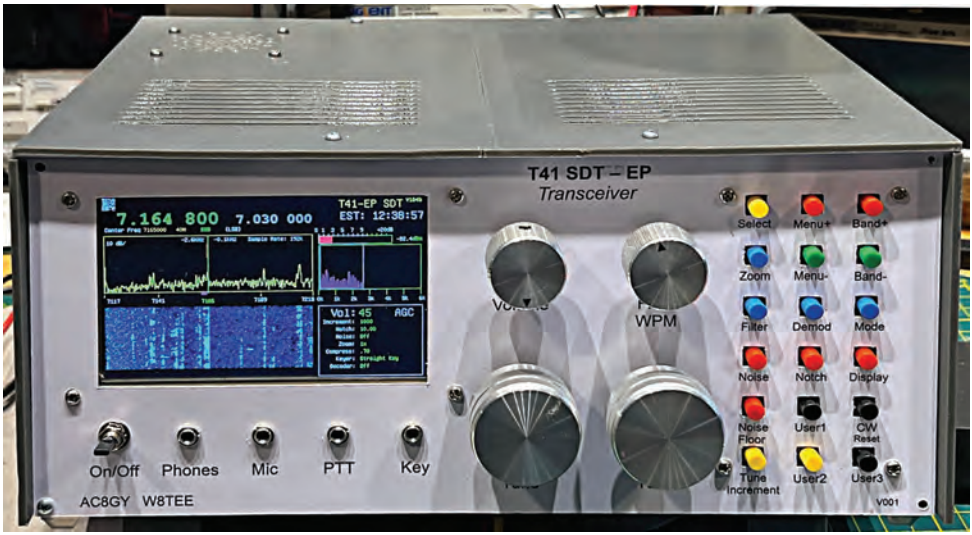
SPRAT

THE JOURNAL OF THE G-QRP CLUB

DEVOTED TO LOW POWER COMMUNICATION

Issue No. 191	© G-QRP CLUB	Summer 2022



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JOURNAL OF THE G-QRP CLUB

Our founder George Dobbs G3RJV (SK)

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EDITORIAL

It was great to meet with so many Club members at the Yeovil QRP Convention in April. There are already plans being discussed about next year, so it must have been a success.

Graham, G3MFJ, and **Roy, GM4VKN**, did their first Club Sales stand since 2019 at the NARSA rally in Blackpool and reported that it was a very good day with lots of members checking in. Hopefully, there will be many more opportunities to meet old friends, and make new ones, through this summer, and beyond.

As things stand, at the time of writing, plans are well in train to take us to our two physical Conventions in 2022.

The first, in Northern Ireland, should be happening, about the time this SPRAT hits the doormats, and there is an advertisement for the Club's annual Convention in Telford on page 7 of this SPRAT.

If you have never been to one of our Telford Conventions, they're very sociable gatherings with the option of a Buildathon and a buffet meal on the Saturday. On the Sunday, the Telford Hamfest, who kindly host our Convention, will have all the usual things you might expect at a rally; traders, bring & buy, catering, etc. and a number of QRP talks.

If you can make if, we would love to see you there. And if you can't be there on the days, we are intending to make the talks available on-line. There may even be a roving reporter following progress at the Buildathon.

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

G4STT Trophy awarded to G3ROO

Ryan Pike G5CL email: RPike78088@btinternet.com

Every year, the G-QRP Club makes a nomination for the **RSGB G4STT Memorial Trophy**, which is awarded for outstanding contribution to QRP. This year, we nominated long-standing Club member, **Ian Keyser, G3ROO** and we were very pleased to learn that the RSGB agreed with our nomination. Ian's award was announced during the RSGB AGM in April.

For those who are new to the Club and may not recognise the callsign, here are a few reasons why G3ROO was nominated. Ian has been an inspiration for QRP enthusiasts 'since Adam was a boy'; he has a 3 digit membership number. He wrote many project articles in *Shortwave Magazine* in the 1980s. He has had several articles published in *RadCom* and had many detailed designs published in the G-QRP journal SPRAT. Ian founded **Kanga Kits** as a means of making QRP projects readily available to a wide audience. Kits included the OXO transmitter, the Sudden receiver, the LCK transceiver and many more.

G3ROO has been the technical contact point for G-QRP club for over four decades and has helped countless members during that period. He wrote a small book about building antennas, which remains a solid source of great practical ideas and you can still get a copy via Lulu publishing.

The **Dover Construction Club** has been hosted by Ian at his home. In one of his many sheds he has a number of soldering stations and over the years probably hundreds of people have come to him for mentoring. He also offered slow Morse contacts for those learning, or recently qualified.

There can be no doubt that Ian has provided an outstanding contribution to the QRP world and is a worthy winner of the G4STT Trophy.

Ed's Mea Culpa

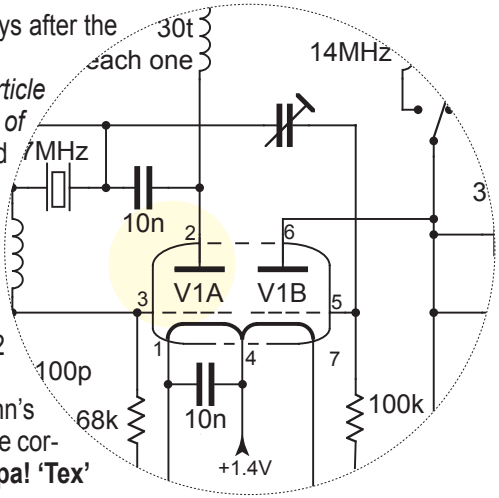
An update to the circuit of John G0UCP's article

I had an email from John G0UCP several days after the last issue of Sprat was published to say:

"I noticed that a very minor error in (*his article '1950's Style TX' featured on p10 of issue 190 of Sprat*). In the circuit diagram for V1A showed pin 2 as grid, and pin 3 for the anode. Actually the grid should be pin 3 and the anode pin 2.

"The pins given for V1B are all correct. Valve data for the 3A5 are not all that easy to find so would it be possible to put the correct V1A pins in an 'errata' note? Regards, 72 John G0UCP".

The error was mine, made as I drew up John's circuit. A corrected area is shown here with the correct pin numbers for V1A. **Mea Culpa! 'Tex'**



The T41-EP: Software Defined Transceiver

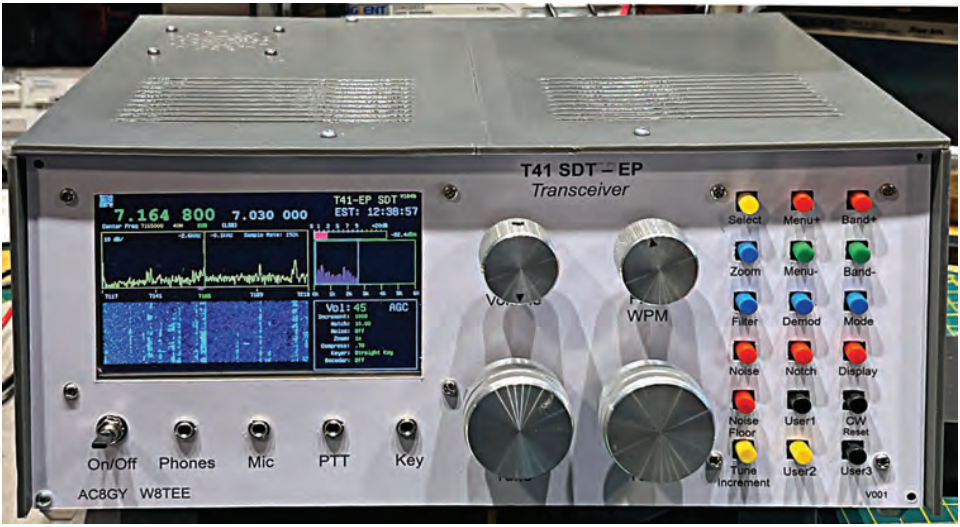
(An open source SDR project for the DIY Ham)

Jack Purdum, W8TEE & Al Peter, AC8GY

We really like SDR radios, especially during contests when you're a "hunt-and-pounce" operator like we are. Two years ago, Jack used a G90 feeding an EFHW antenna during Field Day instead of a normal 5W QRP CW rig (µBITX and QCX). It was sort of an experiment to see if 15-20W could do anything with just under a bazillion other operators competing for the same slice of spectrum. Answer: Yes, you can compete. You don't need high power or a fancy antenna to have fun in a popular contest.

Al and I talked about our weekend experience on our two-hour drive home, listing anything we could think of that might make using a radio like the G90 more enjoyable. This led to a project we designed to bring SDR technology within the grasp of DIY hams at a reasonable price. The objectives included providing easily-understandable SDR technology all-in-one place, as well as designing reasonably-priced hardware.

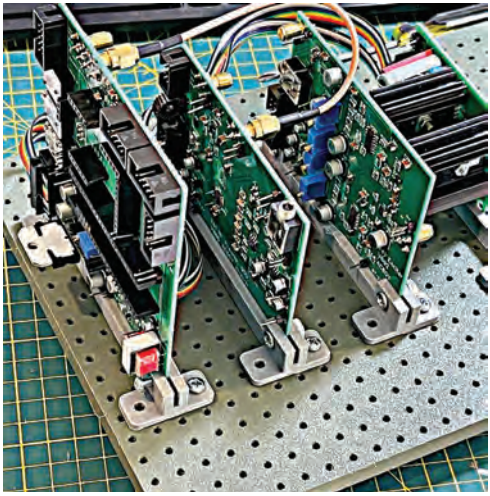
After two years of intense effort, we think we have it. We would like to introduce the Sprat readers to the T41.EP, a homebrew CW/SSB software defined transceiver (SDT) as shown below



We named it the T41 because the microprocessor hiding under the hood is the Teensy 4.1, a beast with 7.9Mb of flash memory, 1Mb of RAM, and 4Kb of (emulated) EEPROM. All of its power is boot-scooting along at a crisp 600MHz while watching over 55 I/O pins. The T41-EP can use 5" (shown), 7", or 9" displays. The T41-EP puts out about 20W SSB/CW PEP on the HF bands. It meets or exceeds US FCC requirements for spectral purity. Power output can be adjusted for QRP contests.

The "EP" stands for Experimenters Platform. The entire T41-EP project (T41 from now on) is Open Source, including the hardware and the software. Gerbers, schematics, and BOM's are on our web site (https://groups.io/g/SoftwareControlledHamRadio). We designed

the rig to use 7 PCB's, each with small footprint so you can take advantage of most PCB houses that have special pricing on boards that don't exceed 100x100mm. If you want to try a different module (e.g., PA, exciter, filters, etc.), just take our board out and plop yours in.



The starting place for much of the code is the Convolution SDR project headed by Frank Dziock, DD4WH. We took those 18,000 lines of code (in a single file) and added significant portions of missing functionality, divided it along functional lines into 22 code (.cpp) and header (*.h) files, while removing features (e.g., RTTY and shortwave specific code) we didn't wish to include. Now, even though there are still about 12,000 lines of C code, we are still using less than 3% of the available flash memory, so there's plenty of memory resources to experiment with. We also added much-needed documentation within the source code.

Design Goals

We wanted a SDT that had the following features:

- **High resolution spectrum and waterfall displays** that did not require a PC, laptop, or tablet. We both have Flex SDT's and love those rigs, but it's a pain to drag a PC into the field. Maestro makes that somewhat easier, especially if it built in, but that's not cheap.
- **Usable display size.** The T41 can use 5" (shown), 7", or 9" displays with 480x800 pixels. Good spectrum bandwidth. Face it, hunt-and-pounce with a 24KHz window just doesn't cut it during a contest. The T41 can display 192KHz spectrum, but we normally use 96KHz because the larger spectrum display loses some detail.
- **Some reserve power.** The T41 puts out about 20W PEP SSB/CW on 80, 40, 20, and 15M. Power drops to about 10W on 10M. Power output can be adjusted for QRP use.
- **"Boot portable".** While you could use the T41 in a SOTA, IOTA, etc. activation, unless you're an Olympic athlete, carrying the rig and a battery or two isn't for the weak. The rig weighs in around 2.5kg, depending on the heat sink used. Add a battery to service the 20W PA and things get a tad heavy. However, we think it's perfect for vacations or business trips. Throw it in the boot and off you go. Leave the PC, laptop, or tablet at home. User-oriented inputs and controls. Attaching headphone or changing from a straight key to a set of paddles on some rigs is a pain because all of the connectors are hidden on the back panel. Figure 1 shows the connectors on the front panel, but the 3D case Al designed allows you to easily parallel the connectors to the back panel. (The STL files are also on the web site.)
- **Easy activation of options.** Some rigs make you work through a labyrinth of menus to change a given setting. The matrix of switches on the right side of Figure 1 is how the most commonly-used menu choices are activated. While there are Main and Secondary menu options also displayed on the screen, they are less-often used than those found in

the switch matrix. BTW, those of you who might be thinking that we wasted 18 I/O pins this way, that's not the case. All 18 options are controlled by one I/O pin and without any multiplexers or complicated circuitry.

- **Speech compression and spectrum shaping**. It amazing what a little tuning here can do for a signal's punch.
- **Filters**. There is a variety of DSP filters available and almost all have skirts that look like cliffs. For example, Figure 3 shows the frequency response of the DSP filters that shape the Exciter input to the RF Power Amplifier at 40M. Note the very steep filter skirts at 7.0003 MHz and 7.0042MHz.
- **Easy servicing and modification.** We have spread the hardware functionality over seven PC boards so users can easily substitute their own variations and get to test points during setup.

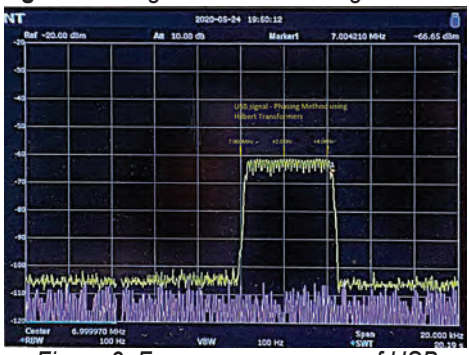


Figure 3. Frequency response of USB Exciter input to the Power Amplifier

- **CW decoder.** We view the T41 CW decoder as a learning tool. Our guess is that a very high percentage of Sprat readers know and use CW. Alas, that's not the case in the US. A good CW decoder gives both audio and visual support for learning CW. The decoder in the T41 is a little unusual in that its algorithm uses the Goertzel algorithm, the hypergeometric mean for adaptive coding via a bimodal histogram, correlation analysis, and a binary search tree to actually find and display the letter. Figure 4 shows the audio plot window with the CW Decoder Sweet Spot indicators. When the decoder is active, the audio plot draws two vertical lines centered on 768Hz. (Because the decoder was turned off in the main picture the Sweet Spot indicators are not visible). This tone locks the decoder for best performance. We think the T41 can help new hams learn Morse code more effectively.

