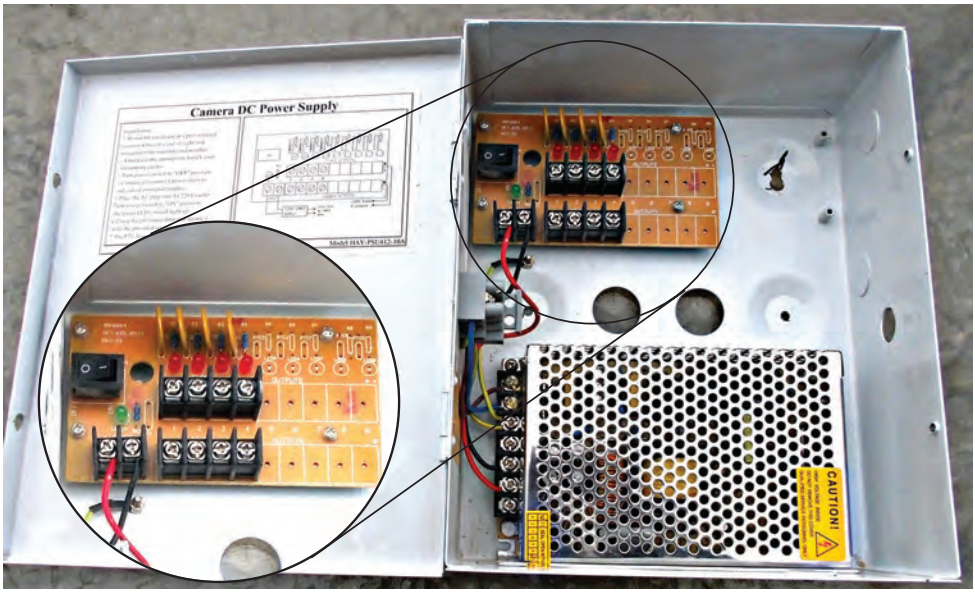
A week after reading the SPRAT article by M0PNN for re-purposing server PC switch-mode power supplies, my 'eldest' presented me with a security camera PSU from a system he had upgraded. A very useable PSU that was otherwise destined for a skip. It has four outlets each with a 2.5A PTC resettable fuse, their individual indicating LEDs and screw terminals as connections. Total output is 10A, though higher output current versions are available.

The unit also features an output voltage adjustment potentiometer, which is easily accessible without needing any covers to be removed to access it, enabling an output of 13.8V instead of the supplied 12V. It has a sturdy enclosure with the door secured by two screws for safety.

Provided the total 10A was not to be exceeded I think that a PTC could be replaced by a higher rated one if required. These are available on ebay quite cheaply.

RS website's PTC Fuse Datasheet: https://tinyurl.com/4enuzrwx

The control board and the four Positive Temperature Coefficient (PTC) fuses plus their individual LEDs indicating an 'open' state are visible in the corner of the box

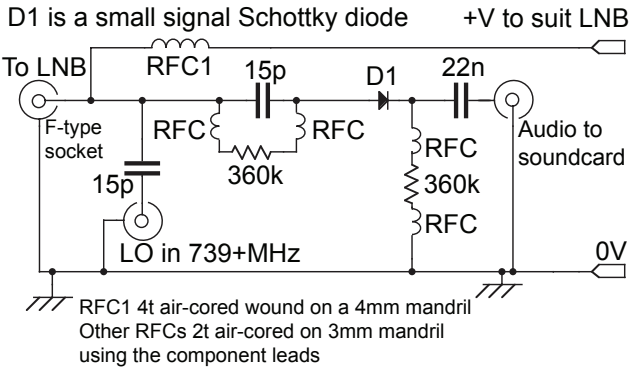


Oscar-100 Cheap and Easy

John G8SEQ email: john@g8seq.com

This project came about after I bought a Nano VNA. After I'd made a few measurements with it I thought what else can I do with it? Well it has a 'CW' mode which means you can use it to generate a single frequency well into the GHz region. A bog standard LNB operating in Low band mode has an internal LO running at 9.75 GHz. Q-100 has a downlink frequency of 10.489+ .

The difference (IF) is then 739+ MHz, a bit of an odd-ball frequency, as not many receivers work that high. However, if the output of the LNB is fed into a simple mixer driven at 739+ MHz then the o/p of this will be baseband (audio) ie a DC Rx working at 739+ MHz. If the output of this is fed into a PC sound card while running an SDR programme like M0KGK SDR Decoder, then we can listen to what is coming down from the satellite.



As QO-100 is geostationary it's like listening to a repeater, except it's thousands of miles away! This might not be everyone's cup of tea but this repeater is somewhat different as it carries multiple channels, mainly SSB & CW plus one fast scan TV channel. as well as several 'beacon' chanels. Despite the fact that you can build the hardware for pennies in about half an hour, you can even "listen before you buy". It's built as in the photgraph, on single-sided PCB material to minimide stray capacitances.

