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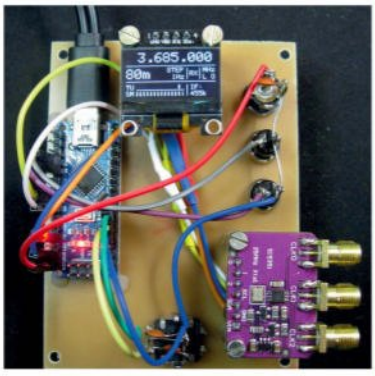

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Keylines

I've not been on the air too much in the past month but continue to enjoy participating in the CW legs of the RSGB Club Championship. It's surprising what 100W and a low dipole can achieve although I am well aware that I benefit from a good location and low noise level (although the rain static during the April event was 'challenging'!). I recall my first efforts in that contest series after moving here over four years ago. I was using a quarter-wave vertical (yes, some 66ft tall) that I had put up for DX working, but it proved anything but helpful for working around the UK and close-in Europe.

On the other hand, of course, a vertical is exactly what the doctor orders for DX chasing. I put up an elevated quarter-wave vertical for the 20m band earlier this month and was pleasantly surprised at how well it was working, with easy QSOs to the West Coast of the USA, to Australia and a quick QSO with the A80K Liberia expedition, through a big pile-up. Horses for courses!

Club news

Having been a bit thin on the ground news-wise in recent months, readers will recall that in my last month's *Keylines* I asked for more feedback on what your club had been doing of late. Whether as a result of that appeal or purely by coincidence, this month I have received lots of great news of club activities, so much so that I must apologise to those who sent news items in that I have had to be quite ruthless in which photographs we have been able to squeeze in. But the sheer variety of items, both looking back and of forthcoming events, from licence training to special event activities, is testament to a hobby that, despite the doomsayers, is clearly in good health in many parts of the country. Our *Rallies* listing is also looking up as the year moves on and summer approaches, again a good sign.

That said, **Georg Wiessala**, past editor of *RadioUser* and still a regular contributor here in *PW*, was at the NARSA rally in Blackpool in April and although he says that turnout was good, he was disappointed at the lack of amateur radio traders. Perhaps there are simply too many events for traders to attend, or perhaps the number of traders is diminishing as the years go by. Let's hope that the National Hamfest, once again happening at Newark (in September) after missing last year, will bring the various traders out in force. I certainly plan to be there and look forward as always to meeting many readers.

The George Dobbs QRP transceiver revisited

The author of this series, **Steve Hartley G0FUW**, tells me that there has been an encouraging level of interest, so much so that he has had to order a new batch of circuit boards from China. Several clubs have decided to make it a club project and, even better, a number of would-be constructors have taken out subscriptions to *PW* as a result! I'm delighted to learn that home construction is still thriving – good luck to all of you who are building this set and welcome to those of you who are new to *PW*.

PW contents

My apologies that some of the articles promised for this month have had to be held over – partly because of the welcome arrival of so much news (see above) and partly because some of the articles we do feature have run to more pages than I had anticipated. Don't worry – most if not all the 'missing' ones should appear next month. I do occasionally get letters or emails to the effect that a particular issue of *PW* didn't appeal to a particular reader – obviously the mix of articles varies from month to month but hopefully, over the course of a year, there is something for everyone.

PW 144MHz QRP contest

This month sees the annual announcement of the *PW* 144MHz QRP Contest. It's amazing that this will be the 41st running of the event and that it still proves so popular. But, there again, while *PW* readers are not necessarily big contesters, this event is very much designed with the occasional contester in mind. You can enter and have fun with a modest station and, unlike many contest organisers, we continue to accept paper entries for those who are not into computer logging. Do put this one in your diaries – it's a lot of fun.

Don Field G3XTT
Editor, *Practical Wireless* Magazine

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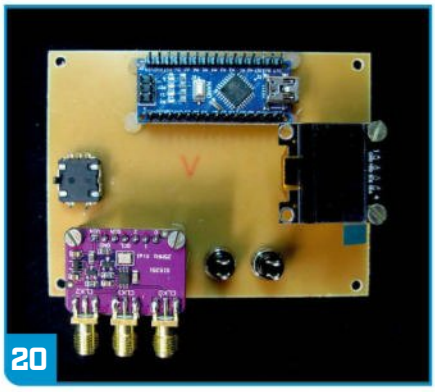

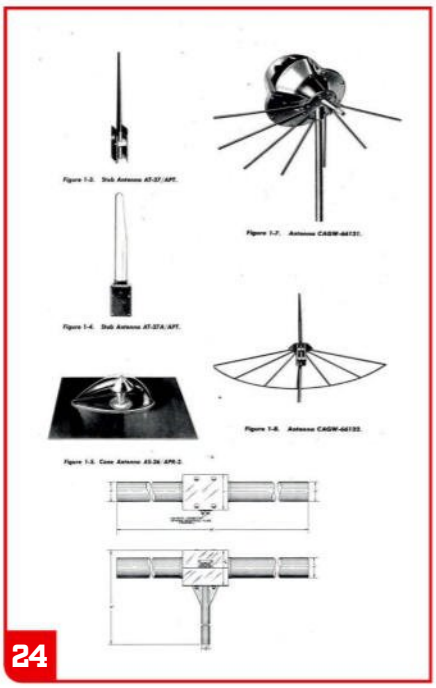

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Newsdesk

Have you got something to tell our readers about? If so, then email **practicalwireless@warnersgroup.co.uk**

QuietRadio introduce the new Aziloop dual-mode (LF/HF) antenna system

QuietRadio have launched Aziloop, a groundbreaking electronically rotatable dual-mode antenna system for LF and HF reception. Aziloop's unique Stepped-Azimuth™ technology creates an electronically rotatable receive antenna with 72 headings in K9AY mode or 36 bi-directional headings in loop mode. Primary frequency coverage is from 20kHz to 10MHz, with secondary coverage up to 30MHz. QuietRadio supply the LCU (Loop Control Unit), the CIU (Common Interface Unit) and the Windows control software. The antenna, comprising a pair of orthogonal wire loops plus a ground for K9AY mode, is sized by the user. A small footprint, low visual impact antenna usually suffices.

Key features:

- Electronically rotatable in 5° steps with a response time of just 60ms, the antenna itself remaining fixed.
- A single coax cable carries all signals to and from the antenna mounted LCU making upgrades a snip.
- Selectable 18dB preamp and 0-6-12-18dB attenuator for up to 36dB of level control to optimise sensitivity versus dynamic range in any situation.
- Four selectable 7-pole pre-selection filters to give your receiver an easier life.
- K9AY load finely adjustable from 250Ω to 950Ω in 50Ω steps.
- Windows app with intuitive, uncluttered UI, putting control where you want it – on the same screen as your SDR.
- Local control via USB, or remote control from anywhere using the built-in Ethernet server or a local PC in server mode, with a remote PC as client.
- Two spare I/O channels with optional PTT sensing receiver protection.
- Omni-Rig support for filter selection, PTT, I/O control, and Rig-Sync.

Applications include low angle DX-reception (K9AY mode) or NVIS / medium distance reception (loop mode), and basic DF work. Also, local interference reduction, thunderstorm mitigation and co-channel separation by adjusting antenna mode and azimuth. In some cases, nulls can exceed 30dB.