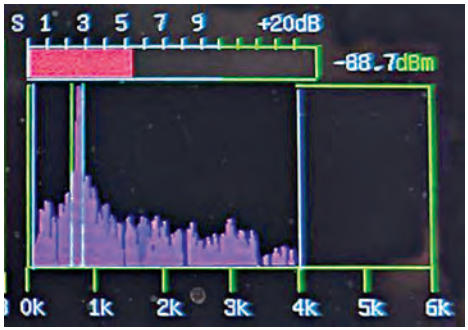


Figure 4. Audio plot with tone centers in the Sweet Spot.

Open Source

As we said earlier, the project schematics, source code and PCB Gerber files are Open Source. Everything is accessible, with documentation in the files of how it all fits together. By the time you read this, you can go to our site and download the Gerber files for the PCBs along with the schematics and BOMs.

The good news for builders is that we have been approached by a well-known organization (we can't divulge who it is yet) that wants to sell the T41 as a "semi-kit". They supply all of the PCB boards for the T41 with the SMD parts already soldered on the board. The user must still supply the connectors, encoders, wire, case, and display. Their target price for the semi-kit is under $250. We hope that they will have announced the final kit price by the time you read this.

Finally, to complete the goal of making SDR technology accessible, we have written a book that describes the T41 from antenna to earphones. There are 19 chapters in the book that discuss the circuits, software, and some of the design choices we made. The book is designed to be a learning tool for both SDR and Digital Signal Processing (DSP) as well as a guide to the hardware circuitry design. All but three chapters are finished and it looks like the book will be well over 300 pages when we are done. It will be available through Amazon, and we will announce when it's out, on our web site.

Conclusion

Almost all modern radios are moving in the direction of SDR and that movement seems inevitable, if for no other reason than economics. We think the T41, along with the accompanying documentation and other resources on our web site, is a good way to get your feet wet in the SDR pool without spending several thousand dollars to do it. Because it is an experimenter's platform, we also hope that the T41 will continue to evolve far beyond what we have done. Have fun and give it a try.

The Telford Hamfest

in conjunction with the

GQRP Club Convention

This joint event will be held over two days, from Saturday 3rd – Sunday 4th September 2022

The location will be the Harper Adams University, TF10 8NB in Shropshire.

The venue, will be signposted from major routes to the event, with the postcode being that of the University itself. It has excellent facilities including free wi-fi and on-site car parking. A cafeteria will be open during the Hamfest providing excellent food throughout the event.
The G-QRP Convention will open on the Saturday afternoon with a Buildathon and there will be a social gathering with a buffet in the bar that same evening. A number of speakers will be delivering QRP talks on the Sunday. After requests during last year's virtual Convention, there will be an on-air activity period, to align with the Convention, and on-line streaming is being planned for both Saturday and Sunday.
Full details will be sent out via the G-QRP IO Group and the members email list held by the Membership Secretary. We look forward to welcoming you there!

The FETLER-Receiver

Philip G4HOJ email: G4HOJ@yahoo.co.uk

Perhaps I am a regenerative receiver nut! Apart from my SimpleHet design, the last two write-ups have been about regens. Not another I hear you say! Well….yes….but I will keep it as short as I can.

Why? How?

The thrill of hearing everything that a £5000 TRX can hear on my simple DC and regen receivers…and that, something so special, about hearing the first signals on any homebrew RX…. plus the 'ether connection' of these simple receivers is the "why?".

My recent designs are valve-based (you have to love valves) but I was asked for opinion of transistor regens the other day. I heard myself saying that I found them to be more difficult than valves to make perform well. So, to be more objective in my thinking, I made a few different solid-state designs to see if I could find a 'tame', good-working design.

My first was an oft' produced Armstrong design and then a couple of Hartley types – tried with both jFET and bipolar devices. Long story short: I played with circuits and values but all variations seemed prone to howling if not set up just right and/or it seemed difficult to achieve good audio output. A few clues emerged as I tested those circuits and so, after a bit of thinking, I set about developing this design.

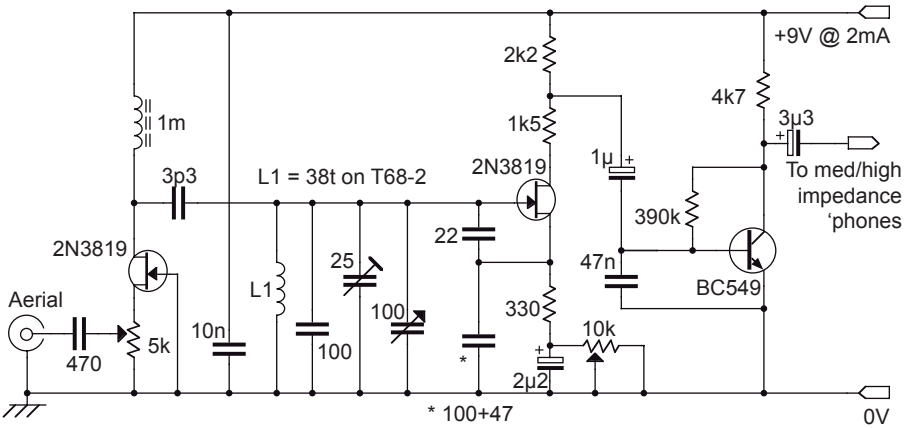
Generally, the FET versions of my trial receivers seemed more controllable. I had a couple of Club 2N3819 jFETs, so I used one as a grounded-gate RF buffer stage and another for a detector. However, there's no doubt that a bipolar stage was best for audio, so I used a Club BC549. Both Armstrong and Hartley version of the test receivers had their own quirks so I tried a, not-so-common, Colpitts-type approach to try and address some of the challenges found with other types. One spin-off advantage is that the inductor is only a single, untapped, winding.

After a while thinking about device parameters, etc., I built the first version (3.5 to 3.8MHz coverage) and then began evaluating and optimising. Again, long story short: I arrived at a receiver that has quite good performance and seems easy to 'drive'.

A Little Detail

The RF buffer is very straightforward, with the 5k attenuator pot. controlling aerial input and, therefore earphone volume. You will need to add attenuation with big aerials/strong signals…. and not just because things get too loud for comfort. The receiver is very sensitive, able to pick up signals on quite a short wire - so it will overload on strong signals. Just increase attenuation until it is happy!

Regeneration is quite smooth and there's no howl on the two examples I built. Other than adjustment for strong signals, it is possible to leave the regen control alone and just tune across the band. Detector output is good, with the 1.5K and 47n capacitor providing simple low pass filtering below 2.8kHz for the audio to the BC549 headphone stage. The arrangement shown can give very good, to too much, audio for my medium impedance headphones, so the overall RX gain seems about right (I did also try an LT700 transformer in the BC549 collector circuit and sensitive 'walkman' earbuds worked OK too). My receiver examples draw around 2mA at 9V.



Conclusion

No need to say much here but, obviously, if you build an example, build it rigidly and, ideally, with a grounded front panel (copper circuit board or even thin wood with foil backing), so that things do not detune by hand proximity to the capacitor or inductor. Think of it as an oscillator and you should be OK. Squeeze or expand turns (or add/subtract) and adjust the 25pF trimmer to put the band where you want it.

Use a decent slow motion drive on the tuning capacitor – even for just the 300KHZ of 80m – as it makes SSB and CW so much easier to tune. This receiver can be built in quite a compact form….but you don't have to build it tiny. Do what works for you. As with all my regens, I can hear VK/ZL, USA, etc., in the 80m DX window(s) when signals are there.

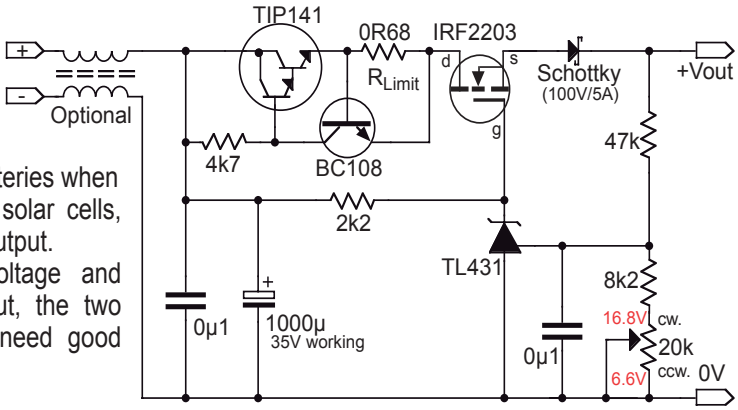
This receiver works pretty well, should be easy to construct and will work for 100s of hours on a PP3 battery. It will pull in 80m signals on a short wire but, with input attenuation increased a bit, will also cope with strong night-time signals from a full-size 80m antenna. Go on….have a go! Nothing beats those first signals on a home-brew RX!

A simple charge regulator

Niall M3NGS email: m3ngs@me.com

The name says it all really, as it was originally to create a protection circuit for 12V lead-acid batteries when kept charged from solar cells, that can give 20+V output.

With constant voltage and current limited output, the two power devices will need good heatsinks.



Club project a 1.5W breadboard DSB Tx.

Eric Sears ZL2BMI email: sears@xtra.co.nz

Over the last five years I have tried to help our club members in Branch 26 at Nelson, NZ, to become a bit more familiar with how circuits work, by getting them to build a circuit in a simple way.

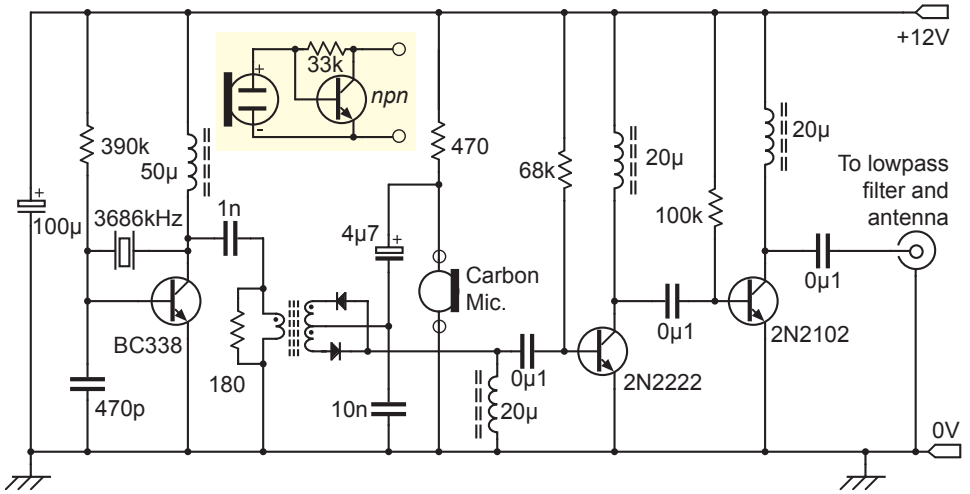
The first project was a 6-component, 600mW CW transmitter, which we achieved by twisting together the leads and taping to a piece of card. Then each group (about five that evening) successfully transmitted to the late ZL2ASO, Bob in Wellington, about 90 km away.

The next year this was followed by a six-component receiver (plus supplied LM386 audio amp) which received transmissions from Bob on a temporary aerial.

Two years later

Two years later, we built a simple am transmitter on a plug-in breadboard, and listened to our transmissions at low level (a few mW) in the club rooms.

So this year is the project below - a 22-component DSB 1.5W transmitter, built on a plug-in breadboard! Can we actually achieve it in one evening? I'm not sure yet, but five kit sets have been prepared and hopefully we will get it to at least one rf amp stage.



The circuit and pictures show what I have done - and as you will see it is nothing out of the ordinary - except maybe building it on a breadboard! The highlighted inset on the circuit diagram above shows an electret microphone replacement for a carbon, microphone if one isn't available.

So far I have achieved transmission to Rotorua SDR from Nelson - a distance of some 400 - 500km, but it could probably work all around NZ and even across to VK under the right conditions.

When I wrote this, I didn't know that **Peter, G4UMB** would be publishing a very similar circuit in last month's *Sprat*. It turns out that the Peter Parker circuit (VK3YE) which he used

was sort of one I originally published in *Sprat* about 30 years ago.

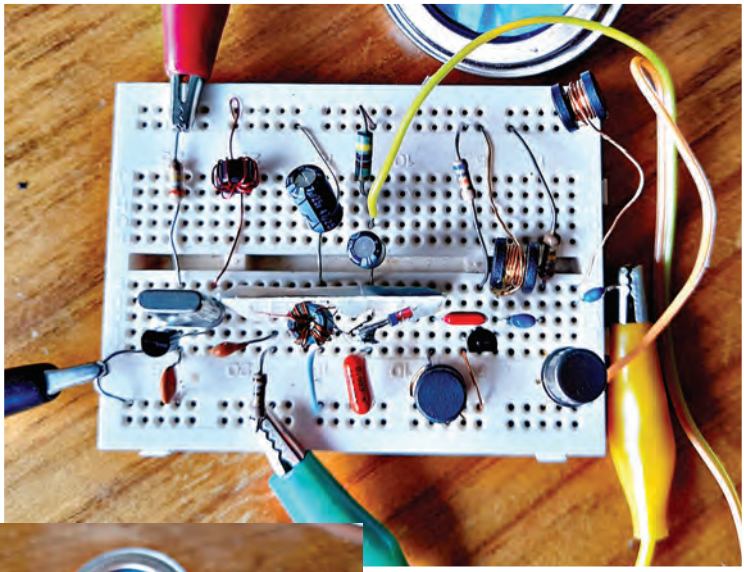
These circuits just keep going round!! The latest version of the circuit to be used at the club has one less inductor as per G4UMB circuit. Send me an email if you don't have the circuit, or would like a copy of it.

The balanced modulator in this version was built on a piece of cardboard with hot glue to hold it all - later versions, now built, use a small piece of veroboard. I call this one component!

There may be one or two differences between the pictures and the circuit - but nothing is critical. The rf chokes were just what I had to hand.

My favourite carbon mics still get used (simple!), but if you need something else the one with my SSB rig in *Sprat* two years ago should work. (See circuit addition). Just change the 470Ω microphone resistor to 2.2k or whatever works best.

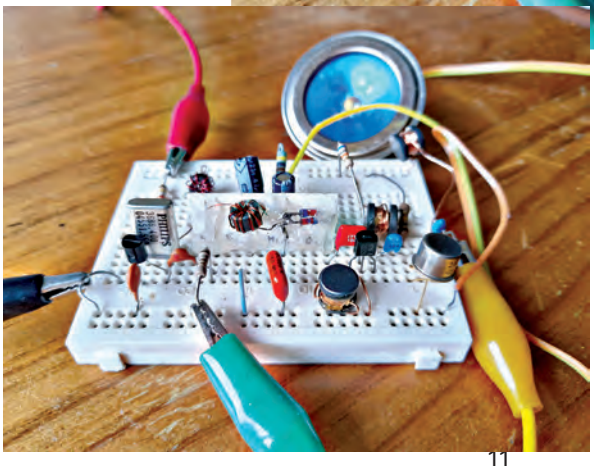
The 3686.4kHz crystal made it simple to get going and I have not tried a tuning arrangement. Possibly a resonator and tuning cap could be incorporated, though I suspect it may cause some 'FMing'. Its not supposed to be a fully-fledged transmitter - just something to show the principles. It actually transmits 3686.6kHz.