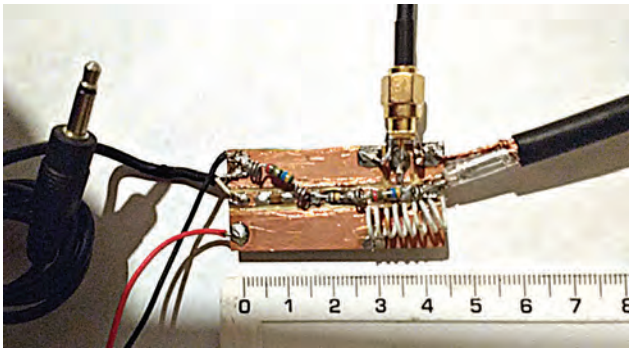
How? Simple – just log on to Goonhilly SDR at: https://eshail.batc.org.uk/nb/ and listen. Suitable soundcard software may be downloaded from:

http://www.m0kgk.co.uk/sdr/download.php

The coverage of QO-100 is enormous, from Malaysia to Brazil including all of Europe and Africa. You don't have to use a Nano VNA any synthesiser chip that produces a few tens of millivolts at 739 MHz will do. Have fun!

BTW: the satellite has several aliases: OSCAR 100 = The 100th Orbiting Satellite Carrying Amater Radio or Q-100 = QATAR 100; QO-100 QATAR OSCAR 100 aka Es-HailSat-2

John G8SEQ



On-Air Activity Manager

Peter Barville G3XJS email: g3xjs@gqrp.com

Winter Sports

Yes, it's that time of year again, the time we QRP ops look forward to. Dec 26th to Jan 1st inclusive, any band, any mode, on and around (do spread out!) the usual QRP COAs. This is not a contest so no points system to worry about – just come on the bands with QRP and meet like-minded folk and share details of your equipment etc. This has always been the most popular QRP event of the year and I am hoping that the improving band conditions will help make this a particularly enjoyable one. But the vital ingredient is YOU and your presence on the bands. If you're busy surfing the Web you won't make many contacts, and we won't be able to work you!

ClubLog

No one can recall how it happened but we ended up with 2 accounts in the ClubLog system. The issue has now been resolved and there is now only one G-QRP Club account that is live. It has just over 300 members listed but only 113 are shown as 'active', which means having submitted a log within the last year or so.

The Club is currently sitting at 115 out of 138 clubs. If you have a *ClubLog* account of your own, but are not listed as a member of the Club, please add it to your profile. If you are already listed then please remember to upload your logs as your QSOs will help the Club gain credit in the ClubLog system.

If you are not yet a member of ClubLog then please consider signing up soon. It is entirely free of charge. More info is at: *https://clublog.org*

Convention On-Air Activity Period

The Club's experiment of running an on-air activity period to coincide with the Convention proved very popular and successful. Those who submitted a log (and there were many) should by now have received their certificates from Steve G0FUW but, if not, please let him know.

In view of its success the Club would very much like to run a similar event next year and the committee is looking into ways to make it bigger and better. Perhaps a few sessions running up to the Convention? However, the Club obviously does not want any of the activity period to clash with the talks. Any thoughts/suggestions you may have will be welcomed.

Lindsay G3VNT has written offering his first contribution to this column: "A first for me was a day working 40m portable with my new QCX+ (CW) and an inverted-V supported by a 10m carbon-fibre pole. I worked several G stations across the UK, and EI6AK (Cork) QRP/QRP. I have a JST-135 transceiver on loan and found that I can wind it down to 5W, so have been active on 80m and 40m with that, almost exclusively on CW in an attempt to get to 'conversational' Morse."

Lindsay drew great satisfaction one evening when he worked an HB9 station (Zurich) on 80m SSB who was 5/9 with him and was pleased to receive a 5/8 report. Why did Lindsay feel somewhat smug? Because he was running 5 watts while the HB9 was running 1KW!

2021 RSGB Spectrum Forum Meeting (Nov 6th)

G-QRP has a seat on this Forum, and that role currently falls to me. The Forum discusses a very wide range of spectrum issues, many of which don't necessarily have much relevance to our normal day to day on-air activities, but there are obviously some that do. G-QRP agreed that, while we don't "own" the QRP COA frequencies, we have stated that we would like to see them respected by other operators more than currently happens. For example, G-QRP pointed out that many contest operators will often ride 'rough shod' over existing established QSOs.

There was general agreement that **all** operators should listen carefully on a frequency before using it, including contest operators, however it is well known that there are many who disregard this basic aspect of good and considerate operating. G-QRP also raised the issue of contest operators who operate outside of frequency limits imposed by some contest organisers. Apparently it is almost impossible to impose sanctions (eg points deduction or disqualification) owing to the difficulties of monitoring and proof. The relevant contest committee members are likely to be participants themselves!

The issue of **the future of the 60m band plan** was also discussed. G-QRP has previously stated that it supports efforts to seek alignment of the UK 5MHz allocation with the WRC allocation (WRC15), and this continues to be the case. Even without this consideration it appears inevitable that the UK will lose the lowest section of the 'band' which, of course, includes 5260kHz and our favourite 5262kHz. At some time in the future we will have to find a new QRP COA on 60m. In the meantime, let's make best use of 5262kHz while we can!