Aziloop is currently on offer to UK customers for £399 (list price £459) from:

www.quietradio.co.uk

Moonraker News

The Moonraker C8000 frequency counter is designed for measuring frequencies between 0.3-50MHz. The unit has 2 x SO239 connectors on the rear panel and also a very high sensitivity RCA socket for reading very weak signal frequencies. Specification: Power supply required 12-14V • Power Rated: 1-50W • Current 150mA • Frequency range 0.3-50MHz • Sensitivity better than 50mV • Size 125 x 170 x 35mm • Weight 0.86kg • Price: £99.95
More details can be found at :
https://moonrakeronline.com

EZNEC and NEC-4.2 news

EZNEC has had an update to v.7.0.3, which allows it to model wire insulation when using the NEC-5 engine, this is not a modification to NEC-5 but to EZNEC itself.
https://tinyurl.com/36y3c38k
https://www.eznec.com
Also, the Lawrence Livermore National Laboratory, who licence the NEC engines, have now made NEC-4.2 more affordable. Like NEC-5, it is now priced at $110 for a three year licence. Both NEC-4.2 and NEC-5 are available to individuals outside the USA and at the end of the three years users will be invited to re-register for free. This is being done as a way to check-in with all the users to see if they are still using the software and to keep their download site updated. The engine will still continue to work after the three year period.
Mary Holden-Sanchez, who is the Digital Assets Coordinator at LLNL, tells PW that she has been asked many times over the years about reducing the price of NEC-4.2 and is very happy that it has now finally happened. She has been determined to keep the work of Jerry Burke and his NEC legacy alive and tells us he would have been very happy to know how many NEC users LLNL now have.
A new webstore was launched this January. Purchasers of NEC no longer have to email forms, and credit card payments are now built into the system. A link will then be provided to download the NEC 4.2 files and utilities and also the earlier NEC 4.1 version too. Any questions can be emailed to softwarelicensing@llnl.gov where the email goes directly to Mary herself who will be happy to help with any questions.
NEC-4.2 can be used as an external engine to EZNEC and also 4NEC2.
https://tinyurl.com/ycxu2xaj

AWARD FOR TEX: The Don Cameron G4STT Award has been given to past *PW* Technical Editor 'Tex' Swann G1TEX at this year's RSGB AGM. Through his SPRAT work, Tex has delivered, and continues to deliver, an outstanding contribution to low power communications. Congratulations Tex!

SPAIN GAINS 8M PRIVILEGES: Amateurs in Spain have been given access to the 8m (40MHz) band for the next 18 months, joining amateurs in other countries such as South Africa, Slovenia, Lithuania, Denmark and Ireland, who also enjoy operational or propagation research privileges on the band.
In Spain, radio operators may use a maximum of 25W PEP for transmissions on 40.650 to 40.750MHz. The announcement was made by the country's Secretary of State for Telecommunications and Digital Infrastructure, which granted the permission after advocacy from the URE, the national association for radio amateurs in Spain. Amateurs in Spain may only transmit from the fixed location to which their licence is assigned and before doing so for the first time, must notify the telecommunications authorities.

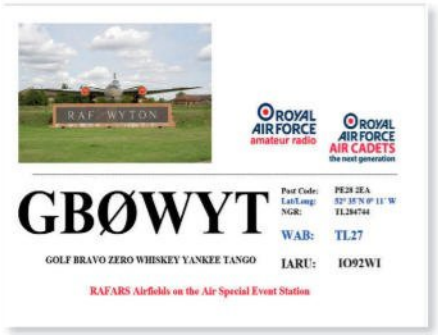
COULD YOU BE AN RCF TRUSTEE?: The Radio Communications Foundation (RCF) is a small charity dedicated to encouraging people to take up radio as a hobby, or in the case of youngsters, considering an RF-based career. The RCF is proud to sponsor Arkwright Scholars, work with the RSGB and Bletchley Park to deliver radio building workshops and to make grants for various projects around the UK. Further information is available in the RCF website:
https://commsfoundation.org/about-rcf
The RCF is now looking to recruit a couple of new Trustees to help deliver its aims. Applicants should have an interest in radio communications and be prepared to be involved in decisions over grant making, delivering RCF projects and attracting charity funding. We would particularly like to hear from anyone with links to secondary education in the UK.
Expressions of interest/applications should be sent to rcfsecretary@commsfoundation.org preferably by the end of June.

MALTBY AND DISTRICT AMATEUR RADIO SOCIETY: Alex and his dad Dave have recently joined the Maltby and District Amateur Radio Society. Just before they joined the Radio Society, the Society had been given two new handheld transceivers. It would be an excellent encouragement to give Alex one of the radios. Now he can listen to the 2m and 70cm amateur radio bands, we hope that he will so progress to study for his first Amateur Radio Licence and take the Foundation Licence Exam. We are planning the next Foundation Licence course now and look forward to starting it soon. We wish Alex every success.
Liam M7LCB wanted to move from his Amateur Radio Foundation licence to study for and pass the exam to get his Intermediate Amateur Radio Licence. He purchased the study guide for the Intermediate Licence and then booked his exam date with the RSGB ten days after the book arrived giving himself just ten days to study and learn all that would be required to pass his Intermediate exam and gain his licence.
This is no easy task, especially when you must fit studying around other daily tasks. Liam received plenty of encouragement from his friends and members of Maltby and District Amateur Radio Society.
We are all extremely pleased to announce that Liam passed his examination. Liam's new callsign is 2E0XLB. The photo shows Liam busy studying.

ROYAL SIGNALS MUSEUM STEM EDUCATION PROGRAMME: The Royal Signals Museum is able to provide Interactive STEM Activities for formal education groups; primary, secondary and colleges, plus cadets, girl guides, scouts, summer schools, youth and community organisations and home educators.
If you want to discuss your needs, please email us at adam@royalsignalsmuseum.co.uk or phone 01258 482 248.
Minimum number is ten attendees up to a maximum of 90 and advance booking is recommended. The opportunity to operate the museum's amateur station GB100RSM can be offered as part of the activities.
Our STEM programme provides a series of interactive modules which can be tailored to school's or college's specific needs. The programme includes modules on the following topics:
•The history of communications, from semaphore to cyber (presentation)
•The birth of electronic warfare (presentation)
•Heliograph, flags and semaphore (activity)
•Use of Morse code (activity)
•Building a Morse code transmitter and receiver (activity)
•Code breaking and encryption (activity)
•Use of field telephones (activity)
•Use of military communications equipment (Clansman and Bowman) (activity)
•Use of amateur radio (activity)
•Radio interception and direction finding (activity)
The Royal Signals Museum at Blandford houses the national collection of army communications equipment. It vividly depicts the story of army communications from the Napoleonic wars to the modern day cyber battlespace through a series of interactive exhibitions and displays.

GLOUCESTER OPEN DAY: Gloucester Amateur Radio & Electronics Society is having an open day for newcomers to the hobby on Saturday 29 June at its meeting place, Down Hatherley Village Hall, Down Hatherley Lane, Gloucester GL2 9QB.
What3Words:///canal.logbook.universal
Opening times are 10am to 4pm and will include demonstrations, exhibitions and live transmitting stations on HF and VHF using the callsign GX4AYM at various points throughout the day.