The G-QRP club 2N3866 (equiva lent) transistors are fine as drivers, but don't seem to last well as finals.

The whole point of this is to get local club members BUILDING something!

By using one of the many online SDR receivers it's now possible to have a QSO by using just the transmitter. Maybe next year will be converting it to a transceiver.



I urge you to try to create some simple projects at your club meetings.

I find that people who wouldn't normally come, turn out when its a "building night with Eric".

But mainly, have fun!

QRP For the Mic-Shy

Chris Andrew, 2E0FRU email: cjhandrew@gmail.com

Background

I passed my Foundation exam in 2012, for which, I have to give my thanks to **Ian G0GRI**. I went on to do my Intermediate, but then failed Advanced/ Full exam. This was despite **Steve G0FUW**'s best efforts. It is now 10 years later, and I haven't had a QSO, because I'm mic-shy and in spite of my best intentions I haven't yet learned CW.

One of the possible causes, is probably because I'm autistic, my 'Executive Function' skills aren't great. This means I spend a great deal of time doing research and planning, but then lose sight of actually **doing** the job, I've so meticulously planned.

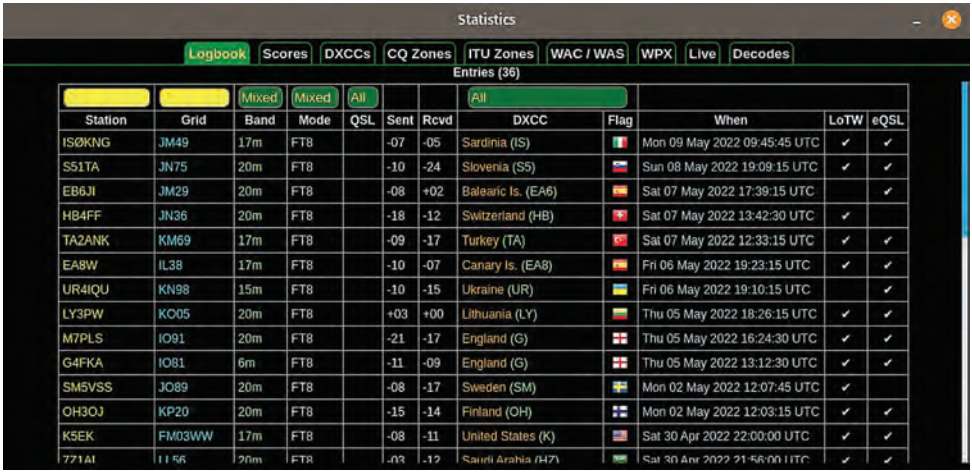
However, I've recently started to manage my time with a technique called the 'Pomodoro Technique' and found that I'm now starting to achieve things. With this in mind, I set myself the task of creating a digital QRP station for myself. This task,I broke down into smaller more easily manageable tasks.

These tasks, included Hardware – Software – Operating Procedures etc. Now for complete transparency, I will admit that I have become a fan of FT8 (I'll get my tin-hat!).

Equipment

I have a 10 year old laptop, an IC-705 and a loop aerial, strung between the roof timbers in the loft. I am a *Linux* user, but the software I use is platform agnostic as there are also versions for both *Windows* and the Macintosh operating system.

The software I installed now includes *FLRIG* , *GRIDTRACKER* and *WSJT-X*. It took me a couple of goes at getting the soundcard configuration right, but I just took it steady, and made mistakes. I knew I wasn't transmitting, so was happy to learn from getting it wrong.

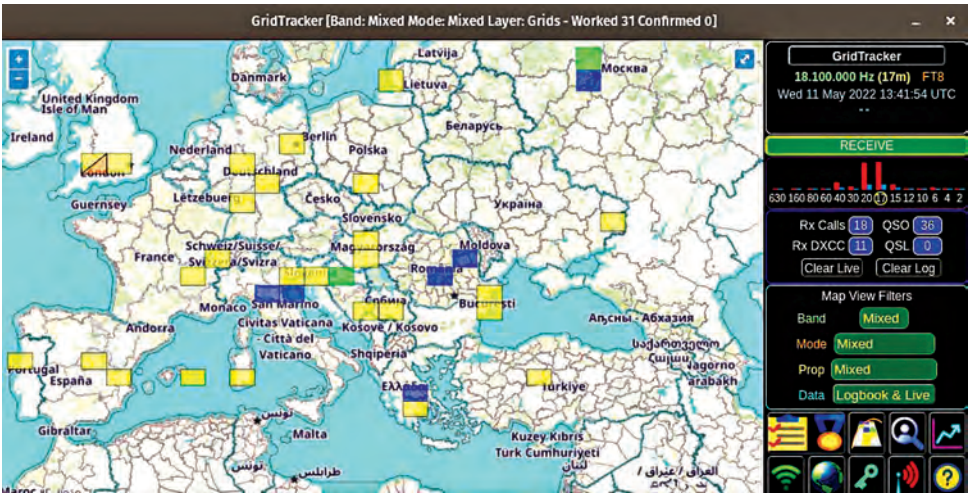


Station	Grid	Band	Mode	QSL	Sent	Rcvd	DXCC	Flag	When	LoTW	eQSL
ISØKNG	JM49	17m	FT8		-07	-05	Sardinia (IS)		Mon 09 May 2022 09:45:45 UTC	✔	✔
S51TA	JN75	20m	FT8		-10	-24	Slovenia (S5)		Sun 08 May 2022 19:09:15 UTC	✔	✔
EB6JI	JM29	20m	FT8		-08	+02	Balearic Is. (EA6)		Sat 07 May 2022 17:39:15 UTC		✔
HB4FF	JN36	20m	FT8		-18	-12	Switzerland (HB)		Sat 07 May 2022 13:42:30 UTC	✔	
TA2ANK	KM69	17m	FT8		-09	-17	Turkey (TA)		Sat 07 May 2022 12:33:15 UTC	✔	✔
EA8W	IL38	17m	FT8		-10	-07	Canary Is. (EA8)		Fri 06 May 2022 19:23:15 UTC	✔	✔
UR4IQU	KN98	15m	FT8		-10	-15	Ukraine (UR)		Fri 06 May 2022 19:10:15 UTC		✔
LY3PW	KO05	20m	FT8		+03	+00	Lithuania (LY)		Thu 05 May 2022 18:26:15 UTC	✔	✔
M7PLS	IO91	20m	FT8		-21	-17	England (G)		Thu 05 May 2022 16:24:30 UTC	✔	✔
G4FKA	IO81	6m	FT8		-11	-09	England (G)		Thu 05 May 2022 13:12:30 UTC	✔	✔
SM5VSS	JO89	20m	FT8		-08	-17	Sweden (SM)		Mon 02 May 2022 12:07:45 UTC	✔	
OH3OJ	KP20	20m	FT8		-15	-14	Finland (OH)		Mon 02 May 2022 12:03:15 UTC	✔	✔
K5EK	FM03WW	17m	FT8		-08	-11	United States (K)		Sat 30 Apr 2022 22:00:00 UTC	✔	✔
7Z1AL	LL56	20m	FT8		-03	-12	Saudi Arabia (HZ)		Sat 30 Apr 2022 21:56:00 UTC	✔	✔

Results

My results have been encouraging. For those who don't know, *GRIDTRACKER* coordinates

all logging, such as *ClubLog*, *LoTW*, etc. I am slowly working through setting these up, but *ClubLog* was the easiest and quickest to get me started. I now have had 5W QSOs with the USA, Russia, Spain, Ukraine (oops!) and many other European countries.



Conclusion

'Hang on a minute, I hated FT8, too'. I once said that FT8 was like shooting fish in a barrel. The reality of that thought is, that I wasn't making contacts, I felt ashamed to sign emails off with '73', because I felt I was not a real Ham, and FT8 is a minimal exchange of information.

Well, now I am making contacts, I'm starting to understand different aspects of our hobby, and from what I can understand, most activity on HF can very often just be of the "59(9) – 73" variety. So exchanging slightly more details with FT8, is fine, in my mind. Additionally, I understand that FT8 is more readable (-24dB) in QRM conditions, than CW. The figure of -24dB represent some 300 times lower noise than in a single voice channel.

But digital isn't limited to HF, and I have had some QSOs on 2m. I now feel like I am involved with our hobby, and this makes me happy. I would still like to get my Full Licence, but at the moment, I can do everything I need to, with the exception the option of transmitting while abroad or working while '/MM'.

So, If you find yourself in a similar situation give it a go, it's rewarding!

ON-AIR ACTIVITY MANAGER

Peter Barville G3XJS email: g3xjs@gqrp.co.uk

SUMMER SIZZLER. I'm not sure when members will be receiving this edition of Sprat but I hope you have not forgotten the 2022 Summer Sizzler. It starts on International QRP Day (17th June every year) and finishes on 23rd June so, like Winter Sports, is 7 days of QRP fun. Again, like Winter Sports,

The event is a relaxed social event during which you can get on the bands and find lots of like-minded QRP folk and meet new (and not so new) friends. Unlike Winter Sports there should be plenty of opportunity to get out and about, away from that troublesome local noise, and try some portable operation. Perhaps even /M from a narrow boat on the canals – whatever floats your boat!! There is plenty of opportunity for some unusual and interesting logs.

CONVENTION ON-AIR ACTIVITY PERIOD. Another heads-up for this event which will run during the first weekend in September, but avoiding the streamed talks and lectures. Further details to follow.

ACTIVITY SURVEY. Following my request in Sprat 190 I received quite a lot of ideas and suggestions (for which many thanks) for increasing QRP activity amongst members, as you will see below. Generally speaking, it was felt that the Club has about the right number of organised activity periods (G3VTT Colin's Monday activity days and Valve Weekends, Winter Sports, Summer Sizzler and the Convention Activity Period) which, combined with International QRP Day (Suffolk Trophy) and the Chelmsley Trophy, ought provide plenty of encouragement to get on the bands with QRP. I therefore don't propose suggesting any additional activity period, at least for the time being.

But of course, we would very much like these existing events to be better supported, and the question remains as to how best to encourage more activity. One of the major deterrents these days is the high level of local noise which can be at a crippling level. These situations can be helped by the use of a specialised receiving aerial (eg Rx loop), or noise phase cancelling systems, both of which can prove very effective. I suffer with very strong noise (mainly on 60m) from a neighbour's solar panel inverter but can null it out almost completely with the provision of a suitable separate noise aerial (some experimentation may be required to find the best option). Some folk find a separate non-resonant 'receive only' aerial to be effective. An ideal subject for a Sprat article – any volunteers?

Another deterrent can often be the level of QRM we suffer as a result of inconsiderate contest operators, many of whom choose to operate on or near QRP COAs. Is it because they believe they will suffer less QRM themselves from the low power stations on/around those frequencies? Are they not aware of the internationally agreed (and published) QRP COAs? Who knows, but finding a solution to this particular problem is not going to be easy, as I know from my own involvement with the RSGB Spectrum Forum.

The advent of recent digital modes has undoubtedly reduced the level of activity on both SSB and CW across the bands and it remains to be seen whether improving HF propagation will entice those operators back to the 'traditional' modes. When it comes to CW, it's true to

say that the mode demands a certain level of operator skill and not all are willing (or perhaps able) to learn and use those skills. I suspect there are fewer new CW ops coming into the hobby nowadays, and that must result in a lower level of CW activity on the bands.

However, there are also now more aids to learning CW than used to be the case and perhaps G-QRP, and its members, could find ways of encouraging newcomers to learn the mode and build up their speed capabilities. Two suggestions are: 1) More QRS CQs and QSOs on/around the QRP COAs, and 2) Always be prepared to reduce your sending speed to match the receive capability of the station with whom you are in QSO. It's only natural for somebody struggling with the higher speeds to be disillusioned and go somewhere else.

Members with access to the G-QRP Reflector could advertise their presence on the bands with a simple one-liner: eg "G3XJS currently calling CQ on 5262kHz at 15:40z". There can be a time lag before posts appear but the facility should still be very helpful. In addition, occasional reports on the Reflector of recent QRP successes can surely only encourage others to give it a go.

Unfortunately, a single activity day, such as the G3VTT Mondays, may prove inconvenient to some, so the Club could perhaps target specific days and between specific times. Chris G3XIZ has kindly produced a spreadsheet detailing such a scheme and has kindly offered to send the spreadsheet to anybody interested in seeing the details. Similarly, I would also be willing to forward it, if requested.

Perhaps we should adopt the "it's best to call CQ on the hour, or half hour" policy in order to maximise the probability of a contact?

Should we raise the maximum permitted QRP power levels (eg to 10W CW and 20W PEP SSB)? Such a move might increase the chances of making QRP QSOs but, in my view, would feel a little like sacrilege and undermining the achievements of those QRP operators who have gone before us. In addition, and especially if other QRP organisations around the world were to follow suit, then a plethora of small, battery powered, QRP transceivers designed as 'pocket sized' portable rigs (many of which have been home built) would suddenly become far less appealing.

We could/should put out more CQ calls on the QRP Centre of Activities, and monitor those frequencies while in the shack doing other things (like building that next rig!) and reply to any caller not otherwise receiving replies.

Lots of other ideas, no doubt, but perhaps these have given you food for thought? You might think our operating will become too regimented if we adopt too many of these suggestions? You are welcome to let me know.

Meanwhile, I'm hoping to catch many of you during International QRP Day and Summer Sizzler. Keep the QRP fun flag flying.

These are the International QRP Calling Frequencies:
CW: 1836, 3560, 5262 (UK Only), 7030, 10116, 14060, 18086, 21060, 24906, 28060
SSB: 3690, 7090, 14285, 21285, 18130, 24950, 28360 kHz
But they are "Centres of Activity" so please spread out if activity levels are high.