Keep the QRP flag flying and hopefully we will meet on the bands soon.

72 de QRPeter G3XJS

These are the International QRP Calling Frequencies:

CW: 1836, 3560, 5262 (UK Only), 7030, 10116, 14060, 18086, 21060, 24906, 28060kHz

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

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

Peter Barville G3XJS, Felucca, Pinesfield Lane, Trottiscliffe, West Malling, ME19 5EN.

Desperately Seeking Your Ideas

Dick Pascoe G0BPS email: g0bps@gqrp.com

The GQRP club is looking to provide Zoom presentations on items of interest to QRPers. We hope to have the first one running early next year. Only QRP related themes will be covered, with guest presenters much like in our QRP on-line convention.

We have had several suggested topics already sent in and hope to have more.
If there is something you would like to learn more about, then please send me your topic of interest to myself as Club Secretary. After all, if you don't say anything, our guesses may not be what you'd like to find out about!

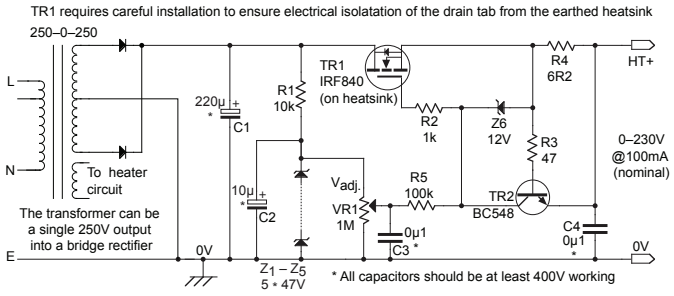
Thanks Dick Pascoe
g0bps@gqrp.co.uk

Valve QRP Reports 6&7th November 2021

Colin Turner G3VTT email: g3vtt@aol.com

Once again I've been contacted before the Valve QRP event about circuits. In the file I had a circuit for a high voltage regulator and variable voltage power supply from 2E1BDU. This should make a useful power supply if you are testing valve homebrew rigs or maybe reforming electrolytic capacitors by bringing the voltage up slowly.

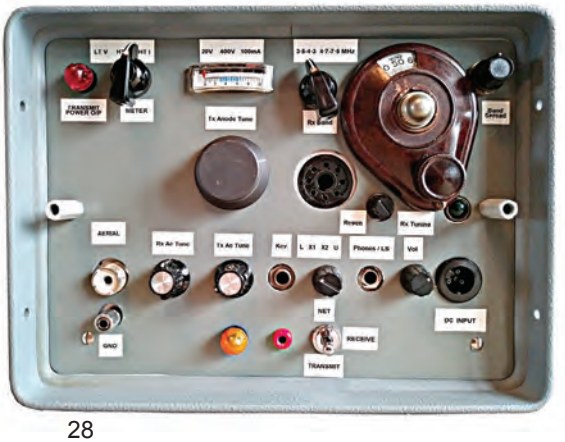
I met Jen **G4HIZ** at the Medway Amateur Radio club and he told me about his own Paraset project. He told me the design was not meant as a replica of the original wartime unit but more of a modern interpretation based on miniature valves and with the addition of an AF output stage. It was housed in an old Marconi Instruments' attenuator case with a new front panel and suitable chassis. The unit covered the 80m, 60m and 40m bands, although the 40m band is more challenging to operate.



The four valve line-up consists of a 6BW6 for the CO/PA, an EF183 as regenerative detector and an EF86 audio pre-amp with another 6BW6 as the AF output stage. Heaters are fed in series by 12.6V DC. Another modification tried was to add a continuous Zener controlled screen supply (regeneration control) for the EF183 to avoid big voltage swings between transmit and receive and thus upsetting the receiver.

To improve regeneration control and stability the gain of the EF183 stage was reduced. The unit had switched built-in crystals, covering 3.560 and 5.262MHz, plus a pair of FT243-type crystal sockets provided by an octal valve socket.

It was interesting to see that at the crystal frequency there was a very sharp 'blip' in receive, confirmed by plugging-in another crystal and seeing a new blip. It looks like the crystal acts as a sort of GDO sucking energy out of the detector and stopping oscillation. The RF output is 5W with good sensitivity with surprising low noise when set up properly. Perhaps Jen could submit a circuit in due course to stimulate others building the Paraset in their own way?



From Holland Gert **PA3CRC** tells me this was his first GQRP Valve Activity Weekend and he enjoyed it using a 5W crystal oscillator and power amplifier arrangement and a four valve superhet operating single band on 80m.

Living in a city he has high noise

levels which didn't help when working QRP but he did make some valve to valve contacts. There were other high power stations on the QRP channel but he carried on with his 20m long wire running from his dining room table then through the window up to the gutter and then down to the shed. At the highest point the wire was six metres high and his counterpoise was a spider web of wires in the dining room.

He contacted G0HUZ, PA0RZT, G4AQS with a single valve transmitter, G3TYB, G3ZRJ, G3NKS with his famous co/pa, and G4ARI with a valve transmitter. As he says, 'unbelievable with five watts' and he compliments the operators at the other end about their receiving skills.