GB0WYT SPECIAL EVENT: Huntingdonshire Amateur Radio Society (HARS) SES Team assembled on Friday 12 April to set up the Special Event Station GB0WYT for the Annual RAFARS Airfields on the Air event at Royal Air Force Wyton, Cambridgeshire.
We still could not get access to the airfield at Wyton again this year so gained permission from the owners of Glebe Farm, which sits just West of the Wyton Main Runway 08/26. Due to operating 'outside the wire' at RAF Wyton station we were not allowed to have any Cadets attend again this year. Saturday was a good start at 8:00am for some of the Team with the calls on HF starting to come in on 40m, the rest of the team arriving by 10:00am as **David, M0SKT** had arranged a staggered start which meant the mid-morning team could take over the operating and logging from the early session operators.
By using the GB0WYT callsign on the calling frequencies on 2 and 70cms FM and SSB on our Icom IC-821H we got some good contacts throughout the event.
We operated FT8 & FT4 from a Yaesu FT-817D (5W) 'out in the field' for a change which gave us a leisurely 51 contacts on 60, 40, 20, 10 and 2m with contacts like NF3R in New York in the West, East was R4IK in Sochi, North was SM7WNM in Sweden and South CT7AMZ in Portugal. PSK Reporter showed we had been heard on the West Coast of USA (California), White Horse in Alaska, Uruguay, Finland, Magadan in East Russia and Hong Kong. We were able to successfully operate the data modes at low power under the main HF station output by carefully selecting bands which did not cause interference on receive frequency plus our setup had a HF dipole North-South underneath the main station dipole antenna which was East-West.
During the event we carried our several very successful training and coaching sessions with Club Members on how to operate the various modes while running a special event station.
David M0SKT would like to thank Dave G4ETG, David M0VTG, John M0JWS (RAFARS 4503), John G0FIK (HARS Chairman), Mervyn G4KLE, Steve G1KWF, Malcolm M0OLG, Malcolm M0KFF, Marc M0IMG, Richard M0OFF and Martin M7XMY for their time and dedication to getting the station on the air.
HARS is a friendly radio Club with a wealth of radio and cyber knowledge among its members. It has a face-to-face meeting once a month at Buckden Village Hall with a Zoom meeting also taking place once a month. Further information can be found at:
https://hunts-hams.weebly.com
We welcome new members even if you are not yet a licensed radio amateur but want to get some help and support and HARS also operates the GB3OV Repeater.



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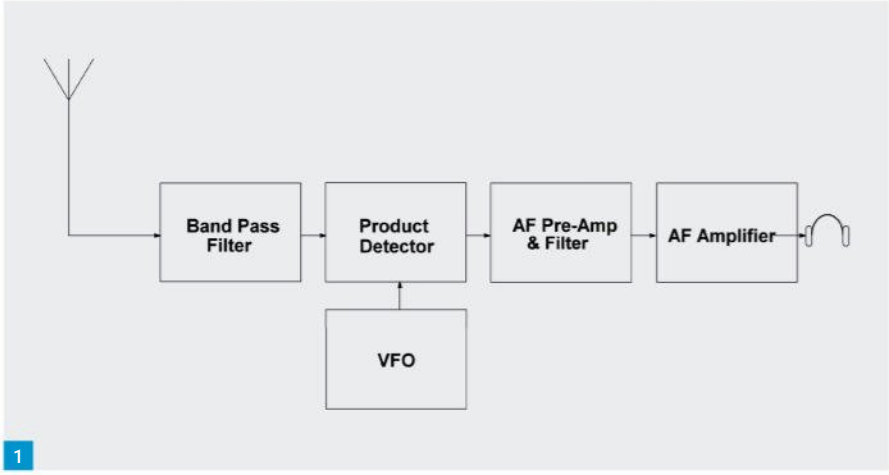


1

The G3RJV SCD QRP Transceiver Revisited (Pt III)

Steve Hartley G0FUW continues the project by describing the receiver.

Just as a quick recap, Part 1 of this series provided the basic project overview and some advice on construction methods, PCBs, etc. while Part 2 covered the construction details for the Variable Frequency Oscillator (VFO).

This part covers the receiver side of the project. Combined with the VFO, the receiver board will enable you to listen to the band while you are building the rest of the project, which is always a very satisfying experience. Morse, FT8 and SSB signals can all be demodulated.

You will find that the instructions in this series repeat component orientation warnings and testing procedures; this is deliberate. This month the main advice is in the sidebar – I recommend going through it as you complete each stage. The series has been written to be usable to those who have not built anything before, so the building and testing is very much covered, step-by-step.

Receiver circuit description

Fig. 1 shows a block diagram of the SCD receiver section, while **Fig. 2** is the circuit diagram. This is by no means a 'state of the art' or 'top of the range' receiver; the original design is at least 40 years old! However, it does work and will allow you to listen to amateur signals on a receiver made with your own fair hands.

The SCD 'revisited' receiver board includes all of the five stages from G3RJV's 'deluxe' version. These are shown in the block diagram. Let's walk through those stages following the received signal path.

The first stage the received signal hits is the **Band Pass Filter (BPF)**, which will allow the wanted signals to pass but excludes all others. The SCD uses a single tuned circuit, which is far from high performance but is perfectly adequate for a simple receiver like this. It includes a trimmer, a pre-set variable capacitor, so the circuit can be tuned to the correct frequency. The stage also includes a pair of back-to-back diodes to limit the amplitude of the RF signals, which prevents any overload or damage to the following stages. Whether these are absolutely necessary is often debated but, for the sake of a couple of very cheap diodes, it feels churlish not to include them.

The second stage is the **Product Detector**, which mixes the filtered wanted signal with the output from the VFO. Like many mixers, there will be two outputs, the sum and the difference. The difference is at audio frequency and that is the output we want. The sum is at radio frequency and is 'ignored' by the following audio stages. The original SCD used a dual-gate MOSFET device, the 40673, but these have become quite hard to find and when you do find them, they are very expensive. The solution is to use two single-gate FETs configured to carry out the dual-gate function. This works just as well and the FETs are still readily available at 'pocket money' prices.

The first of three audio stages is a very simple **audio frequency (AF) amplifier** that lifts the signal level to a reasonable level to apply to the following stage. It comprises a single 2N3904 transistor in common emitter mode. Because there are more audio stages this kind of stage is often referred to as an '**AF Pre-Amp**'.

The second audio stage is an active **AF Filter** that is designed to make the most of the Morse code and attenuate the very low and very high frequencies. The filtering selectivity comes from the resistors and capacitors that are connected to an operational amplifier integrated circuit. The uA741 is a very common and cheap device but works really well in circuits like this. This stage feeds the AF Gain (volume) control.

The final **AF Amplifier** stage is another common circuit that has been used for many years. The LM380 integrated circuit is used to power a speaker, or headphones and will deliver lots of output. The IC has a reputation of going into oscillation, losing output and overheating. I have seen this happen in other projects but the test builds did not show any signs of bad behaviour.

Building instructions

The parts list is at **Table 1**. Most parts are available from G-QRP Club Sales. Non-members should be able to purchase from the likes of Rapid Electronics, CPC Farnell, Bowood Electronics, JAB electronics and/or Spectrum Communications.