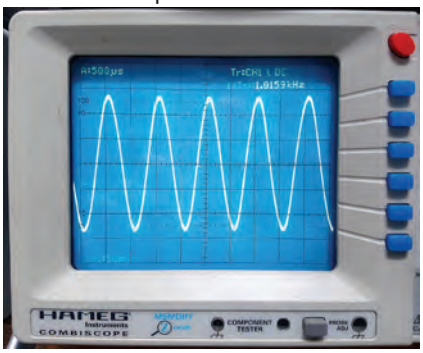
72 de QRPeter G3XJS
Felucca, Pinesfield Lane,
Trottiscliffe, West Malling, ME19 5EN

Cross-coupled DB product detector

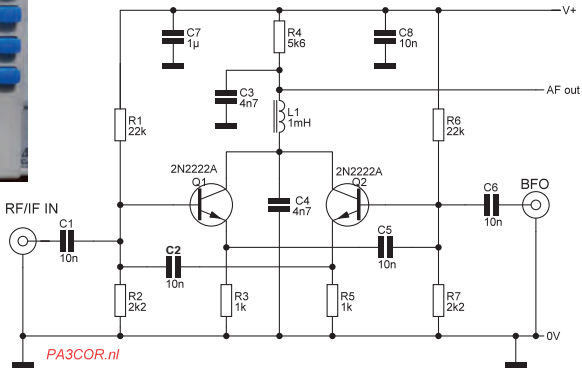
Cor van Rij PA3COR email: corvanrij@gmail.com

The double-balanced cross-coupled product detector had a brief stint of popularity in the 70s and 80s. It's popularity quickly faded once integrated product detectors like the Plessey SL640, Motorola MC1496/1596 and the CA3028A came on the market. Offering ease of use and further integration. My attention was first drawn to the cross-coupled product, when casually browsing some Technical Topics columns from **Pat Hawker G3VA** from the 80s.

His June/July 1980 articles briefly mentions the product detector. Out of curiosity, I decided to build it and do some tests with it. The nice thing about this whole circuit it can be build without any transformers! The only thing needed is a 1mH choke that be bought of the shelf for a couple of cents.



The circuit is copied directly from the original Technical Topics. The only thing that was changed is the use of 2n2222a transistors for Q1 and Q2. The article mentions the use of BC108, BC182 and other old-school transistors that I fondly remember.



Operation

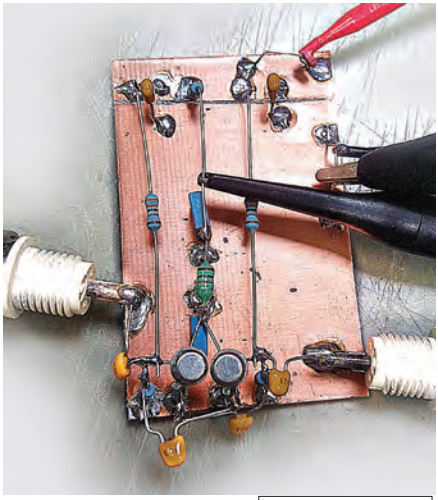
Details on the actual operation of the circuit are sparse. The only hint to it's functioning was found in the Pat's column of June/July 1980 [1]. Here it was stated that "The BFO injection should provide a signal about 10 times that of the i.f. signal". Based on this, the following operation can be deduced: if the BFO input goes positive, the voltage on the base of transistor Q2 will rise, as well as the voltage on the emitter of Q1. Thus transistor Q2 will conduct more. However, because the base of transistor Q1 is held a at a fixed voltage and the emitter of Q1 rises, Q1 will conduct less.

The RF signal is offered, at the base of Q1 and the emitter of Q2. For the RF signal, Q2 is configured as a common base amplifier and thus the input and output signal will be in phase. On the combined collectors of Q1 and Q2, the RF signal will show up in phase.

If the BFO signal goes negative, the opposite of opposite of above happens: now Q1 will conduct more and Q2 will conduct less. For the RF signal Q1 is configured as common emitter amplifier and thus the input and output signal will be reversed in phase. On the combined collectors the RF signal will show up in reversed polarity.

The circuit only works if the BFO signal is dominant, determining if Q1 or Q2 will increase or decrease conduction. Hence the requirement for the signal to be 10 times larger.

Build and test



The whole circuit is quickly build on a piece of copper clad board. You can easily see the metal can TO-18 2n2222a at the bottom. The 10nF caps are the four yellow blobs at the bottom. The 1mH RFC choke is the fat mint-green resistor like device in the middle. The transistors were not matched, just came from the same batch. For the biasing 1% metal film resistor were used, however.

After firing up the PCB, the static DC voltages were measured. It all pretty much agreed with the calculated values. Initially started with 9V DC but I could not get the circuit to work (later on, it was no problem, so I must have make a mistake somewhere). Then I decided to up the ante a little bit and go for 24V. This worked beautifully! You'll find the results in the table below. The photo at the beginning show the scope output.

BFO (mVpp)	AF (mVpp)
1000	92
900	260
800	260
700	260
600	250
500	250
400	210
300	90
200	76

All test were done with RF = 1MHz, a BFO = 1.001MHz with an input of 20mVpp. The optimum value for the BFO input voltage is thus somewhere between 700-900 mVpp, featuring a voltage gain of 13x = 22dB. Any lower and it will not sufficiently put Q1 and Q2 in and out of conduction.

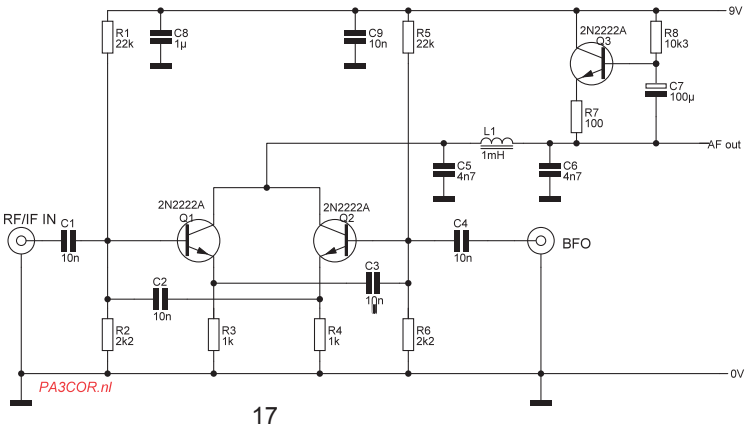
At even higher BFO voltages the gain decreased, which was a surprise. However, this is probably because Q1 and Q2 are being pushed into saturation and thus takes a longer time to recover and thus makes the conversion operation less efficient.

The bandwidth of the output filter (C4, L1, C3) was measured by increasing the BFO in 100Hz increments and was found to be 2.8 kHz.

Gain improvement

The gain of the mixer is set by resistor R4. The value of this component cannot be increased unlimited, however. The standing current through the resistor creates a voltage drop of R4. If the voltage drop becomes too large, the voltage at the collector will become too low for proper operation.

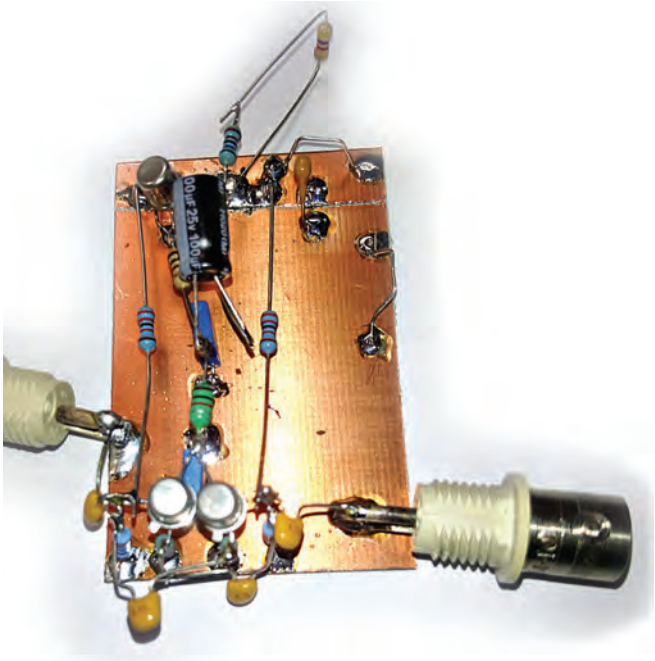
Another option would be to change the resistor to a current source. For this purpose R7, Q3, R8 and C7 were added. Even if the AF out-



put changes momentarily, the voltage over C7 will keep the Vbe voltage and the voltage over R7 constant and hence the current. So, this section effectively works as a dynamic constant current source. Dynamic, in the sense that it automatically adjust to the standing current through Q1 and Q2. Constant, in the sense that it does not change because of changes in the output.

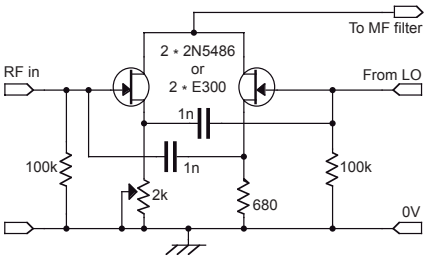
The tests above were repeated, with the results here. All tests being done with fRF of 1MHz, a fBFO of 1.001MHz and VRF = 20mVpp. So, the conversion gain has almost doubled. The odd value for R3 is because the original 5k6 was augmented with a 4k7 resistor.

Vcc =	9V	24V
BFO (mVpp)	AF (mVpp)	AF (mVpp)
1000	500	460
900	480	480
800	480	440
700	480	440
600	470	440
500	470	400
400	460	320
300	440	140
200	430	64
100	320	24



In his seminal book "*Ontvangers*" F.A.S. Sterrenburg, briefly mentions a product detector with a JFET [2]. In general, those devices have a large spread. So the inter-device spread needs to be compensated. In the referenced design, this is done by making the source resistance of one of the FETs adjustable. I fail to see that using jFETs over bipolar transistors seem to offer any significant advantages in this application, so it is not further pursued here.

Although ordinary BJT transistors, do a have a large spread as well, this is easily remedied by fixing the bias conditions. In this case this is done with R1,R2, R3, R5, R6 and R7.



Literature

[1] *RadComm*, Technical Topics, June/July 1980, page 639
[2] *Ontvangers*, F.A.S. Sterrenburg, page 135
[3] *Electron* 1980, Reflecties, May 1980, page 204
[4] *RadComm*, Technical Topics, May 1982, page 411
[5] *RadComm*, An SIC transceiver of SSB and AM, June 1971, page 378

VHF Managers Report

John Beech G8SEQ e-mail: john@g8seq.com

Now that summer is approaching, we can look forward to some enhanced propagation conditions on the VHF/UHF bands. With high pressure in charge of the weather we may get some tropospheric lifts on the higher bands of 2m & 70cm, while thunderstorms can inject energy into the ionosphere and give Es openings to the lower VHF bands of 50 and 70MHz.

Receiving the *PW* certificate shown here, reminded me of how under-used the 4m band of 70-70.5MHz is. Sporadic E openings often don't get as high as this band, but in years gone by it has been possible to work Slovenia, Cyprus and Gibraltar to name just a few.

To this end some amateurs local to me have been trying to drum up activity on 4m by having SSB skeds on 70.195 MHz most evenings between 21:00 & 22:00 local time. So far we have only managed to attract a handful of stations, outside of contests.

For last year's contest, I used an IC706 driving a Spectrum Communications Transverter (28–70MHz), with 10W PEP output to a double turnstile antenna, all of which is over twenty years old! So if anyone else wants to give G5LOW an airing in this years contest, contact **Steve G0FUW** for permission to use the call.

de **John GG8SEQ**

124, Belgrave Road, Wyken, Coventry CV2 5BH.
Tel. 07858 777363

Member's Advert

For Sale:

Gould Advance SG200 signal generator. Covers 160 kHz to 230 MHz, cw or internal/external AM modulation. Mains powered but with provision for internal batteries. Handbook included. £20 or offer. Buyer to collect from north London.

Colin G0CEU 020 8801 1415

email: margaretcolinh@btinternet.com

Picture courtesy of radiomuseum.org

WSPR Audio Tones Box

Hugh GM8FXD email: g8fxd73@gmail.com

How many of us have an FT-817 or similar, sitting in a cupboard not earning its keep? Well I had and I wondered whether I should move it on in the classified ads or find a useful function for it. Its low RF power output makes it ideal for WSPR but I really didn't want another PC running for hours on end or indeed overnight just to output 1W WSPR.

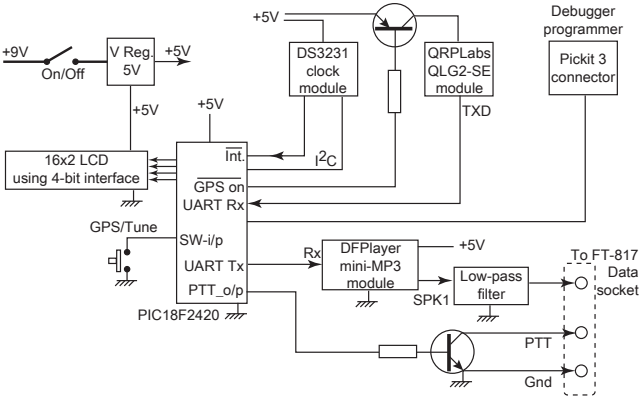
Over many years I have built and used the excellent kits from QRPLabs which amongst a host of other modes do standalone WSPR and work very well. The only downside for me is the need for individual RF low pass filters board for each band which with an FT-817 is obviously comprehensively catered for over all bands 160m to 70cm.

About this time I came across an article on the IK1ZYW Lab blog(1) who was experimenting with recording WSPR tones onto an MP3 pen who described a way to play a pre-recorded WSPR audio file into the Data connector of an FT-817. This sounded interesting and triggered a memory of seeing a tiny MicroSD card audio player module on EBay suitable for PCB mounting and interfacing with a microcontroller.

You can see where I was heading with this, a box you simply plug into the DATA port of the FT-817 which would allow you to transmit WSPR on any of the bands. So although this would be a long way away from an original idea, it could be a fun project which is what I want from the hobby.

So as an experiment I connected the loudspeaker output of my PC to the line input of the PC and ran WSJT-X in WSPR mode. Using a well known and free audio program called Audacity I recorded one cycle of WSPR (1 minute 50 secs). Starting and stopping the recording by hand meant that I needed to trim the recording using the edit facility of Audacity. Finally I transferred the .wav file to a microSD Card.

I was now happy to sketch a circuit diagram and order a few bits and pieces to make a prototype. My aim was to make use of ready built modules for each function which could be wired together on a piece of breadboard.



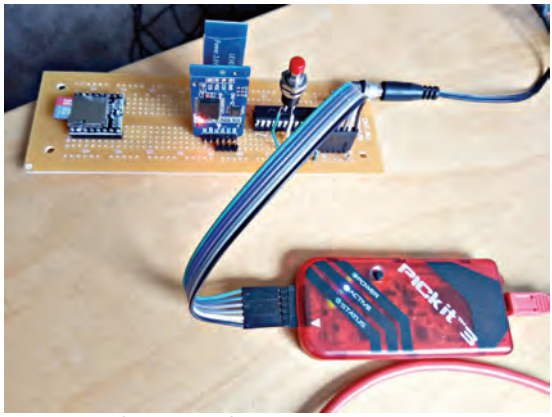
Microcontroller

At this point, I think for processing power many would understandably turn to the ubiquitous Arduino module, but because I had previous experience of writing 'C' code for PIC 18F series microcontrollers and had a PICKit 3 to program/debug I chose my own route. It would also mean all processing would be done by just one chip as opposed to a module and have lower power consumption and would keep me occupied writing firmware!