Tim **G4ARI** also had an enjoyable weekend making 19 QSOs using a Codar AT5 and also a QCX-60 to give 3 stations that were using valve gear their first QSOs on 60m. He also made two contacts on 160m with Chris **G3XIZ** and Ian **G4GIR**. No one complained about his transmitter drift and one station even commented that it was fun chasing him up the band!

This year Tim's Codar AT5 seemed to drift more than in previous years and he will be delving into it over the winter to try to reduce the drift. Geoff **G3YVF** wasn't so lucky although he heard plenty of stations on 60m over the two days he didn't work any and blames his antenna. A number of stations had chirp which he finds quite useful when winkling them out. He notes lots of noises now on 60m. Here at **G3VTT** I find 60m most useful during the day with my best contact being Cliff **GI4CZW** for this session who is often heard on the bands with a 10 watt transceiver.

Chris **G3XIZ** heard all the regulars on over the weekend and has added 60m to his new valve transceiver. He has also made a few modifications to the power supply making a total of 26 contacts this session and having full break-in QSK and a VFO certainly helped. He is also working on keeping the drift down in preparation for next time. In total his valve to valve contacts were 18 in number on 160m, 80m and 40m.

Regular John **G3TYB** had a productive weekend that produced seventeen contacts from a series of casual and random operations. Conditions seemed good on 40, 60 and 80m but there was weak short skip on 160m. He had five QSO's QRP valve to valve, seven with other QRP stations and five with QRO operators. Saturday morning produced seven contacts on 40m, including F6CRK who was running 5W from a valve set up, which was particularly satisfying.

The 80m and 60m bands produced three and four contacts respectively and 160m the remaining three who were all valve to valve. Astonishingly John worked Luk, **ON5UK**, on 80m who informed him their last contact was in September 1970! Equipment used at G3TYB was either a home brew VFO/PA transmitter or a MK 119 spy set transmitter and an Eddystone 830 receiver coupled to a 80m LW antenna.

Another stalwart is Karolj **YU7AE** who was busy with work so had little time on the bands and he also suffered contest QRM. (When will we ever get contest free segments respected in our bands?). He made four QSOs on Sunday night, two from Hungary, one from Germany and the Czech Republic all on 80m. He used his 'good old spy radio' a Telefunken SEM-78 made around 1955, using one EL803 in the VFO and one EL84 in the

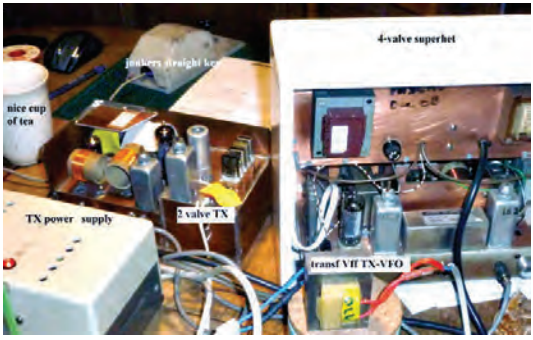
amplifier giving 5W output.

On the receive side the original SEM78 receiver worked but had stability problems so the second receiver was the back-up FT-817ND and the antenna was a low EFHW (End Fed Half Wave) 20m long wire with 1:49 transformer. He used a straight key which was ex GDR (East German) K-64 new from his key collection.

It's nice to have newcomers John **G0UCP** says this was the first valve activity he had 'keyed into'. He worked a small but select group of three valve to valve contacts, all on 80. Two were with Tim, G4ARI and his Codar AT5 on separate days and the third with Martin G4ZXN. Forty was awash with contesters and 60m was rather quiet. Generous intervals between contacts allowed experiment with a VXO circuit using a variable inductor to pull the crystal as described by G3ZII in Sprat 134 which was very encouraging.

Derek **G3NKS** had another enjoyable weekend on QRP. Using his usual 6V6 CO/PA he made a total of 16 QSOs, 6 on 80m, 7 on 30m and 3 on 40m. As seems to be the norm for these valve QRP weekends he found 40m was hard going because of contest activity spreading over 7030kHz. Stations worked sporting valve transmitters were Chris G3XIZ, Tim G4ARI, Cliff GI4CZW, Ian G4GIR, Martin G4ZXN, John G8ROD and Gert PA3CRC. He was sorry to miss some of the regulars. He apologises to those who may have called him in vain on 80m, the S7 noise his QTH from VDSL etc. makes copying weaker stations impossible.

Thanks to Peter **G3XJS** GQRP was supported at the RSGB Spectrum Forum Meeting which met on line over the weekend. He spent even more time writing up his Sprat column to include information on the Forum for our readers and subsequently he had very little time on the air. Despite reports to the contrary he found activity levels were high, which was pleasing and propagation across the bands mainly good. He used his Drake 'B' line set up with the power turned down to contact the regulars plus **G4JBD G3CWI/A M6MPC** and **PA3ALX**. Finally David G4HMC worked eleven homebrew valve stations with his homemade semiconductor transceiver to support the event. He notes G3XIZ who was strong and stable on both 80m and 60m and G3NKS who was worked on 80m, 60m and 40m.