The 2N3819 FETs can be replaced by the J310 but check pin configuration. You can do that by obtaining the datasheet for the device you plan to use. Most component suppliers will provide the appropriate datasheet or you can use one of the free online datasheet libraries such as:

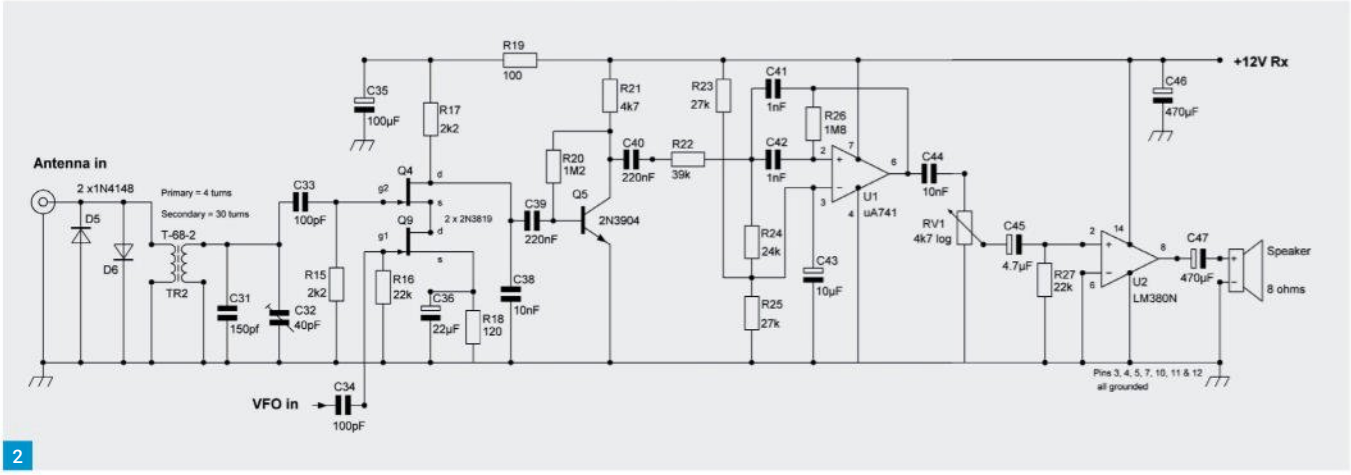
www.datasheetcatalog.com

Band specific parts chart

The only band specific parts on the receiver board are those that form the BPF, the transformer TR2 and the fixed capacitor C31. For reasons I do not fully understand, the correct calculated values do not work. The values in **Table 2** have been tried on at least two examples and they do work. The primary windings are made from hook-up wire and the secondary (tuned) uses 24swg enamelled copper wire.

Let's melt some solder!

As I said in part 2, I am a great advocate of building a bit and testing it before building some more. That way you can narrow down any issues to the section you built since the last successful test. This board is an excellent example of using that technique.



2

Initial Current Testing

After each stage it is worth taking a break and then coming back to cast an eye over the parts to make sure they are in the right places, and to check the soldering for any leads you may have missed, or any unintended solder bridges. If all is well, move on to the testing.

Testing

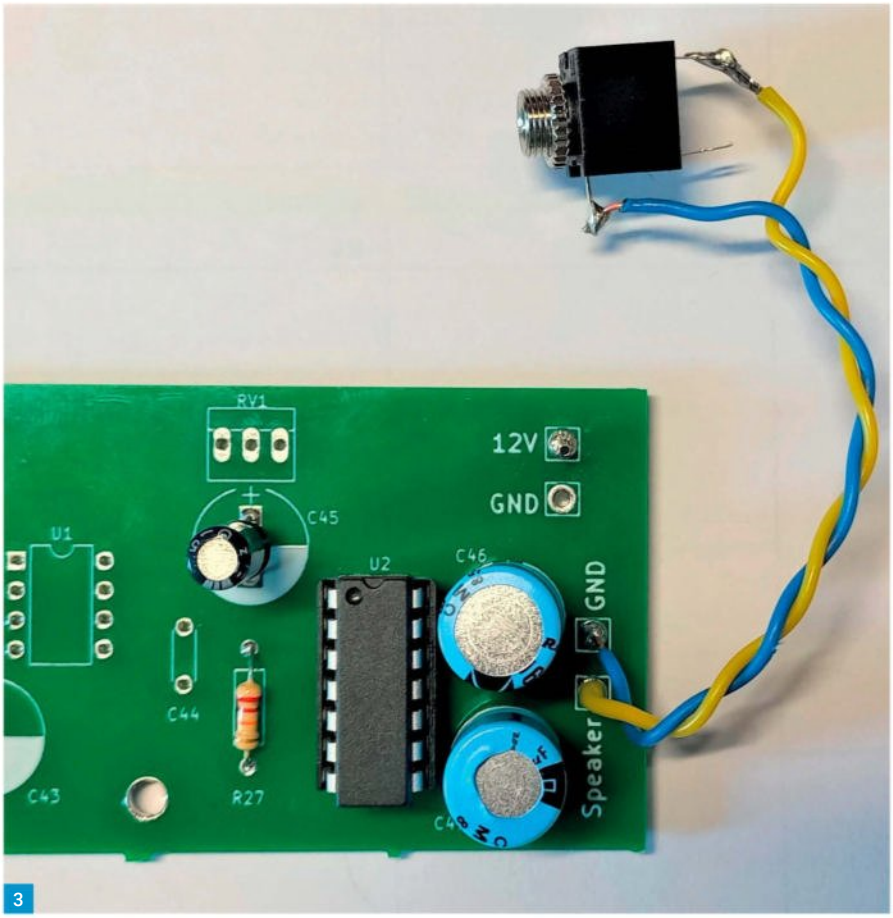
After building each stage, connect a temporary lead between the ground of the PCB to the negative terminal of your battery or power supply; you may still have the lead connected from the previous stage. If not, replace it.

Set your multimeter to the highest DC Amps range (typically, 5 or 10A). Most meters require you to change the red lead over to a separate socket for high Amps. Now connect the red lead to the positive terminal of your battery or power supply and the black lead to the V+ point on the PCB.

If you get a reading more than 0.1A, you probably have a solder bridge or a faulty component. Stop and re-check your soldering before continuing.

Assuming your reading is in the mA range, you can drop to a lower range (typically 200mA) and check the exact value. Remember, you will most likely need to swap your test meter leads back to the mA socket again.

Fig. 1: Block diagram of the SCD receiver section. Fig. 2: Receiver circuit diagram
Fig. 3: The completed Receiver AF Amp.



3

Receiver building is best done by working back from the speaker, that way you can actually hear your progress, which is very reassuring. In this case we build the LM380 AF amplifier, then the uA741 filter, then the audio preamplifier before adding the two-FET product detector and bandpass filter.

Work your way through the parts list and tick them off as you go. It is worth pausing after each stage, to compare your board with the photo of the finished board and correct any misplaced parts before moving on.

I cannot stress enough the need to check, check and check again, that you have the right part in the right place before you solder it; it is so much easier to make changes before soldering!

A wee reminder that all parts should sit on, or just above the surface of the printed circuit board.