My first implementation consisted of a PIC18F2420, GPS module GY-NEO6MV2, Audio

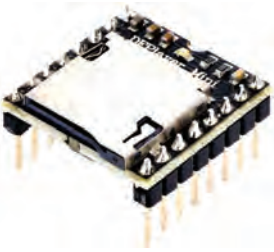
MP3 Module, battery backed RTC module and a Bluetooth module. The latter I included to help with test/debugging so that useful data could be input/output to a terminal program.

The GPS module came with its own ceramic antenna and I popped it all into a plastic sandwich box. It worked well enough to develop it further with a display and respectable box.



Audio MP3 Module

This is a DFR0299 Embedded MP3 Audio Module and cost just a few pounds, with a footprint of 20.5mm square and plays TF /microSD cards upto 32Gb in **.mp3** or **.wav** files format. Simple play control is possible using the modules I/O lines which is what I used for the prototype. However in the final unit the UART interface was used which allowed changing files with better start and stop control which proved necessary for providing a 'TUNE'facility. See Photo 4. This is made available between WSPR cycles, so that the user can push a button and introduce a 1500 Hz audio tone to allow any external antenna matching unit to be adjusted.



Timing

The most obvious issue with WSPR is ensuring that transmissions start at the beginning of even minutes. On previous projects I had used the DS3231 Real Time Clock (RTC) which proved to be extremely accurate once initially set up.

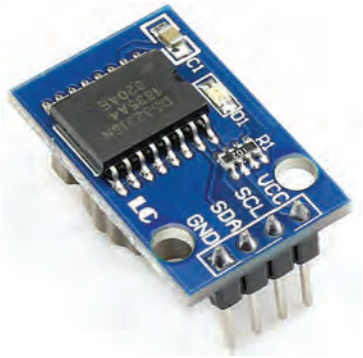
GPS is the obvious way of obtaining an accurate time, although at this location it is difficult indoors to receive and takes a long time to find sufficient satellites to produce valid time data. So I was thinking about a combination of the two, if I only had to step outside to get accurate GPS time once in a while to synchronise the RTC that seemed fine.

I won't bore you all with the firmware bugs which as always needed sorting out but eventually I had code which read time from the GPS module, could read/write to the RTC and play a **.wav** file at the appropriate time from the TF card player.

GPS Module

The prototype was fitted with the readily available low cost GPS module GY-NEO6MV2 complete with its own ceramic antenna. As mentioned earlier signal levels indoors are very poor and in the final unit I decided that having an external active antenna on the end of a cable

would allow a window sill position to get best operation. The QLG2 from QRPLabs was ideal.

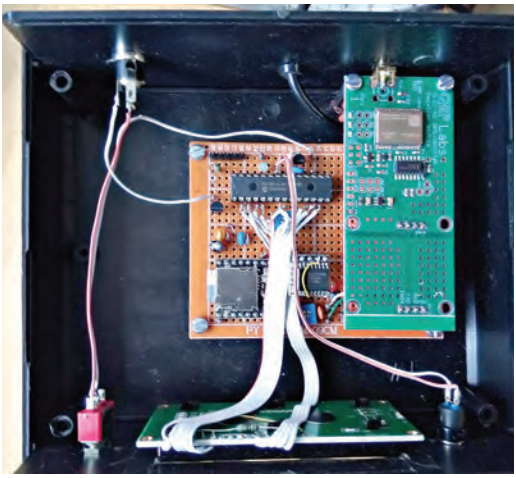


RTC Module

The DS3231 I2C Real Time Precision Clock module comes complete with its own lithium coin cell back-up battery which worked very well. The firmware uses the / Alarm output of the DS3231 and is programmed to issue an interrupt to the PIC on even minutes.

LCD display.

This 16-character by 2-line display needs little or no introduction really. Other than to say I chose to use the 4 bit interface with my own PIC driver code.



Final Unit Build

The system was built on 0.1" pitch perforated breadboard with a 'leisurely layout' as I wasn't trying to achieve miniaturisation, see picture on the right. A black plastic enclosure was sourced which was roughly the width of the FT-817, so that the transceiver could sit on top. The simple front panel layout has the power on-off switch on the left and the button for GPS/ Tune.

Operation

A GPS search is only initiated if the front panel button is held in during power-up.When valid time data is received it is sent to the RTC and the GPS module is then powered down. Normal operation then continues with the next target WSPR time slot displayed together with the current time, as it would be if the system is powered up without the button held in.

When the RTC determines the appropriate time it generates an interrupt. The FT-817 PTT line is pulled low via NPN transistor putting it into transmit and a play command is then sent to start the WSPR audio file. The audio signal for the FT-817 goes via a simple low pass filter and a preset potentiometer to establish the required audio level for the transceiver. The audio output and PTT lines together with ground are wired via a screened cable to the FT-817 DATA port connector.

Current Limitations

Essentially I have created a dumb WSPR box that allows the FT-817 to transmit WSPR on any band at fixed WSPR spots, with fixed repeat cycle lengths. This suited me well enough and has been in regular use. Multiple WSPR files could be recorded at a range of spot frequencies perhaps played in sequence helping to avoid QRM, there is after all copious space

This shows the unit waiting for the next WSPR transmit slot, then below is the progress during the actual WSPR transmission.

The progress bar during the actual WSPR transmission.

While waiting for a transmission slot, pressing the front panel button gives the opportunity to check the antenna SWR.

on SD cards. The repeat cycle length could also be changed perhaps with a front panel switch. But the most useful change would be CAT control of the FT-817 so that automatic band changing would be possible.

Conclusions

The system has been working well, I run 1W into a homebrew end-fed-half-wave antenna (EFHW), which gives acceptable SWR readings on 40, 20, 15 and 10m, so cycling through these bands could give a useful indicator of propagation and would be fun to check the results. So adding CAT control is my next task.

It was also found that the GPS only needed enabling every few weeks depending on temperature changes.

References:

MP3 WSPR, *https://ik1zyw.blogspot.com/2009/04/mp3-wspr.html*

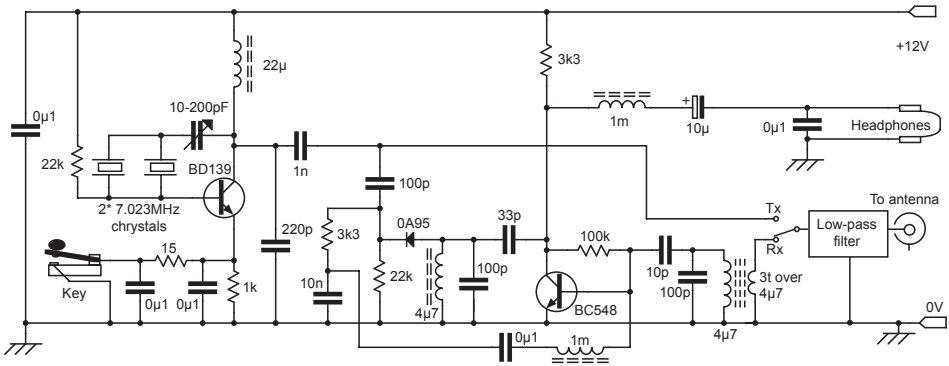
The “Poxie”

A two transistor 7MHz QRP reflex transceiver

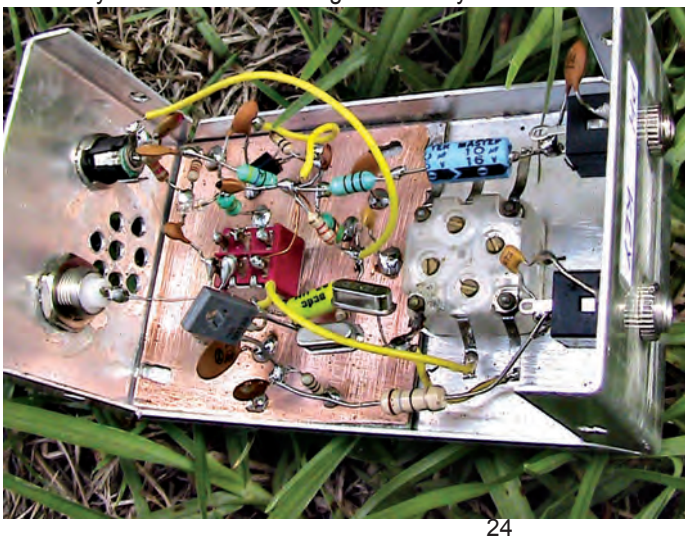
Peter Parker VK3YE

People have made contacts with one transistor CW QRP transceivers but it’s hard work. Especially if you’re doing it the authentic way with a crystal earpiece or high impedance headphones rather than cheat with an external audio amplifier.

‘Bare bones’ designs all compromise on transmitting and (especially) receiving. Common problems include susceptibility to overload from broadcast stations, insufficient gain and poor selectivity. Being crystal controlled with milliwatts is also a liability on transmit. That’s because you are relying on others to find your weak and possibly chirpy signal unless someone workable fortuitously calls on your crystal’s frequency. If they’re not workable then you can kiss your operating session goodbye until they’ve finished.



The more parts you add the fewer the compromises. An extra transistor could mean a higher RF power output or a better quality signal on transmit. On receive it could improve sensitivity and volume. The ingenious may use the extra transistor on both transmit and receive however this may require complex switching or present construction difficulties.



The Poxie is my answer to those who want a two transistor transceiver that is still very simple to build. The first transistor functions as the sole transmitter stage with about 600mW output. It remains oscillating (at a reduced level) to operate as the receiver’s local oscillator during key up.

All other receiver functions are performed in the second transistor. This circuit works it twice as hard in a reflex circuit that allows the transistor to do double duty; firstly as an RF amplifier before the germanium diode mixer and secondly as an audio amplifier between this and the earphone. Consequently, while the Poxie has two transistors its performance is effectively that of a three transistor circuit. At my noisy suburban location I can hear 7MHz band noise both on a sensitive crystal earpiece and less sensitive low impedance headphones.

Rejection of unwanted broadcast stations is assisted with two tuned circuits in the receiver. Both use 4.7µH prewound RF chokes in parallel with 100pF disc ceramic capacitors. That nearest the antenna has incoming signals applied via a coupling coil of three turns of enamelled copper wire wound around the body of the RF choke. Approximately double these values if you are building it for 80m.

Frequency Agility

A small amount of frequency agility is provided with a variable capacitor wired in series with the crystal. This is desirable to dodge interference and to provide an offset for receiving. You can use just one crystal if that's all you have but I used two to increase the amount of frequency shift provided.

Transmit/receive switching is manually done by switching the antenna between the transmitter's output and the receiver's front-end. Only a single pole double throw switch is needed as both the transmitter/local oscillator and receiver are powered at all times. A pi network low pass filter can either be built in to the transceiver case or plugged in externally (as with mine).

Getting contacts with the Poxie is still harder than a transceiver with more power and frequency agility. However under reasonable conditions and a clear frequency its 600mW can still attract replies from several hundred kilometres distant. Demonstrations of it in use are at:

youtube.com/vk3ye .

What if you already have a one or two transistor QRP transmitter? Just build the Poxie's receiver portion. Modify the transmitter so its oscillator is on all the time, preferably at a reduced power level. If it is fairly strong you might wish to reduce coupling into the diode mixer by reducing the 100pF capacitor to 10pF or so. I have had success doing this with the 5 watt two transistor transmitter I described in Sprat #188.

A 12V, 5Ah Battery Supply for under £10.

Daimon Tilley daimontilly@hotmail.com

I wanted to make a battery pack with a size that sat somewhere in between my small home-brew 3S packs and my big 12Ah Li-Po battery in an ammo can, one just big enough to allow me to take the G90 rig out for a couple of hours. In the garage I had three defunct laptops destined for the local recycling centre.

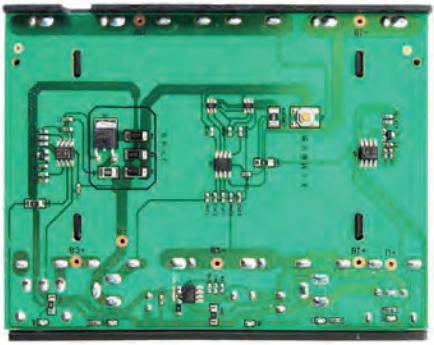
From these, I harvested 18 18650 Li-Ion cells overall, Then I charged and tested the individual cells and was pleasantly surprised to be left with a dozen with plenty of life left in them.

Searching the usual online shopping sites, on eBay I came across a DIY power-bank box from our 'Chinese friends'. This plastic box houses a battery tray for 6 of the 18650 cells in a three series–parallel (this is often labelled as 3S2P) configuration.

All you have to do is plug in your cells and you are finished. The PCB on the reverse of the tray provides a BMS and the usual protection. You can charge it using between a 12–13V supply. Afterwards, it will deliver 12V at up to 5A. It also provides a 5V 2A USB output for other items. My G90 draws less then 4A at 20 watts output.

Like many things Chinese, it has far too many LEDs, and the box is not very robust, but good enough for my needs. An aluminium enclosure would have been nice, but more expensive. At £9.24 including postage from Hong Kong, why not give it a go? I works well for me.

The eBay address for the box at the time of writing this article: *https://tinyurl.com/22puhety* While it doesn't appear to be an eBay address, the original was extremely long and difficult to copy. But should that item be no longer available, look for "USB DC 12V Output 6x18650 Batteries UPS DIY Power Bank for Cellphone Router LED" on eBay.

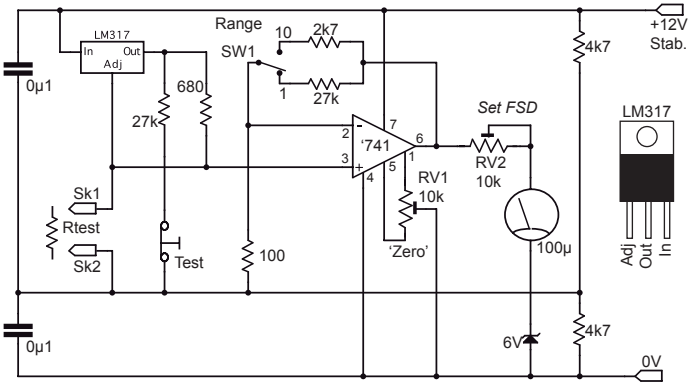


Low Resistance meter

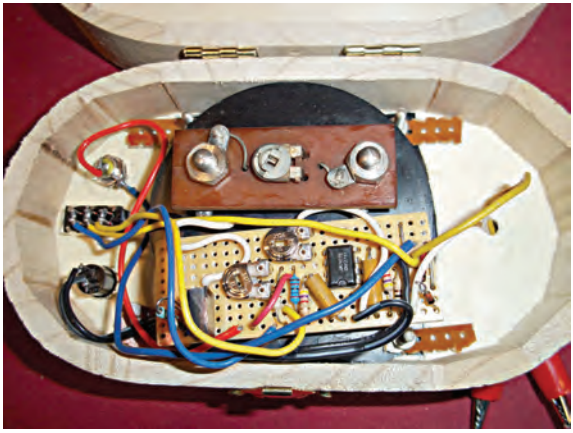
Peter G4UMB email: pahowd@gmail.com

Here is a Low Reading Ohmmeter which I have remade from a more complex circuit I found by **R A Penfold** in the *Hobby Electronics, Magazine* from September 1984. Having bought an old 100µA meter from a rally as a 'spare', I thought that such a circuit would be handy for checking coil windings, loud speakers and low resistances that regular multimeters don't specialise in.