That's all for this report. I hope we can meet again during the GQRP Winter Sports when you should have received this copy of Sprat. The VQRP dates for 2022 are April 16&17th, July 16&17th and November 6&7th.

Here's to a Happier and more Healthy 2022. Keep your filaments burning!

Postal reports to: *Colin Turner G3VTT, 182 Station Road, Rainham, Kent ME8 7PR*

MEMBERS' NEWS

by Chris Page, G4BUE

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gc4bue@gmail.com

After my plea in the last issue for more news items, I have been overwhelmed this time to the extent I had to ask Tex to give me an extra page! Many thanks to everyone who responded. Those of you of my generation who were in amateur radio in the UK in the 1960s and 70s (well before the internet), will probably remember **G6CJ**. Dud was one of the original Old Timers and an expert on antenna theory that he demonstrated in talks to amateur radio clubs with his 'Aerial Circus'. My thanks to **G3NKC** for telling us on another mailing group that Dud's last demonstration of the 'Circus' was recorded and is available on *YouTube* at <https://www.youtube.com/watch?v=v9OXRtISCjM>. QRPers know what an important part the antenna plays in their station and may learn something from the video.

MØRON built the Ham and Hale TCVR from Walford Electronics (right), covering the whole 40m band (also available for 20 or 80m), and set it for 5W output on 12V. Andy says it has excellent instructions, can be set up without special kit, has CW filters and decent RIT adjustment, and he has added a digital readout as a rough guide to frequency. First SSB QSOs from his Cheltenham QTH using an 82ft long and 13ft high wire antenna with 10 four feet ground rods, were with GM north of Aberdeen and PA, both giving good audio and signal strength reports. Andy says it is an excellent radio for the price and will be going 'hill topping' with him.

DF2QF took his portable QO-100 equipment on a holiday to France in August and September and QSO'd more than 50 Stations, mainly SSB with about 8-10W at the feed of a 60cm dish on a tripod (far right)! He says it is really easy to set up and be QRV over the satellite. Matthias' station consists of an old trusty FT-817, DXpatrol upconverter + PA, RSP1 SDR and SDR console software, and a LiFePO battery from Eremit. He used 10m from the FT-817 to the upconverter and the output is 2.4GHz towards the satellite. The downlink works via a stable LNB on 10GHz which downconverts it to 739MHz, then fed into the RSP1 SDR RX which in turn is connected via USB to the laptop. **VK3YE**'s latest video at <https://www.youtube.com/watch?v=1cnc14VW8Ro> includes a 30m CW QSO with **G3ROO** on 30m when Peter was /P using a 20m Bobtail that also works on 30m!

VE3IPS activated POTA VE-1368 several times on HF and 50, 144, 222, 432 and 1296MHz from his car boot shack (far right), working five unique callsigns and best with **VE3EU** at 46 miles with 2W and IC-705 and transverters on VHF and UHF. His recent antenna projects include the **DK9SQ** Diamond loop and a 40m horizontal loop. The POTA antenna (right) is typically a 20ft mast on the trailer hitch and a Packtenna 40m/20m linked dipole, and FT-891 the main HF rig. He traded his FT-817 for the FT-818 and got a Moonraker HO loop for 2m which he says is a great antenna for /P. John says, "Looks like Cycle 25 is starting, based on the strength of EU signals across the pond. **VA3GKX** and **VE3IGG** focussed on 6m ops from the grass using a Moxon. I had an Arrow 6m vertical and the linked dipole on the mast and the hitch pin fell out and crashed to the ground bending the Arrow before making a single contact, so now it's using a bolt with nuts".

The Sudden Digital VFO article in *SPRAT* 188 made **GW4JUN** think it was time to "take the plunge and try some digital 'hocus pocus', and so I ordered a PCB from Club Sales and the three break-out boards and got soldering! A couple of weeks later, and with some superb help from **GØFUW** and **MØKHZ**, I have a fully working digital VFO. This is a great first-time project for anyone who wants to dip their toes in the water of the digital ocean". Vic adds the main PCB is excellent and with the break-out boards, arrived quickly. All went together with no hardware hitches, there are instructions on the Club website and Kevin's software was easy to load and does a great job.

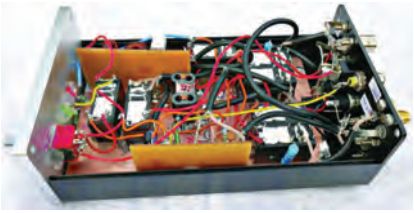
GØHUZ and his wife **GØLUZ** were /MM round the UK and into the Baltic during August and September with QRP. Despite fairly poor conditions, and the EFHW antenna that proved less effective than their usual centre-loaded G-Whip vertical (above with Suzanne from a previous voyage). They will be /MM again, mainly CW from 30 to 10m, between early December and early January as they cross the Atlantic on their way to the Caribbean, returning via Tenerife for New Year's eve and onto Southampton. Tony says, "There are some very rare squares to be found as we cross 'the pond'. During our last crossing we worked **HB9FH/AM** on 20m from the mid-Atlantic, Alex was Captain of a 737 as he flew over Africa at 30,000ft towards Cape Town". They will be doing it all over again from mid-February through to the end of March. The second picture shows Tony operating from the open deck near Cuba during a Christmas 2019 voyage to Florida, with their trusty Elecraft KX3 in a Peli case.