Parts List:	QTY	Part Numbers
Resistors (0.25W)		
100Ω	1	R19
120Ω	1	R18
4.7kΩ, sometimes shown as 4k7	1	R21
2.2kΩ, sometimes shown as 2k2	2	R15, R17
4.7kΩ, Log potentiometer sometimes shown as 4k7	1	RV1
22kΩ	2	R16, R27
24kΩ	1	R24
27kΩ	2	R23, R25
39kΩ	1	R22
1.2MΩ, sometimes shown as 1M2	1	R20
1.8MΩ sometimes shown as 1M8	1	R26
Capacitors		
60pF or 40pF Pre-set Trimmer	1	C32
100pF	2	C33, C34
150pF (*see band specific parts)	1	C31
1nF	2	C41, C42
10nF	2	C38, C44
220nF	2	C39, C40
4.7µF 25V electrolytic	1	C45
10µF 25V electrolytic	1	C43
22µF 25V electrolytic	1	C36
100µF 25V electrolytic	1	C35
470µF 25V electrolytic	2	C46, C47
Semi-conductors		
2N3819 FET	2	Q4, Q9
1N4148 diode	2	D5, D6
2N3904 NPN	1	Q5
uA741 IC	1	U1
LM380 IC	1	U2
Miscellaneous		
14 pin IC socket	1	
8 pin IC socket	1	
PCB	1	
T-68-2 Toroidal Coil Former (*see band specific parts)	1	TR2
24 swg enamelled copper wire	50cm	
Hook-up wire (3 different colours, e.g. red, black, yellow)	20-30cm each	TR2, RV1 & Speaker/ Headphone socket
Knob for AF Gain control	1	
8 Ω speaker	1	
3.5mm speaker/headphone socket	1	

Table 1: Components List.

Component & Value	Notes	Done
14 pin IC socket	If using IC sockets - note orientation; U-shape notch between pins 1 and 14	
R27 22kΩ		
C45 4.7µF	Electrolytic - note orientation; usually a stripe on same side as negative lead	
C46 470µF	Electrolytic - note orientation; usually a stripe on same side as negative lead	
C47 470µF	Electrolytic - note orientation; usually a stripe on same side as negative lead	
U2 LM380	Note orientation; dot against pin 1 and/or U-shape notch between pins 1 and 14	
3.5mm speaker/headphone socket	Or direct wire to an 8Ω speaker	
Check against photo before carrying on		

Table 3: Check list for audio amplifier build.

Operation / Test	Expected Result
(Assuming 13.8V DC supply)	DONE
LM380 pin 1	6.9V
LM380 pin 2	0V – buzz in speaker when touching
LM380 pin 8	6.9V
LM380 pin 14	13.8V
LM380 all other pins	0V

Table 4: Checking the voltages of the audio amplifier board.

Component & Value	Notes	Done
8 pin IC socket	If using IC sockets - note orientation; U-shape notch between pins 1 and 8	
R22 39kΩ	Orange, White, Orange	
R23 27kΩ	Mounted vertically	
R24 24kΩ	Mounted vertically	
R25 27kΩ	Mounted vertically	
R26 1.8MΩ		
C40 220nF	May be marked 0.22uF	
C41 1nF	May be marked 0.001uF	
C42 1nF	May be marked 0.001uF	
C43 10µF	Electrolytic - note orientation; usually a stripe on same side as negative lead	
C44 10nF	May be marked 0.01uF	
U1 uA741	Note orientation; dot against pin 1 and/or U-shape notch between pins 1 and 14	
Check against photo before carrying on		

Table 5: Component checklist for audio filter.

Part	3.5MHz	5MHz	7MHz	10MHz	14MHz
TR2	4 + 30 turns T-68-2	4+30 turns T-68-2	4 + 30 turns T-68-2	3 + 21 turns	
T-50-6	3 + 19 turns T-50-6				
C31	330pF	150pF	56pF	120pF	47pF

Table 2: Band specific parts.

Audio amplifier

Table 3 is a checklist for building the audio amplifier while **Fig. 3** shows the completed board. At this stage it is worth taking a break and then coming back to cast an eye over the parts to make sure they are in the right places, and to check the soldering for any leads you may have missed, or any unintended solder bridges. If all is well, move on to the testing.

Testing

Carry out the initial current tests using the instructions in the sidebar. The current at this stage should be in the region of 10-20mA and almost zero noise out of the speaker.'

Touching a finger, or a screwdriver blade on the centre input pad for RV1 on the PCB should see the current rising to 40-60mA accompanied by a reassuring buzz in the speaker.

Fig. 4: AF Amp with optional Zobel network.
Fig. 5: Audio filter assembled.

If all is well, switch off the power supply, or disconnect the battery, replace the meter with another supply lead and prepare to measure some voltages. To prevent confusion, I would recommend sticking to the 'red is positive, black is negative' convention.

Now set your meter to read at least 13V DC (typically a 20V max range).

Switch on the power supply and connect the black meter lead to ground by touching it against where the black negative power lead is attached to the PCB.

Now touch the red meter lead on each of the LM380 pins, taking care not to short out two or more; it is best to put the tip of the probe on the pin where it meets the body of the IC.

Knowing the voltages are correct is always very reassuring. If the results are very different to those shown in **Table 4** (more than 10%), it is worth re-checking all the parts are the correct values and in the right places and that there are no solder bridges or unsoldered joints.

Assuming the voltages are correct, disconnect power and add the AF gain pot (RV1, 4.7kΩ log). Using three lengths of different coloured hook-up wire, twisted together to link the AF gain pot and the PCB saves confusing which is which.

Reconnect the DC power and put your finger or screwdriver blade on the top contact of the AF gain potentiometer (pot).

Check that turning the AF gain pot increases/decreases the volume of the buzzing. If you find it decreases as you turn it clockwise, you have the input and output wires connected the wrong way round; simply switch them around.

Note: *If you do experience oscillation problems (causing high current and/or strange noises in the speaker/headphones), the solution is very simple; a filter circuit known as a Zobel network is added between the output and ground. It is just a 2.2Ω resistor and a 100nF capacitor (see **Fig. 4**) in series between pin 8 of the LM380 and ground. Probably best fitted on the underside of the PCB. It is very simple but it can prevent much grief.*

When all is well, add the audio filter stage…

Audio filter construction and testing

A component checklist for the audio filter appears at **Table 5** and a photo of the completed filter at **Fig. 5**. Please see the sidebar, following the instructions given, before reading further.

With your test meter set in the 200mA range, the current should be in the region of 10-20mA and almost zero noise in the speaker.

Switch on the power supply and connect the black meter lead to ground by touching it against where the black negative power lead is attached to the PCB.

Now touch the red meter lead on each of the uA741 pins, taking care not to short out two or more; it is best to put the tip of the probe on the pin where it meets the body of the IC.

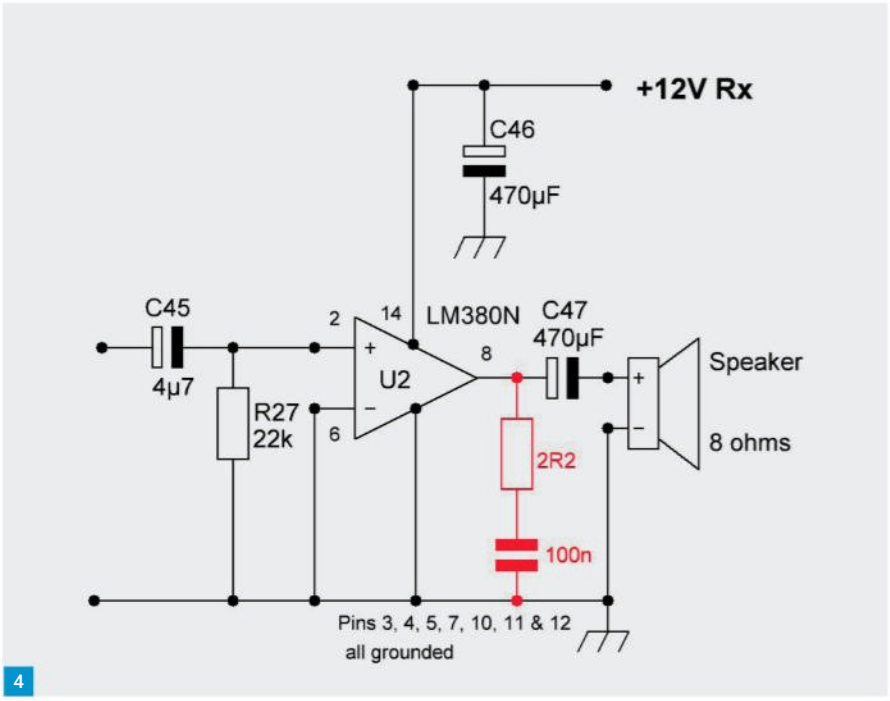
A set of expected test results appears as **Table 6**.