The meter has two FSD ranges, of 10Ω and 1Ω. So you can easily measure down to 0.1 with it. The LM317 IC creates a constant 3mA testing current. Use a 12V stabilised supply or add a 12V integrated circuit stabiliser. The normally closed push button switch is to ensure the test terminals are shorted out , only press it when testing otherwise the meter movement could get damaged.



To setup the meter, put it on the 10Ω range and adjust RV1 for ZERO. Then connect a 10Ω resistor and adjust RV2 for FSD then switch to the 1Ω range and check it reads 1/10 of the scale



Repeat until you're happy with the results. The original circuit suggested you put the 'ZEROING' control on the front panel to compensate for temperature drift. .

I used several resistors to calibrate it with ie. values of 1Ω, 0.5Ω, 4.7Ω and 10Ω. The scale is linear.

I made it on Stripboard, as there's no RF involved. The wooden box is from "The Works" and it cuts quite easily with a Stanley knife.

Characterise a Dummy Load

Steven Bennett M7SLR email: m7slr@outlook.com

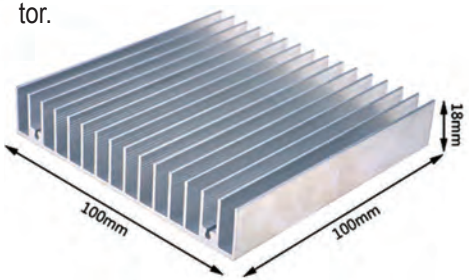
How to build and characterise a dummy load using a directional coupler and spectrum analyser

After recently passing my foundation exam and purchasing an HF transceiver I decided that I needed a dummy load to test and configure the transceiver before attempting my first CQ. There are plenty of reasonably priced dummy loads available online but what's the fun in that, so I decided to construct my own.

A dummy load is basically a 50Ω resistor in a box; now the box was easy to choose but what about the resistor? Obviously a wire wound component would be useless due to its inductance, so I initially thought about paralleling ten 500Ω carbon resistors to create a 50Ω resistor with low inductance and reasonable power dissipation.

Browsing through AliExpress for suitable resistors their 'algorithmic mind reader' suggested a 250W RFP 250N50F Microwave Resistor with a claimed frequency range of DC-3.0GHz and 50Ω resistance mounted on a copper slab for easy thermal transfer to a heatsink.

Selecting a case was easy, a die-cast aluminium enclosure large enough to take a suitable heatsink to dissipate up to the 250W maximum of the microwave resistor.



Although the case would dissipate quite a lot of power there seemed no reason not to add an extra heat dissipater in the form of an aluminium extruded heat sink (100x100x18mm).

Finally as the dummy load is intended for transceiver testing an SO-239 socket was the obvious choice for a connector.

Assembly: First the microwave resistor was fastened to the base of the enclosure using nuts and bolts and with a layer of silicone thermal grease to minimise thermal resistance.

Next the SO-239 socket was fastened to the side of the enclosure and connected to the load resistor using a short piece of RG316 coaxial cable, which has a maximum operating voltage of 1200 V RMS and would therefore tolerate the 111V RMS that would dissipate 250W in a 50R resistor.

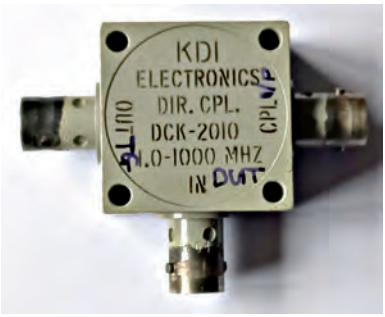
The heatsink was mounted on the base of the case, again using nuts & bolts and thermal grease. Finally the entire case and heatsink were sprayed with two coats of rubberised matt black paint from Halfords, which gave a very good finish.

Characterising the finished unit

How to measure VSWR using a spectrum analyser and a directional coupler, a unit that's are most frequently constructed from two coupled transmission lines set close enough together such that energy passing through one is coupled to the other. To calculate the VSWR of a Device Under test (DUT) it is necessary to measure a parameter called RETURN LOSS (RI), which can be measured using a directional coupler operating in reverse mode, as shown below.

In reverse mode a frequency source is injected into the coupler's OUTPUT port and the power level measured at the COUPLED port. If the INPUT port is disconnected the SOURCE power will appear at the COUPLED port, reduced by a device parameter called DIRECTIVITY, which for the coupler used is specified as -20dB.

If a perfectly matched load is connected to the IN port it will absorb all the SOURCE power and none will appear at the CPL port, however any mismatch caused by frequency dependant variations in characteristic impedance (Z0) will cause some power to be reflected to the COUPLED port. The value of the reflected power is called the RETURN LOSS and can be used to calculate VSWR.



The return loss of a system is defined as the ratio of reflected to source power and is measured in dB. High return loss results from low reflected power, so high return loss is desirable for a system as it minimises VSWR.

The DCK-2010 directional coupler operates from 1MHz to 1000MHz, has an impedance of 50R and has 20dB directivity. The DCK-2010 is quite an expensive part, but low cost devices are available on eBay and AliExpress.

One spectrum analyser setup (for 'Siglent SSA3021X Plus' Spectrum Analyser)

1. Press the FREQUENCY button and set the START and STOP frequencies and if desired change the FREQUENCY STEP from AUTO to MANUAL and set the step frequency using the keypad.
2. Press the TG button and then turn on the Tracking Generator, set the output power to -20dBm and NORMALISE to off and check the displayed signal power is -20dBm.
3. Note that power in dBm, or decibel-milliwatts, is proportional to the logarithm to base 10 (log10) of the actual power divided by 1mW i.e. P(dBm) = 10 * log10(P(mW) / 1mW).
4. Connect a BNC coaxial cable to the TG SOURCE and another to RF INPUT, using N to BNC adapters, and join the free ends with a male-male BNC coupler.
5. The display should be mostly flat and read approximately -20dBm, any variation from a straight line is due to the characteristics of the cables.
6. Connect the Spectrum Analyser Tracking Generator (TG) SOURCE to the coupler OUT port.
7. Connect the coupler CPL port to the RF INPUT of the spectrum analyser.
8. Connect an OPEN fitting, leave unconnected, or connect an extension cable to the IN port, so all the signal inputted at the OUT port will be reflected and will appear at the CPL port with a 20dB reduction in power (see directivity from coupler data sheet) i.e. -40dBm on the display.
9. Note that power gain, or loss, expressed in dB (not dBm!) can be added or subtracted from a dBm power level to produce a final power in dBm e.g. -20dBm – 20dB = -40dBm.

10. Press TG and turn on NORMALIZE and note display shows a flat reference level of 0dBm.
11. The normalisation function of a spectrum analyser measures the gain, or loss, of a system at many frequency points and stores the results in its memory. All subsequent frequency scans add, or subtract, the normalisation data from the measured data, which results in a flat, or level, trace on the screen usually at the 0dBm point. The process of normalisation removes any frequency dependant characteristics of the system, such that only any changes made to the system will deviate the on-screen scan. So in this example only changes to the DEVICE UNDER TEST (DUT) will be displayed.
12. Connect the DEVICE UNDER TEST (DUT) to IN port e.g. a BNC 75R resistive load.
13. Note that the display line is now at approximately -14dBm; to measure more accurately press MARKER which will display the power numerically on the screen.
14. We want to calculate the RETURN LOSS (Rl) as a prelude to calculating the VSWR. Rl is proportional to the log10 of the ratio of REFLECTED to SOURCE power, but we don't need to convert dBm values to mW to do this, we can simply subtract the dBm values, which is mathematically the same thing.
15. So Rl is simply 0dBm – (-14dBm) = 14dB, or without normalisation -40dBm – (-54dBm) = 14dB again.
16. The sign of the RETURN LOSS (Rl) does not matter, it depends whether one thinks of it as negative gain, or positive loss. Then calculate VSWR using the following formulae:

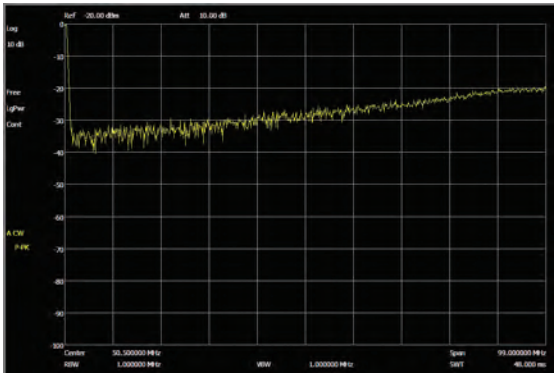
$$VSWR = \frac{1+10^{(-RL\ /20)}}{1-10^{(-RL/20)}} = \frac{1+10^{(14/20)}}{1-10^{(14/20)}} = \frac{1+10^{(0.7)}}{1-10^{(0.7)}} \qquad VSWR = \frac{1+5}{-4}$$

Ignore the sign so VSWR = 1.5:1

17. Note that for a purely resistive load the VSWR is just e.g. R(DUT)/R(TEST SYSTEM)
18. = say 75/50 = 1.5 again!
19. Note that the RETURN LOSS and VSWR is constant for a purely resistive load but of course a complex load containing resistance, capacitance and inductance can be measured in the same way and Rl and VSWR will vary with frequency.
20. Replacing the 75Ω DUT with my home constructed 50Ω dummy load shows the RETURN LOSS to be 35dB (SWR 1.04) at 10MHz and 20dB (SWR 1.22) at 100MHz, from the image below.

Conclusion

The dummy load performs well over the frequency range from D.C. to 100MHz and beyond. It should dissipate the 100W of my ICOM-7300 without overheating and probably cost less than buying a ready-made commercial device. I had to do some research into power levels, the distinction between dBm and dB and learned a lot in the process.



Parts list

250W RFP 250N50F Microwave Resistor DC-3.0 GHz 50Ω https://tinyurl.com/fpvmrwf3
Aluminium Enclosure Project Box 145.5x121.5x39.5mm https://tinyurl.com/whb7r373
Aluminium Alloy Heatsink 100x100x18mm https://tinyurl.com/yw5h3svv
Coax Connector SO-239 https://tinyurl.com/2p8wv4k4
RG316 coaxial cable 2.5mm 50Ω https://tinyurl.com/mum67b4k
Matt black rubberised paint https://tinyurl.com/2p8bbsuy

Treasurer's Report Year to March 2022

Graham G3MFJ email: g3mfj@gqrp.co.uk

After last year's surplus, this year we have a loss. Not very much, it is just over £3000. This was caused mainly by the lack of attendances at rallies due to the pandemic, also, we are paying for some of the committee to travel to Northern Ireland to support the convention that is happening in mid-June this year. I am not worried about this loss, we have plenty in hand to cover our costs for this year. The club has already had a stalls at a couple of rallies this year, and we are looking forward to attending more this summer.

Sprat is still an excellent magazine, thanks to our editor, Tex, and also to our printer who turns Tex's copy into a magazine we can all be proud of.

Now, subscriptions. Despite the small loss this year, we do not need to increase the base level of our subscriptions, so the UK figure will remain at £6.00 for the current year, and probably 2023. However, some overseas subscriptions will have to increase, and it's just the DX level which will change. This change is purely because of postage costs. So, from next January, the DX subscription will change to £15 – not a great increase. I repeat, this is purely due to increases in postal charges. European subs will remain at £12. If you remember, I said last year that we no longer have to pay VAT on our European postage, something to do with Brexit, I guess.

I am looking into offering direct debit as a form of payment for the UK members, this may come into use for 2023, but no promises yet.

So again, the report is that the club's finances are in a very healthy state.

I have shown below, the loss/surplus figures for the past few years:

Year ended -	March 2017	-£1011
	March 2018	+£281
	March 2019	+£504
	March 2020	+£7400
	March 2021	+£4414
	March 2022	-£3100

We have sufficient money in reserve to cover us for at least one year, should some disaster befall us. So, we are fine, however, to keep things tidy, we still will not allow renewals for more than one year at a time. Your committee would like to use some of our money to encourage youngsters into the hobby, so this is one of our continuing projects for the immediate future.

Valve QRP Reports Easter Holiday 2022

Colin Turner G3VTT email: g3vtt@aol.com

I've received fewer reports this time and there was some activity although less than usual in my view. It could be folks were unaware of the dates. I tend to give the dates of the next session at the end of my overall report and a reminder on the GQRP reflector a couple of weeks beforehand. Make a note now, the next dates for VQRP are July 16th and 17th and November 5th and 6th 2022. My thanks to those took part.

Tim **G4ARI**, writes "Another very enjoyable GQRP Valve Weekend. I made 17 QSOs using my Codar AT5, and as last time I also used my QCX-60 to give 4 stations that were using valve gear, contacts on 60 Metres. Again, as last November, I managed two contacts on 160m with Chris G3 and Ian G4GIR, but this time on Sunday we managed a three way QSO between Chris, G3XIZ, Ian, G4GIR and me.

"After last years comments about drift I carried out quite a bit of work on the Codar AT5 including replacing all the old valve bases and also slightly re-positioning the VFO Capacitor. I replaced the temperature compensation capacitor, which I think helped to some degree, so that I was still in the 500Hz passband of the CW filter at the end of each over!

"Finally I must just tell you about my 80 metre QSO on Saturday with Tony G4LFU, in Brampton who was using a Codar AT5 transmitter and a Codar CR70A receiver, which as you might recall doesn't have any filtering whatsoever, but we enjoyed an excellent 15 minute contact at night on 80 metres CW.

"I have to take my hat off to Tony for his above and beyond bravery. I say this because when I first got on the air in 1971, I used the very same receiver together with a homebrew 160 metre crystal control AM transmitter on 160 metres, which worked reasonably well, but as you tuned HF the bandspread reduced dramatically (see picture below), and of course there was no product detector, just a BFO, so SSB and CW detection could be quite challenging to say the least."