G3XIZ reports the sad news that **MØJXM** became a SK in August aged 91, and had been interested in electronics from an early age. Chris says Dennis was very knowledgable, had written several technical books, was a keen home constructor and recently had joined in the G-QRP Valve Activity Days, where he will be greatly missed. More sad news from **W5JAY** and **G4WIF** who report **K7SZ** (**K7YHA**) is also a SK. Rich was well know to UK QRPers in the 1980s when he was a G5 stationed at RAF Mildenhall with the USAF, and more widely as a QRP Hall of Fame inductee and the editor of the ARRL's *Low Power Communications Vol One* and other books. His Obituary is at <https://www.arrl.org/news/author-qrp-enthusiast-rich-arland-k7sz-sk>. Some better news from **GØFUW** in November, "Just opened *QST* to see club member **N2CQR** as the featured member this month. Great plug for homebrewing and, of course, the most excellent *Soldersmoke* podcast. Congratulations Bill!".

IZ4AFL in his shack (right). Enrico writes, "Due to issues with my neighbours, I had to remove my antenna and was QRT for a while, but the 'remote rig' system has come to my rescue, and I am now QRV again from Modena, Italy while sitting in Innsbruck, Austria. The rig (TS-480) and antenna (Aerial-51 all bands off-center-fed dipole) are installed at my parent's house in I4, while the control unit of the TS-480 is here in OE7. This system is amazingly reliable and one really forgets to be operating remotely. Thanks to the Aerial-51 Mod 807, I can now operate on all bands, WARC included. Remotely controlled relays driving a linear motor allow me to connect/disconnect the coax from the rig <https://youtu.be/MrLaoDWG0H4>.

On page 13 of *SPRAT* 185, there was a photo of the inside of **G4GHB**'s 19 Set, but no explanation of what it was. Bill says it is a Denco coil used to tune the antenna side on RX, and with an antenna change-over relay switching between RX and TX. He removed the green receive antenna wire going to the first stage and with a DC blocking capacitor, wired it to the larger coil on the Denco coil in parallel with the variable capacitor and earth. The smaller winding goes to the relay and to the antenna input. He says this made quite an improvement and he is now able to tune the RX input independently of the MHz tuning dial. Bill added an output transformer, 600Ω to 8Ω, visible under the RX tuning capacitor, and

driving an external loudspeaker, loud enough for indoor use. The picture shows the new fine tune control knob with a small variable capacitor behind the front panel at extreme right of the main tuning dial, just enough room to drill the front panel and install it. He considered this essential because the slow motion drive on the dial doesn't work, which made fine tuning a very delicate operation. Next, he is to look at the RX in the CW position which goes through the CW audio filter because it goes inaudible, and the BFO is pretty useless, so he leaves the NET switch down and tunes the RX for a beat note on CW and SSB.

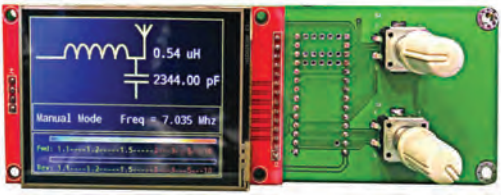


Man made noise levels are high at **MØHNK**'s QTH and dissuaded him from being QRV very much. Richard has very restricted space for antennas so has resorted to a trapped dipole in the attic covering 20, 30 and 40m that does a reasonable TX job, but he struggles to hear anything but the strongest signals on RX. After investigating separate RX and TX antennas, he tried a small magnetic RX loop in the garden, and built an antenna switching unit (above) that automatically switches between RX and TX either by the PTT line or by RF sensing. Richard says it also has a switchable bias tee so DC can be supplied to an external amplifier via the coax if required, and a signal splitter so that a RX signal can be shared between an SDR (for waterfall display) and one of his QRP TCVRs. He has also built a square loop antenna from 15mm copper pipe (third picture) and linked it up to a homebrewed version of the 'improved **MØAYF** loop antenna amplifier', see (https://wiki.radioreference.com/images/0/0d/Modified_M0AYF_Loop_Amplifier.pdf). Initial tests are quite encouraging (average improvement 5-6dB SNR) and he is also starting loop amplifier experiments using Norton amplifiers in a quest for further improvements. He has also built a WSPR RX and tested a couple of transitional six-pole Gaussian to 6dB crystal filters to be incorporated into a proposed superhet WSPR RX.