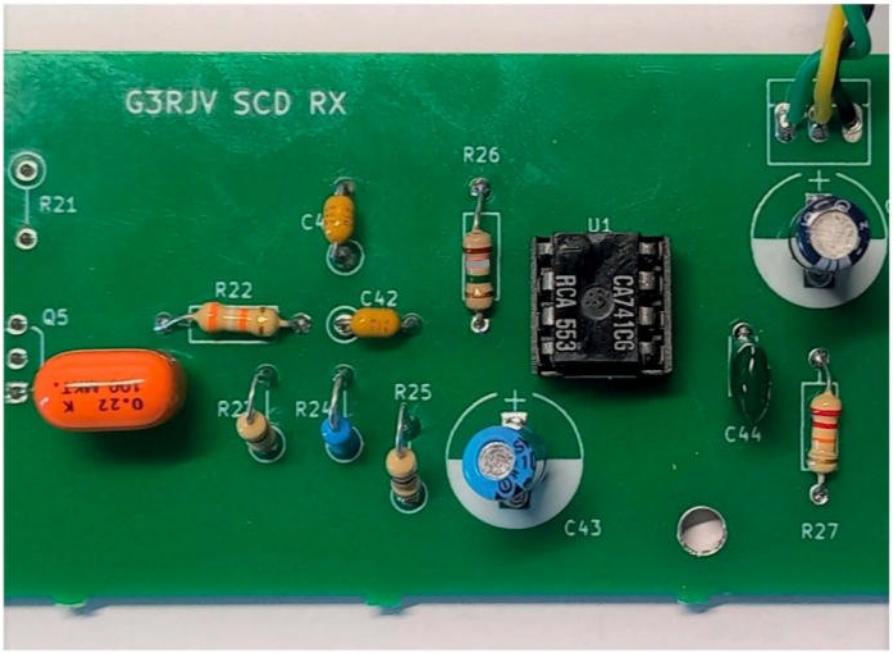
Again, knowing the voltages are correct is reassuring. If the results are very different to the above (more than 10%), it is worth re-checking all the parts are the correct values and in the right places and that there are no solder bridges or unsoldered joints.

Assuming the voltages *are* correct, put a finger or screwdriver blade on the unconnected end of C40. The volume of the buzzing should have increased, but with a narrower, filtered, sound.

Feedback? *On some of the beta builds we experienced some feedback when the AF gain pot was set to maximum. The fix is to increase the value of R22; 100kΩ seemed to do the trick when there was an issue. Other constructors have used a 150kΩ pre-set resistor to allow the level to be fine-tuned.*

If all is well, add the audio pre-amp stage…





Audio preamplifier

A component checklist for the audio preamplifier appears at **Table 7** and a photo of the completed preamplifier at **Fig. 6**. Please see the sidebar, following the instructions given, before reading further. With your test meter set in the 200mA range, the reading should be in the region of 20-50mA. There may be a little more noise in the speaker now.

Switch on the power supply and connect the black meter lead to ground by touching it against where the black negative power lead is attached to the PCB.

Now touch the red meter lead on each of the transistor pins, taking care not to short out two or more.

Table 8 shows the expected voltage readings for the audio preamplifier stage.

As noted above, knowing the voltages are correct is always reassuring. If the results are very different to the above (more than 10%) it is worth re-checking all the parts are the correct values and in the right places and that there are no solder bridges or unsoldered joints.

Assuming the voltages are correct, put a finger or screwdriver blade on the unconnected end of C39. The volume of the buzzing should have increased further, still with the narrow, filtered, sound.

If all is well, add the Product Detector stage…

'Dual Gate' FET product detector

A component checklist for this stage appears at **Table 9** while **Fig. 7** shows the assembled product detector. Please see the sidebar, following the instructions given, before reading further. With your test meter set in the 200mA range, the reading should be in the region of 20-50mA. There may once again be a little more noise in the speaker.

Switch on the power supply and connect the black meter lead to ground by touching it against where the black negative power lead is attached to the PCB.

Now touch the red meter lead on each of the FET pins, taking care not to short out two or more.

Expected test results are shown in **Table 10**.

As you should now be very aware, knowing the voltages are correct is always very reassuring. Once again, if the results are very different to the above (more than 10%), it is worth re-checking all the parts are the correct values and in the right places and that there are no solder bridges or unsoldered joints.

If all is well, add the Bandpass Filter stage…

Bandpass Filter

A component checklist for this stage appears at **Table 11** while **Fig. 8** shows the assembled bandpass filter.

Add the bandpass filter and protection diodes. Note that the diodes are fitted in opposite orientation to each other. It is also worth noting that this stage has some band specific parts, which replace the 60m values shown on the circuit diagram if you are building your SCD for a different band (see Band Specific Parts, Table 2).

If you have never wound a toroidal coil before, read on. Each time you pass the wire through the centre of the toroid it counts as one turn. It can be a little fiddly at first so you might like to do a practice run with some hook-up wire.

Hold the toroid between your finger and thumb. Pass the wire through the centre and grip it, with the toroid between your finger and thumb. Now bring the other end of the wire back around and thread it through the centre for a second time. Pull the wire tight and repeat that same action until you have the correct number of turns on the toroid. Don't allow the turns to overlap; they should sit neatly next to each other.

Once you are happy with the technique, use the 24swg enamelled copper wire to make the secondary winding. Space out the turns so they cover about three quarters of the toroid (see photo, Fig. 8).

The primary winding is a repeat but with the winding over the secondary winding and using some solid core hook-up wire (again, see photo).

Completed receiver testing

Assuming you made the VFO in Part 2, you can now couple up the VFO to the receiver board and see if you can hear any signals. A short length of miniature coax, or a pair of hook-up wires twisted together will do the job.

Powering up both modules will allow you to peak the front end with the little purple trimmer C32 and the receiver should be working.

What can you expect to hear?

This version of the SCD is intended for the 5MHz band. Just about the easiest signals to use as a 5MHz receiver test are the VOLMET weather stations on 5.450MHz (West Drayton) and 5.505MHz (Shannon). You may need to retune your VFO to get that coverage but it is worth it to see what you can hear. Both stations allow you to know there is some propagation at play.

Tuning around 5.262MHz may allow you to hear some low power (QRP) Morse code stations or there may be some voice (USB) signals around 5.365MHz. Remember that the UK primary user on the band is the Military, so don't be surprised if you hear non-amateur signals on the band. Check out the RSGB website for the full bandplan:

https://tinyurl.com/4vz7ksxc

Clearly, if you have decided to build your SCD for a different band, you will need to refer to the appropriate band plan to find the various signals.