Rupert **G4XRV** has long supported QRP operations and the old valve technology and I am pleased show a picture of him below. He tells me "Hello Colin, I had great fun in the Valve QRP Weekend over Easter. I was operating with my 6J5/6V6 CO/PA transmitter, which I built some years ago mostly to a design by G3IBX from the June 1957 issue

of *Short Wave Magazine*, running at 5W output to a 100ft Doublet.

"This transmitter was built with junk box parts plus a mains transformer gifted from G3NKS and a scrap TW Phase II Transverter chassis gifted from G3HGE. The Receiver used was a Racal RA117 in a smart recently re-powdered coated black desktop cabinet. Keys used during the weekend were a NATO straight key and a 1938 B Deluxe McElroy Bug.

"I had 20 QSOs in total with 10 being on 80m and 10 being on 60m. 15 of these QSOs were Valve to Valve with the valved stations worked being G3NKS, GW3UEP (who was QRO with 20Watts), G3VTT, G3XIZ, G4AQS and G4GIR with each station worked several times apart from one. I looked on 40m a couple of times but there was a contest in progress so I moved back to 60m."

Another regular is Derek **G3NKS** who had an enjoyable time. Derek writes: "It was another enjoyable Valve-QRP weekend albeit a slightly disappointing one. Conditions on 80m and 60m were below par and 40m was full of contest stations whenever I listened. I thought QRP activity was a bit below par too, I didn't hear several of the regulars but perhaps like me they were involved with family gatherings over the weekend.

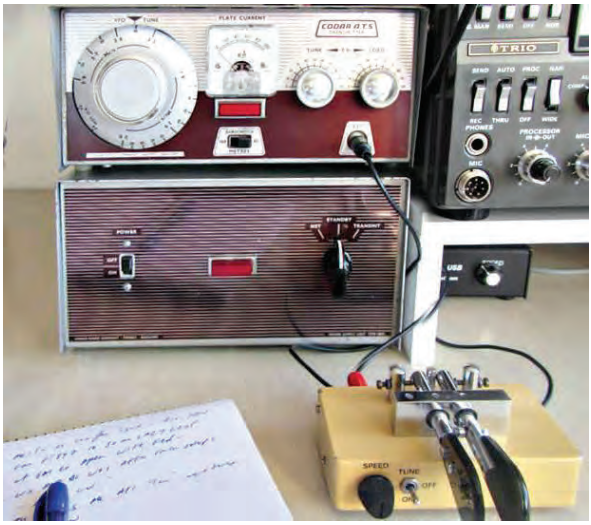
"Nevertheless it was good fun, renewing friendships and chatting. Twelve QSOs made it into my logbook, most on the Saturday. Valve TX-to-Valve TX QSOs were made with Colin G3VTT, Chris G3XIZ, Mike G4AQS, Tim G4ARI, Alan G4BLI, Ian G4GIR, Rupert G4XRV, and Rog GW3UEP. Many thanks to Colin G3VTT for promoting the event and to everyone who took part. I'm looking forward to the next one, as always'.

From **G4LFU** "Hello Colin, I saw your note on the GQRP group about logs for the recent VQRP weekend on 16/17th April and am pleased to be able to tell you that I joined in for the first time and had a lot of fun using a Codar AT5 transmitter and a Codar CR70A receiver. I was also using a W7RF keyer with a W7RF keying interface to protect the keyer from the transmitter. A photo is attached.

"I made six contacts using this set-up, all on 80m CW with GM3VMB/Peter, G3RVM/Ian, G4ARI/Tim, G4WPS/Dave, G4AQS/Michael and G4LNA/Paul. Not a bad start but the Codar CR70A hasn't got much in the way of receive filtering and it sounded like I had half the band coming through the audio at once! Manual changeover switching also presented a challenge.

"The AT5 was given to me many years ago by my friend Dave/G8KAP. I bought the

CR70A recently on eBay. It was listed as 'untested' because it had been in storage for many years so I was amazed to find that it not only works correctly, but also looks like it has just left the factory - complete with original manuals! I hope to be able to make the valve weekend in July. Regards and 73 de Tony **G4LFU**."



From Chris **G3XIZ** came, "Hello Colin, Activity was quite high even accounting for the Easter holiday and excellent weather and most of the regulars seemed to get on the air. I was using my home brewed eight valve transceiver which performed 'adequately' but there will have to be some serious mods done to it before the next valve event. As always my local QRM was the limiting factor with difficulty copying anyone much below S7.

"Even my active, remotely rotated receive loop aerial was not that much use as the QRM is now coming from multiple directions. Over this (long) Valve Weekend I managed to get 29 QSOs with 15 individual stations and 21 QSOs were valve to valve and with 12 unique valved stations including G3NKS, G3TYB, G3VTT, G4AQS, G4ARI, G4BLI, G4FKI, G4GIR, G4XRV, GW3UEP, M0FMT and ON6XB. Interestingly Xavier ON6XB was using a home-made semiconductor rig but with a 6146 valve PA.

"The QSO breakdown by band were as follows, 7 were on 160m, 14 on 80m and 8 on 60m. Looking back through the log-book I see that my first Valve activity day was in April 2012, hence 10 years ago. (blow me down – is it that long?).Over the succeeding years in these events I have totalled 481 QSOs and worked 28 other valve stations. Long may the 'GQRP Valve Days' continue. 72 / 73 Chris **G3XIZ**."

Finally another regular operator - **G4GIR**. "Unfortunately with the Bank Holiday and the marvellous weather operations were severely curtailed!! However I had a few contacts on the Friday and Monday as well. A few regulars were missed but a good time was had. I used the WS 19 MK III on 80, 60 and 40 and the Long Fella 6V6 CO/PA for use on 160m, both 4 to 5 Watts output into an Inverted L and Fan Dipoles for 60 and 40m. I managed 19 contacts with 12 unique stations including three with Tim G4ARI on 160,80 and 60m, plus a 3 way with G3XIZ and G4XRV on 80m plus a rare QSO with Cliff's GI4CZW's MK123 . Fourteen of the contacts were valve to valve. Thanks to all for the activity. 72 Ian from G4GIR."

That wraps it up for this time so make a note of the next session which is July 16th and 17th. Please send me a short email or Word document with your results or technical information on your valve equipment but I don't need logs as it's not a contest just an activity period. I am always interested in circuits or technical tips you may want to share.

g3vtt@aol.com
or : 182 Station Road Rainham Kent ME8 7PR

MEMBERS' NEWS

by Chris Page, G4BUE

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

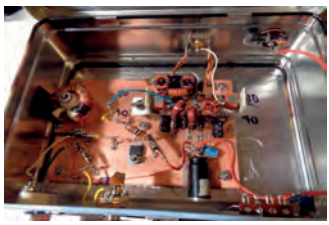
A new header picture showing my simple shack at our new QTH in Bexhill. An Elecraft K3 and P3 panadapter with Schurr Profi-2 key on the right in front of the telephone. The Elecraft BL2 balun on the end of the ladder-line from the 132ft inverted vee doublet at 30ft, with the ends bent to fit into our garden, is behind the P3, above where the ladder-line enters the shack through the external wall. I have been QRV since 22 January only using 5W CW.

Sad news on 17 May that John Birkett who ran his radio component shop at the top of the hill in Lincoln, had passed away aged 93. In addition to the shop, John attended all the major radio rallies where the majority of G-QRP Club builders bought their components. I was introduced to him by the late **G3RJV**, George being one of his best customers. More sad news that **G4VVT** has also passed away. Alan was a keen constructor and an active member of Rochdale and District Amateur Radio Society (RADARS) - *thanks* ***MØNVQ***. **MØRLO** passed away on 22 February.

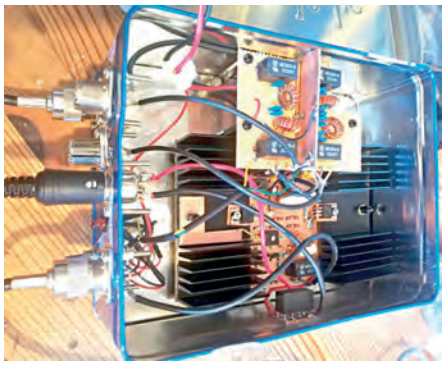
G4FBC missed the deadline for the last *SPRAT*, after sending pictures of some of his homebrew rigs. Pictured above left is a dual band 40-20m version of the Pixie that Ron made up from just junk box parts, with switched crystals and bandpass filters. Centre is a QRPp single 2N2222 transistor TX giving 65mW into a 50 ohm load. He was just about to test it but Storm Eustace brought down his **W3EDP** antenna yet again! Finally, an old LNR FX-2 QRP 40/30m tcvr that refuses to give out any TX power after being in storage for a while. Ron said it was working fine when it was last used in the field and contacting LNR was no help at all, just saying it was a long discontinued set! He is wondering if it is a software fault (two versions) and asks if anyone can help him, please <finebiz4@gmail.com>.

Not long ago, **F5NZY** sold his KX3 to club member **F3ET** who wanted a second one to operate /M. Steph has'brought out' his FT-817ND, that he hasn't used in almost 10 years, and has a 500hz Collins filter and finds, for its size (although quite heavy), the RX is not too bad. He calls it his backpack transceiver and plans to be QRV from a wooded park, close to his QRA in Normandy. He will also try VHF CW QSOs with it from a high point in Normandy facing the sea and the UK. **MØKTZ** has built a little SDR tcvr designed by **WB2CBA**, and based on an Atmel328 CPU (Arduino) for CW/SSB, although he has only used it for CW. Enzo says you can build pluggable four-band PA+LPF boards, which give between 1.5W and 3W depending on the band. Since mid-March he has made about 290 CW QRP QSOs with it using either his Lucky Loft Loop antenna, a 43ft random wire or a Norcal doublet recently installed in his loft. Best QSOs were **7X4AN**, **EA8OM**, **OY1CT**, **KP4JRS** (to win him the NAQCC 1000 Miles per Watt award) plus USA and VE stations.

K3DZ recently finished his version (right) of **VK3YE**'s two-transistor QRP TX from *SPRAT* 188 that uses a 2N3904 as the Pierce oscillator, and a two-toggle switch method of choosing either an 80m or 40m LPF. In the interest of in-



creased harmonic purity, Frank also added one more identical section to each output filter. The RFC in the oscillator circuit uses a T-130-2 core and 48t of magnet wire, for no other reason than that's what was on hand, for an RF choke. The design's matching transformer is as **VK3YE** designed it and he will attempt to redo it someday using 14 twisted turns. He says, "I constructed the TX dead bug style on a piece of unetched PCB, roughly 5.25x4 inches. Some of the design's parts mounting is assisted with 10M ¼W resistors used as stand-offs. The most difficult part of the construction was to punch or drill clean round holes through the enclosure's thin plated sheet metal, approximately 0.010 to 0.014 inch, however, the clamping effect of the through parts straightened out the sheet metal case wrinkles. Unexpectedly, the 80m tone is more 'chirpy' than the 40m tone, however, the TX has character! I'm not going to try to clean it up with a buffer to minimise startup drift and chirp. Definitely an attention getter, and for those in the know, a pleasant reprieve from the sterile 'factory made' TXs. I definitely recommend the **VK2YE** design – it is a boiler plate design and should work right out of the starting gate!".



Not QRP, but **MØRON** says his amplifier is driven from his FT-817ND at 1W. Andy used the high power linear from Walford Electronics as the base for an amp to help a little when out /P, and writes, "Tim kindly gave me some 24v relays in order to run off a 24v supply instead of 12v. The 817 controls the amp via a relay, it operates on 20, 40 and 80m giving 25-50W depending on the band selected, all fitted inside a Grandads Goodies tin. At the end of April, **M3KHZ** was 'blown away' with a contact from a holiday cottage in Trefanny Hill, Duloe in Cornwall. Paul writes, "This is about four miles inland and so no advantage of salt water ground. Early one morning I set up in the back garden, using just the AT 271 whip antenna and coil clamped to a tent peg pushed into the ground, and a single counterpoise wire just sprawled out. I started calling CQ on 14055kHz with my 5W CW and was astounded to have **VK2GR** call me back after just a matter of minutes. I know John has a great set-up, but mine was so compromised; a short <3m base loaded vertical with the base at ground level. How does that even happen? Of course it's down to good propagation, but still amazing".

Pictured right is **R2AUK**'s all HF bands QRP CW tcvr. The design is two IF superheterodyne (45MHz and 9MHz) with IF-derived AGC supporting RIT, XIT and Shift. It has a built-in 10-30WPM Elekey-B type keyer and a High SWR indicator. The PA is 5W class C based on RD15. There are five 9-pole LPFs in order to get 42+dB harmonics suppression on all bands and Alek designed a PCB based on SMD parts to fit all the components on a single board. He has used the tcvr as his primary one since January 2022 and is extremely happy with it, having made a lot of contacts, including two-way QRP (the best with **GØRGY** on 20m, using his 80/40/20/10m trap dipole. Both firmware and hardware are open-source and available on GitHub <https://github.com/afiskon/hbr-cw>. Alek writes, "I was too lazy to write a proper step-by-step build instruction, but anyone interested in building this tcvr is welcome to contact me at <r2auk@mail.ru>. This work was heavily influenced by EMRFD, and also the projects by **VU2ESE**, **VK3HN**, **G4TGJ**, **N6QW** and others".

M5AML recently sold several tcvrs and replaced them with a new FT-991A, leading to much on-air 'testing', including 10W SSB QSOs with I, EA, DL, HA, OK, YU, and 9K using his bent loft dipole. John contacted **JWØX** via QO-100 (2W) then again exactly 12 hours later on 20m (10W)! Finally on 14285kHz, he had a two-way QRP QSO with **IZ6BXV** and is

now looking forward to some summer 10m and 6m activity. **G4TGJ** completed his five-band (40, 30, 20, 17 and 15m) tcvr which he is regularly using on SOTA activations. Richard has started work on an additional TX board to add 12 and 10m. **DK1MI** has compiled a list of all the QRP tcvrs he is aware of, and added some information about them, see <http://qrz.is/qrp_trx.pdf> and <http://qrz.is/qrp_trx.ods>. Michael invites additions, errors, etc <mail@dl6mhc.de>

With high hopes for Cycle 25, **N2CQR** has finished his homebrew dual-band (17 and 12m) SSB tcvr (pictured above his 'Mythbuster' 75-20m rig, both based on Farhan's BITX architecture), and is happy a 21.472MHz IF works well for these bands. Bill's VFO uses a tuning cap from an old Hallicrafters HT-37 and he is working lots of DX with the rig. More details on <soldersmoke.blogspot.com>. **GØXAR** writes, "Those of you who learned your programming back in the days of the first home computers will be delighted to learn that there is a version of BASIC for the Raspberry Pi Pico. I've just watched this excellent video by 'Explaining Computers' which tells all <https://youtu.be/Cxmjy1nz6MM>. Whilst fans of other Pico programming languages such as C and Python may disagree, I think BASIC is perfectly adequate for many tasks and the implementation for the Pico seems particularly friendly". **G8IFF** adds, "There's also an embedded version of FORTH for the Pico".