W4JUN got back QRV early in the year after a long break and also found a lot of (VDSL) noise, making HF almost unusable. He reduced the noise by replacing some of his telephone and internet house wiring and making a RX loop antenna based on a **PAØFRI** design using a pair of Club Sales 2N3866 and a one metre copper pipe loop. Vic says it worked just as well with co-ax for the loop, and he can null out much of the noise so HF is usable again! He says it is well worth a try if you are having issues from VDSL. **DL6MHC**'s latest project, a Hardrock-50 remote display, is described at <https://qrz.is/hardrock50-remote-display/>.

Trystan, **GØKAY**, writes, "I have a tip, quite literally. It is a Wisdom Tooth Stain Eraser which I find perfect for cleaning light tarnishing off IC leads, PCB pads and so on. It looks a bit like a toothbrush, with an angled head, and its tip is a very lightly abrasive rubber compound, and is similar to the coarse pencil rubbers (erasers), or the stuff railway model enthusiasts use to clean the tracks. **G3XIZ**'s second shack resides in the corner of his garden in a 30 year old wooden shed with wood rot, several leaks and leaning at an alarming angle where the ground at the front had subsided. Chris jacked it up, inserted wooden wedges to level it, has renovated it including guttering given to him by a friend, and is now working on the inside.

MØKHZ is working on a modern interface for a manual ATU, switching a bank of fixed inductor and capacitor networks, based on the popular **K3NG** design and incorporating a TFT screen. Kevin says initially, hardware and software will support manual tuning of each network via rotary encoders, with the ability to switch between Hi or Low Z, with a graphic depicting the network topology currently selected. He then wants to add switching in/out an input for a NanoVNA/dummy load, incorporating a frequency measurement system to enable RF sensing and returning to pre stored L&C combinations. Forward and reverse SWR sensing is also included.



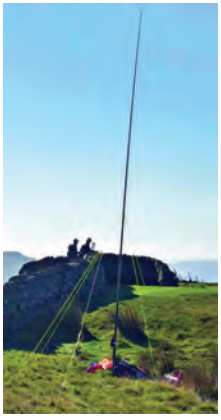
GØEBQ built a short vertical for 20m, a copy of a commercial design, using a cheap four-feet Screwfix earth rod, loading coil and counterpoise. Nigel says it peaks nicely with less

than 1.4/1 SWR and has QSO'd as far as the Black Sea with it with 1W. His favourite band is 12m where his best recent 2W SSB QSO was CT3. **F5VLF** is moving his shack to the top floor of their house, which will let him try a new antenna configuration: a half-wave dipole on 40m with the possibility of using it as a T, but fed at the top rather than at ground level, and the vertical section will have a generous number of ground spikes. When time permits, John hopes to try some of the more exotic modulation schemes on 136kHz.

Pictured right is **G8SEQ**'s stealth antenna! The white washing line is about a quarter-wave on 40m and made of E2003 coax (just because he had a lot of it!). The outer braid is used as the radiating element (inner not used) and the feeder is a short length (about 16ins) of RG58, with the inner connected to the washing line and the outer to the iron work. It needs an ATU to get it to load properly as is only about 6ft AGL. John says it works as an NVIS antenna, so is good for inter-G working (recent QSOs **GB6NHS**, **DD3JN**, **DM5ML** and **F4VPL**), and now the colder WX is here, he is going to extend the feeder into the shack. It also works well with washing on it!

GØAYD's shack (right) showing (l to r top shelf) 2m PMR with three repeaters, LDG auto ATU with SW40 CW TCVR on top; uBITX ver 6.1 all-band all-mode, speaker and Pheonix Kits SCAF filter connected to the uBITX. Bottom shelf (l to r) Ten-Tec Jupiter and Yaesu FRDX RX, and on the worktop, two Benchers, one connected to the Jupiter the other to the uBITX. In April, Dave acquired the latest version 0.6.3 mcHF TCVR, which he is very pleased with. With the power wound down to 5W, he QSO'd VP6 and YJ using an off centre-fed dipole at 25ft. Earlier this year, he repaired a uBITX, built an old Pixie kit he forgot he had, and got a broken SW 40m CW TCVR working. Then in November, a local club member gave him a Yaesu FLDX-401B TX and matching FRDX-400 RX, that are both now working. Dave says the RX is, "awesome and is really nice audio and used most days". Finallt, he has a Ten-Tec Jupiter bought with faulty encoders and, after sending it to have all four encoders changed, is now fully working.

MØNDE has taken a "leap back to proper QRP by selling my 7300 and replacing it with a 705". Nigel says to use his rucksack to full effect has meant reducing coax sizes, remodelling the **G3HBN** loop supports and generally dumping heavy accessories. His recently built Chinese tuner kit helped reduce space and weight too and he will be QRV with the new rig on 20 and 40m, plus UHF and VHF. On his bench (right) is a BPF module and PA section from a broken FT-707, in case he needs a bit more power, that **G3ROO** will help him get to work properly. **N6QW** has supplied the code for his DC RX Project in *SPRAT* 187 to over 80 requesters and asks you email him, <craponthebench@gmail.com >, if you have built the RX.