What next?

The next part of the project will be along soon and will cover the changeover and sidetone board so you can prepare it for when the transmitter board is completed. **PW**

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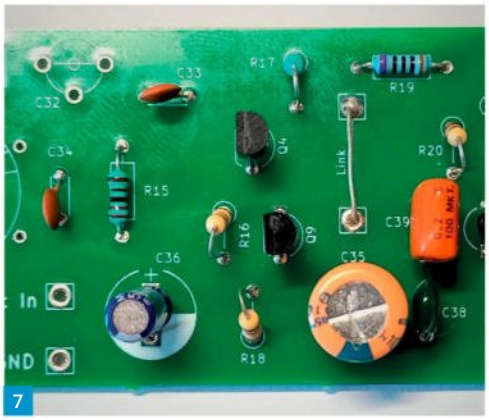

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Fig. 6: The audio preamplifier assembled.
Fig. 7: The product detector assembled.
Fig. 8: The bandpass filter assembled.

Operation / Test	Expected Result
(Assuming 13.8V DC supply)	DONE
uA741 pin 1	0.01V faint buzz
uA741 pin 2	6.8V louder buzz
uA741 pin 3	6.8V
uA741 pin 4	0V
uA741 pin 5	0.01V faint buzz
uA741 pin 6	6.8V very faint buzz
uA741 pin 7	13.8V
uA741 pin 8	0.01V

Table 6: Expected test results for audio filter board.

Component & Value	Notes	Done
R15 2.2kΩ		
R16 22kΩ	Mount vertically	
R17 2.2kΩ	Mount vertically	
R18 120Ω	Mount vertically	
R19 100Ω		
Wire Link	The original C35 was a long axial type electrolytic. The wire link is used if you have a radial type.	
C33 100pF		
C34 100pF		
C35 100µF	Electrolytic - note orientation; usually a stripe on same side as negative lead	
C36 22µF	Electrolytic - note orientation; usually a stripe on same side as negative lead	
C38 10nF	May be marked 0.01uF	
Q4 2N3819	Note orientation; different transistors, even of the same type can have different pin configurations. Check the datasheet from your supplier.	
Q9 2N3819	Note orientation; different transistors, even of the same type can have different pin configurations. Check the datasheet from your supplier.	
Check against photo before carrying on		

Table 9: Component checklist for the FET product detector.

Component & Value	Notes	Done
R20 1.2MΩ	Mount vertically	
R21 4.7kΩ	Mount vertically	
C39 220nF	May be marked 0.22uF	
Q5 2N3904	Note orientation; different transistors, even of the same type can have different pin configurations. Check the datasheet from your supplier.	
Check against photo before carrying on		

Table 7: Component checklist for the audio preamplifier.

Operation / Test	Expected Result	
(Assuming 13.8V DC supply)	DONE	
Q5 collector	8.0V	
Q5 base	0.7V – buzz in speaker	
Q5 emitter	0V	

Table 8: Expected test results for the audio preamplifier board.

Operation / Test	Expected Result
(Assuming 13.8V DC supply)	DONE
Q4 Drain	2.8V
Q4 Gate	0V – faint buzz in speaker
Q4 Source / Q9 Drain	1.4V
Q9 Gate	0V – louder buzz in speaker
Q9 Source	0.5V

Table 10: Expected test results for the product detector.

Component & Value	Notes	Done
C31 150pF		
C32 40pF trimmer	Purple trimmer (60pF is a yellow trimmer)	
D5 1N4148	Note orientation; the diode has a black band at the cathode end of the body	
D6 1N4148	Note orientation; the diode has a black band at the cathode end of the body	
TR2 T-68-2	4 turns primary, 30 turns secondary	
Check against photo before carrying on		

Table 11: Component checklist for the bandpass filter.

News

BE PART OF THE WW2 D-DAY 80TH ANNIVERSARY CELEBRATIONS: In 1944 the US Air Force (USAF) 438th Troop Carrier Group were based at RAF Greenham Common Airbase, near Newbury, Berkshire. This would be critical in transporting men of the US Army 101st and 82nd Airborne Divisions in the build up to D-Day in June 1944. The airbase had over 400 of the Waco CG-4A gliders, along with their Douglas C46 & C47 towing aircraft, which were used to carry troops, jeeps and munitions for the D-Day operation.

6 June 2024 marks the 80th anniversary of D-Day and the recently restored air traffic control tower at Greenham is being recognised as an important part of the WW2 commemoration in West Berkshire. To make a contribution to this very important time in WW2, the Newbury and District Amateur Radio Society (NADARS) will be using a very special callsign at our permanent HF radio station at the Control Tower.

Earlier this year, Phill Morris G6EES submitted a detailed proposal to Ofcom requesting that we be issued with the unique callsign GB80DDAY (80th D-Day). This is unique because GB special event callsigns are usually only a single number and two or three letters. After requests for more information, Ofcom granted us the NoV.

Using the callsign GB80DDAY, and the explanations we will give on-air and to visitors to the Control Tower, will help recognise the troops of all nations involved in D-Day and the many who did not return. It is expected to generate a lot of interest both on-air and in the TV & press.

You are invited to take part, on-air, in the 80th anniversary of D-Day and make contact with GB80DDAY. The callsign will be active from 1 to 28 June, and in addition to operating the HF station remotely from home during the weekdays and evenings, we will be active at the Control Tower each Saturday morning in June. We will also have a special focus of our operation at the Control Tower on Thursday 6 June (D-Day) when there will be a number of other activities, organised by both the tower's team of volunteers and other organisations.

www.nadars.org.uk

FORMER COLLIERY SITES ON THE AIR DAY: Back again this Former Colliery Sites on the Air, started in 2012 by Paul M0PJA and Denis M0USV, was designed to encourage radio amateurs to go out and use the 2m band.

In England, Scotland and Wales, coalfields occur in rocks aged from the Carboniferous age, some of these coalfields extend under the North Sea. The UK coalfields are associated with the following areas: Northumberland and Durham, North and South Wales, Yorkshire, the Scottish Central Belt, Lancashire, Cumbria, the East, and West Midlands and Kent. This year's event takes place on Wednesday 19 June from 18:00 to 21:00 BST. For full details please see:

https://fcsota.org.uk

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Georg Wiessala
wiessala@hotmail.com

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Twice the Fun: The SDRplay RSP1B and the Stampfl STRESSLESS

Georg Wiessala gets his hands on two interesting but very different receivers.

The SDRplay RSP1B

UK firm SDRplay has a dedicated following among many radio enthusiasts, citizen scientists, students and DXers, especially those new to SDR. The firm is very active at radio shows on both sides of the Atlantic and is known to engage actively with customers, listeners and developers.