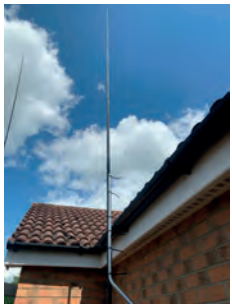
VE3IPS (above) has been QRV on 1296MHz running 2W as part of ParkBootOps. He recently did a first activation at Mary Lake Rosary Park POTA VE-5549, and has been promoting POTA for the past year with new amateurs, buying up FT-818, Xiegu G90s and FT-891s with assorted wires at the rallies for what will be a busy POTA season in the Toronto Area. John writes, "See ya'll at Dayton/Xenia on 51Mhz FM with a RF-10 at 1W. I hope to have a BuddiHex beam and Mastwerks set-up purchased at the big event". **G8NXD**'s 4m WSPR beacon is QRV again for the Es season, an RFZero signal source driving a 40w PA, but only running 5W into a dipole at 20ft AGL, transmitting once every 10 minutes 24/7, all reports welcome <mike@pencoys.org.uk>. Mike's 6m WSPR RX is also QRV, a QRPLabs RX with Progrock SI5351 LO on 10m IF, and a homebrew 6m converter. The 6m antenna is a crossed dipole 15ft AGL. He has applied for a licence to transmit WSPR and FT8 on 8m.

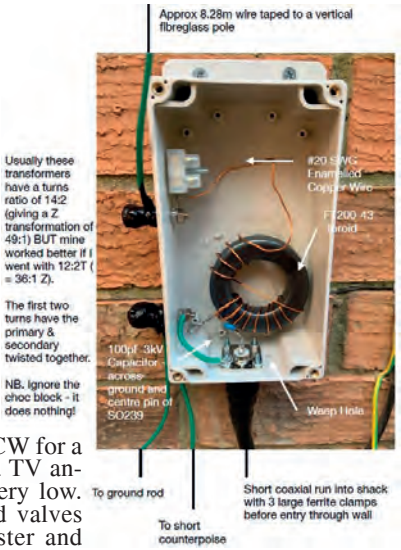
GM3YBQ is a director of the Museum of Communication in Burntisland, Fife, and sends a picture of a display of the late **GM3OXX**'s trophies and awards, which is part of the museum's 2022 celebration of 100 years of British broadcasting. The museum, which also holds all George's log books and QSL cards, is open 1100-1600 Wednesday and Saturday between early May and the end of September, and is located at 131 High Street, Burntisland,

Fife KY3 9AA. Admission is free but donations are welcome. Their web page is <www.museumofcommunication.org.uk>, email <enquiries@moft.co.uk> and telephone 01592 873099 or 01506 823424. **VK5GI** writes on 4 May, "A few weeks ago I had eye surgery and then last weekend, I underwent an unscheduled triple cardiac bypass and am feeling a bit iffy. However, I am on the mend and still enjoying playing with my HW-8! I'll be back on my feet before you know it!". Good luck to you Norm.

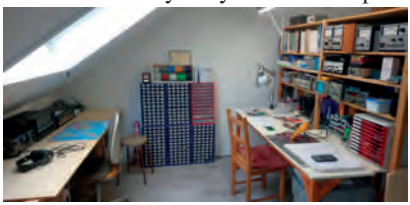
Writing on 3 March, **G1KQH** says, "It's about this time of the month we receive (if subscribed) the *Hot Iron* newsletter, which was begun by **G3PCJ** and is now produced by **GW6NGR**. **VK3YE** has just alerted me that these are all archived back to issue 1, at <https://www.w4npn.net/hot-iron-directory/>. You can subscribe by sending an email to Peter, **GW6NGR** <equieng@gmail.com>. Operating in the QRP Section of the March BERU Contest, **G3YMC** was pleased with his eight QSOs with **C56DF**, **9H6YI**, **V26K** and **9H6A** on 15m and **9H6A**, **VE3EJ**, **CJ3A** and **VK2GR** on 20m. Congratulations to **G3ROO** on being awarded the RSGB's **G4STT** Memorial Trophy for his outstanding contribution to QRP, at the RSGB AGM in April - *thanks* ***GØFUW***. **G4USI** was QRV 12/17 May as **SM/G4USI/P** from various locations on the west coast of Sweden, between Helsingborg and Gothenburg, as he cycled the 250 miles Kattegattleden trail. Daimon planned to use his QCX Mini for 30 and 20m, a homebrew 49:1 and EFHW antenna.

MØNTV reported in the last *SPRAT* he was building a SSB tcvr for 17m, a band he has hardly used before, and had to construct a resonant antenna for the band. Having a tiny garden with very limited horizontal space, Nick settled on one of his tried and trusted favourites - the end fed half wave (EFHW), based on the standard EFHW 49:1 design as popularised by Steve Andrews etc. Two QSOs (albeit QRO) with JA at the beginning of May prove the antenna is working very well. The pictures show the antenna and details of the matching transformer. You can follow the progress of Nick's homebrew tcvr on his *YouTube* channel at <https://www.youtube.com/c/M0NTVHomebrewing>. **G3XIZ** tried using 2m QRP CW for a few weeks and made a five-element beam from an old TV antenna but, apart from local stations, found activity very low. Chris says a friend asked him to check a box of old valves from a SK, so he dug out his home-made valve tester and checked about 60 valves. Quite a few had their identifying numbers rubbed off, so it was detective work to find out what types they actually were. He took the opportunity to do a few mods to the valve tester, replacing a couple of old noisy potentiometers and re-calibrating the meters and supply voltages. Chris's local top band FM net is still going strong on Tuesday evenings at 7pm on 1985kHz and says any callers or reports will be most welcome.

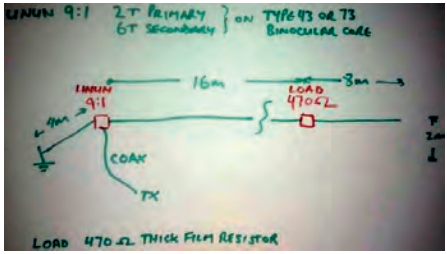




PA3COR has been working on a 40m DC RX, using two TS5A3157 SOT23-5 switches as a mixer and a discrete symmetrical amplifier as a follow-up stage. The input BPF, audio BPF filter and LF amp are done and Cor is now working on a DDS VFO. The picture shows his shack: left is the desk with RXs and right is the desk for electronics and experiments. He says the LED 'TL' has been a real winner providing plenty of 'daylight', enough to work with SMT parts without problems. The other picture is his probe storage solution, using old VHS tape enclosures to store his oscilloscope probes. A new cover is created with the most important characteristics of the probes, and when not in use they are safely stored, yet within arms reach when needed. A template for the VHS cover can be download from his website at <http://www.pa3cor.nl/electronics/scope-probe-storage/>.



G3MFJ and **GM4VKI** manned the club stand at the NARSA rally in Blackpool on 24 April where there were about 40 stands of clubs and traders. Roy says public numbers were a bit down on the last rally, however most people were treading carefully with the risk of covid possibly still about and a lot of masks were being worn. Roy and Graham will be at the Craigavon NIRSGB/G-QRP Convention in June in GI. **MØNDE** visited **G3ROO** and writes, "I stumbled over a box on the old Dover Construction Club workshop floor. It was **G3HBN**'s (SK) old Milliwatt TX and sadly it had been damaged with various wires detached and the PA section blown. I took it back to my new QTH in Stoke and, with the help of my new friends at SOTARS, the TX is now working, measuring a maximum 20mW output. The tuning on 80m is poor so we may have to switch in more capacitance". Nigel also salvaged two very nice US made capacitors and homemade coils for an Ezee Match balanced line tuner, again from our Jimmy's shack, and they will be restored next. He says it will be fun to try and make contacts this summer with kit previously owned by **G3HBN**, or as Jim called himself 'Harrow's biggest nitwit'. Because he has just had a pacemaker fitted, Nigel thinks using QRP is now an even better idea!



M3KXZ wanted a no tuner antenna he could set up in a minute or so with minimal fuss strung up between gorse bushes that make up a lot of the flora on the hills around where he is QRV /P, or tie at head height between trees in the local woods. Pete's search led him to the Bushcomm Mil-1 and he made a homebrew version of it. The antenna is fed via an unun and has a load resistor in the main antenna element. He guessed at a 9:1 unun and a 470 ohm load resistor and the sketch shows the set up. The unun is wound on a BN73-202 core with 2t primary and 6t secondary, and he installed in a small electrical gel box with Wago connectors on the outside to attach to the antenna wire. The load resistor is a 470 ohm thick film carbon resistor. With a load resistor and 5W CW into the antenna mounted less than 7ft above ground, it gives a low SWR right from 160m to 6m, which means no tuner is needed. First QSO was last October on 40m with **EI5KJ**, with the antenna in Pete's back garden, and he has since made contacts across the UK, Europe and into the US, all with 5W CW. He writes, "It has proved to be far from a dummy load and has enabled me to get set up so quickly and straight on air making fantastic contacts. I am more than happy for anyone to contact me for more details <pete.millis@gmail.com>. Using either his AmPro 20 whip on a magmount, or a mil surplus AT271 whip with **M1ECC** Slidewinder DX coil on either a tripod or a ground stake, and 5W CW from the beaches close to his Sussex QTH at early morning grey line, Paul is constantly amazed at the QSOs he makes. Recent QSOs, making the most of the salt water ground, have been with **ZL1BBW**, **VK2ARZ**, **VK2GR**, **VK5LJ**, **VK4TJ**, **VK6LC**, **VK3XU**, and an incredible two-way QSO with **VK3YE**.

GØJXX writes, "We have a group called the Worthing Radio Events Group (WREG) and although small, we do quite a lot of stuff from vintage restoration (I'm on my third AR88) to satellites and digi-stuff. I wanted to encourage more members to get up to speed on CW and build kits as a group, and we organised a 'Play Day' for which I ordered 10 kits from <pheonixkitsonline.co.uk> from an advert in *SPRAT* 190. The build went very well and Paul from Pheonix Kits provided excellent service. It was a fun day and hopefully will bring more into the CW fold and join GQRP! Some tips from **G3UGF** when installing antenna cables indoors: never drill a level hole though a wall - always drill slightly upwards to have a downward angle to the outside, this ensures water cannot seep in. Where practical, line the hole with a plastic pipe so water cannot drip into an air gap between inner and outer skins of the building. An uncut plastic cable tie around a coax with the uncut tail downwards, helps water drip off the cable before it gets indoors.

Thanks to all the contributors. Please tell me how your summer goes for the Autumn 2022 edition of *SPRAT*; what you have been building, who you have been working, and any other information about QRP, by 12 August. Also, interesting pictures please, don't be shy in letting members see what you have been building and/or where you have been operating from, your antennas, who you have been meeting, and even a shack picture to let other members know what you and your equipment look like. Let me know if you intend operating from somewhere other than your home QTH during the autumn and winter months, especially during the Winter Sports, so I can let members know to listen out for you.

UMPP

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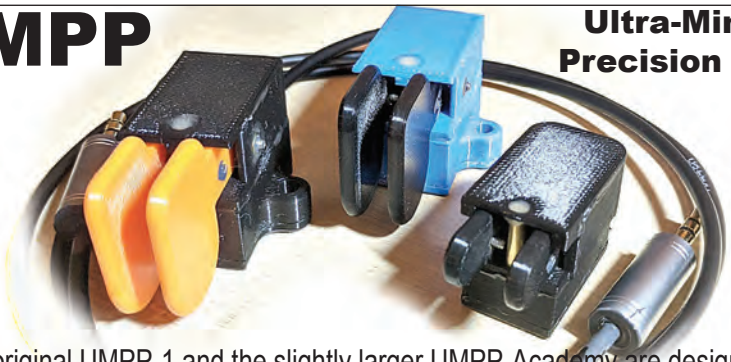

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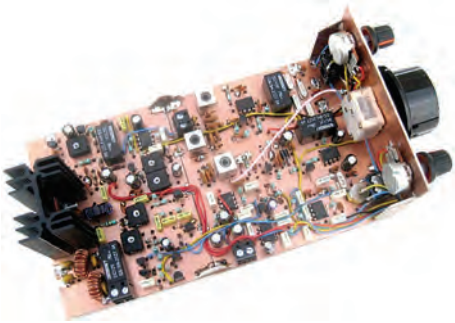

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Pad cutter - 2mm shaft: 7mm o/s, 5mm i/s diam, gives a 5mm pad with 1mm gap **£6.00** } as books

10K 10mm coils – 1u2H, 1u7L, 2u6L, 5u3L, 11u0L, 45u0L, 90u0L, 125uL – all 85p each } or DVDs

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

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

Bifilar wire – 2 strands - red & green bonded together. Solderable enamel. 3 sizes } with parts.

21SWG (0.8mm dia) – 2metres = £1; 26SWG (0.45mm dia) – 3m = 70p; 30SWG – 3m = 60p }

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

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

QRP heatsinks - TO92 – 30p; TO39/TO5 – 40p; TO18/TO72 – 80p (pics in Sprat 148) }

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

3.3, 4.7, 6.8, 10, 15, 18, 22, 33, 39, 47, 56, 100, 150, 220, 470 and 1000 - all uH, all 20p each. }

Toroid Cores – priced per pack of 5 – you may order 2 packs only if you actually need them.

I will no longer supply 2 packs of everything – order only what you need please.

T25-2 – 50p, T25-6 – 60p, T30-2 – 70p; T30-6 – 80p ; T37-2 – 80p; T37-6 – 80p; } **Postage**

T50-1 - £1.00, T50-2 – £1.40, T50-6 – £1.60; T50-7 - £1.20, T50-10 - £1.20; } **for toroids**

T68-2 - £2.20, T68-6 - £2.50, T130-6** - £2.60ea; } **includes**

FT37-43 – 90p, FT50-43 - £1.20, FT37-61 - £1.20, FT50-61 - £2.40; } **postage**

Ferrite beads – FB43-101 (3.5mm dia x 3.2mm long, 1.2mm dia hole) – 40p for 5; } **for all**

BN43-2402 - £1.50; BN43-202 - £2.40; BN43-302 - £3.40; BN61-202 - £3.40. } **small parts**

All toroids are plus postage – up to 5 packs = £1.20 (UK), £3.50 (EU), £4.50 (DX).

Each additional 5 packs, please add 50% **** Except ** item** – these are heavy and each counts as a pack

Standard MeSquares (0.25"), Little MeSquares (0.15"), MePads for DIL & MePads for SMD - £6.00 each plus post (UK & EU as parts for up to 4) : I can include up to 3 of these with small parts for no extra postage.

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 – THE G-QRP CLUB, 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.