G4TGJ continued work on his superhet RX, trying out different amplifiers to ensure the mixers and crystal filter are properly terminated, looking to add AGC and seeing if he can get a class E PA to work on the higher bands (now the sunspots are coming back), starting with 15m. Richard has made some SOTA activations, including that pictured right at Whernside with Ingleborough in the distance on a glorious day in October. **RW3AI** and **G3XJS** mention the 'Do-It-Yourself - QRP contest-game' every August and December, see <http://qrp.ru/contest/diy/398-diy-eng>. **MØHDF** mentions a new channel dedictaed to QRP /P operations by **G4ABX** at <https://www.youtube.com/channel/UCsf2kAoDC1 WlBMOK7dpizNw>.

DM5TU took part in an eight week CW Ops Academy intermediate CW course to improve his CW head copy skills, a recommendation for all wishing to get better in receiving, see <https://cwops.org/cw-academy/cw-academy-options/>. The pictures next page show Stef's stage built NorCAl30A with SI5351 DDS VFO. The IF filter uses matched 8MHz HC49 xtals, following the **G3UUR** method, and after building the

circuit 'muppets style', he made a PCB. The RX is working fine with good stability and the final step is to put the final Q for the PA using a 2SC799. Stef has also made a 'xtal determination setup', and says, "Measuring the frequency loaded and unloaded, as well as other electrical motional parameters in volt. The xtals are all individualised and all parameters are being documented in a spreadsheet for further selection".

R2AUK has now built a superhet (top right) with a single IF, based on bidirectional amplifiers by **W7ZOI** and **K3NHI** using a STM32F103 MCU, Si5351, 1602 LCD, LM386 and 24LC64 EEPROM. The RX/TX switching circuit was borrowed from **DK7IH**. Aleksander says the class AB PA circuit is similar to the uBITX one, but he replaced the transistors with KT3142A (=2N2369A) and RD15HVF1 to give 5.5-7.5W output across all HF bands after trying the original circuit that didn't perform well on 12 and 10m. Currently, he only has BPFs for 80, 40, 20 and 10m because his trap dipole only covers these bands, but there is space for another four BPFs. The rig fits into a 200x178x62mm aluminum enclosure and draws ~350mA on RX and ~1.5A on TX when powered from 13.8V. It can be powered from a 3S Li-Ion battery and the power drops to 3.5-5.0W when VCC = 12.6W, and to 0.9-1.7W when VCC = 9V. Aleksander has done a *YouTube* video and published both the firmware and the schematic, <https://youtu.be/UZ0amTM9agg>. He has also built a fully analog QRP CW superhet TCVR (above bottom) for 40 and 20m based on bidirectional amplifiers as well, but using class C PA bases on RD15 and TDA2003 as an AF amplifier, and the AGC IF-derived and based on a Waugh voltage variable attenuator (VVA). He discovered two defects with it: first, the VFO is not thermally compensated so when calling CQ for 10 minutes or so, the frequency can shift ~200 Hz. It is especially pronounced around 14060kHz, when the capacitance of a variable capacitor is low. Secondly, sometimes at night he can hear some AM broadcast stations on 40m. The RX in the previous rig is identical except for the AGC part and doesn't have this problem, causing him to think it is due to the extra diodes the VVA has on the RX path. The defects are minor though and don't prevent him making contacts with it. A *YouTube* video compares the RXs at <https://youtu.be/hogDf2eY554>.

G3XBM has been RX only on 630m WSPR recently as he has to fault-find his homebrew transverter which, when working with 10mW ERP, gets to LA most nights on WSPR. Roger has been using his 10FT8R receiver to RX on 10m FT8 (right and see <https://sites. google.com/view/g3xbm 4/home/hf-mf-and-lf/homebrew/10ft8r-rx>), a very simple DSB design that works really well and was featured in *RadCom* in the summer. On 10m WSPR, he uses a 500mW **W5OLF** beacon, and is surprised how many people still use 10m WSPR. Roger has applied for an NoV to TX on 8m FT8 next Es season, is QRV on 70cms and 2m SSB most months in the UKAC activity contests (2.5W to a 2m big-wheel omni), and on 2m FT8 with 2.5W, also to the big-wheel omni antenna.

Thanks to all the contributors of this column. Please tell me how your winter goes for the Spring 2022 edition of *SPRAT*; what you have been building, who you have been working, and any other information about QRP, by 12 February. 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 spring and summer months, so I can let members know to listen out for you.

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I can supply UK & EU, will DX please order direct from Rex. ***These items from Rex's stock are pictured on the website.***

Limerick Sudden kits RX & TX both single band (160 through 20m); **ATU** (80 through 10m) **£40.00 each plus post** UK - £3.50, EU - £6.50, DX - £9.00

Sprat-on-DVD – 1 to 184. Only £5 each to members plus postage, UK - £1.20, EU - £3, DX - £4.00

Now also available as Sprat-on-a-stick - on a USB stick – same price and post, but they will travel free with parts

Sprat Binders – nylon string type – Black with club logo on spine -16 issues per binder – **£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 – G-QRP Club Account, 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 are getting greedy and charge us about 5%, so a contribution towards that is always welcome, or, send as a gift to friends/family – thanks. Maximum quantity of any item is 20.