For many hobbyists and professionals, the main advantage of the SDRplay 'black-box' SDR receivers and proprietary software programs that come with them (SDRuno & SDRconnect) is their adaptability, openness to development and third-party applications, plus their useability with a growing range of different computer platforms and architectures. At the time of writing, for example, for those interested in receiving Trunked Radio, the SDRtrunk program was working with the new RSP1B unit.

https://tinyurl.com/mpkvam6h
https://github.com/DSheirer/sdrtrunk/wiki

The SDRplay range offers 1kHz to 2GHz coverage and comes in an affordable mid-price bracket. Most SDRplay models have been reviewed over the years by a selection of radio magazines, including this one (also The Spectrum Monitor (TSM), October 2018; February 2020). A more recent review of the new RSP1B by 'Tech Minds' has been shared on the SDRplay website, and there is a video by SDRplay (**Jon Hudson**), which briefly compares the new RSP1B to the RSP1A, using SDRconnect and concentrates on noise performance on LF. Other tests have focused on the Non-Directional Beacon (NDB) band – with *prima facie* impressive results. Some of the reviews on the SDRplay Facebook Group or SWLing Post are also worth checking out (e.g. **T. Berner**).

Comparison-video:
www.youtube.com/watch?v=8OLHFAwBnDA
SDRplay:
www.sdrplay.com/reviews
SWLing Post:
http://tinyurl.com/4ws3rrs5
Tech Minds:
www.sdrplay.com/reviews

The new kid on the SDRplay block is the 14-bit RSP1B, **Fig. 1**; see also TSM, March 2024. This newcomer is billed as the successor to the RSP1A, which has become a popular starter-level receiver for many. In its promotional literature, SDRplay claim that the RSP1B represents a significant enhancement over its predecessor. First of all, it is enclosed in metal, not plastic. This boosts its green credentials, RF shielding and physical stability. Nice to see that SDRplay have been listening to customer comments.

Moreover, the RSP1B is said to offer better filtering and noise floor management in specified areas (<1MHz, and in the 3-5-5, 50-60, and 250-320MHz sections). Like the other SDRplay types, the RSP1B receives, monitors and records 10MHz of spectrum at a time. The makers further promise superior signal handling at HF frequencies. This was the main reason why I was keen to test one, together with the proclaimed LF advantages. The RSP1B weighs in at 315g and measures 98 x 94 x 35mm. There are two external connectors: a single 50Ω RF connector (SMA-type) and a USB 2.0 (high-speed) type B socket.

The RSP1B can be operated with either SDRuno or the brand-new SDRconnect software (See: *Practical Wireless*, February 2024: 47-49). The precise technical specifications of the SDRplay RSP1B can be found at the URL below, and there is a product leaflet to download (January 2024, V.1.0).

The latter will give you a great idea of what an SDR like this can be used for. Spoiler alert: it is much more than just broadcast or utility radio. In this context, SDRplay's engagement with education deserves particular mention. There is also a handy comparison table, situating the RSP1B among the other SDRplay units.

Technical details:
https://tinyurl.com/z6r2f9er
Comparison Table:
http://tinyurl.com/33j6rhze

Setup and operation

In common with all the previous SDRplay receivers, the RSP1B is easy to install and ready in no time at all. Follow the instructions on the SDRplay website if you are new to this and plug in the USB cable, *but only when you are told to*. I used a professional (receive-only) Standing Wave Barrier for 0.15-30MHz with the RSP1B: the MWS-1 made by Heinz Stampfl in Switzerland (see below). A device such as the MWS-1, or the GI1000 from Bonito, can improve reception with any SDR, by precluding any current flow problems with active aerials. I used my Wellbrook LN1530 for this test. However, a simple long wire aerial, with or without a Balun, should be more than adequate in most cases.

In my tests, the RSP1B performed above average in all areas, from LF to VHF. I found that SDRplay's own YouTube video, comparing the RSP1A to the RSP1B, is an accurate reflection of this radio's performance.

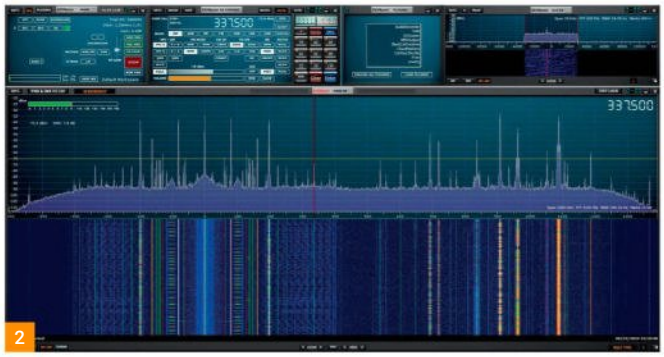
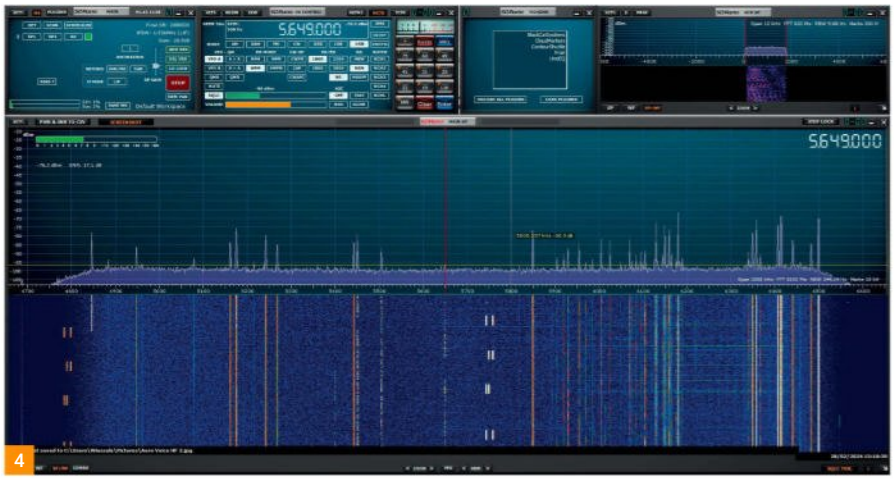
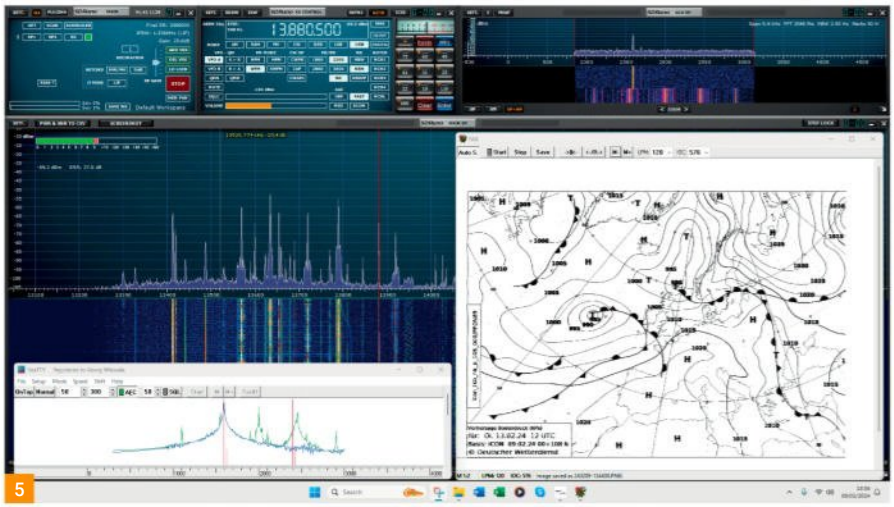


Fig.1: The new SDRplay RSP1B Software-Defined Receiver. Fig. 2: A screenshot of the Beacon Band by day. Fig. 3: A screen grab from LF time signals to the Medium Wave broadcast band. Fig. 4: Aeronautical HF Voice from Shanwick at 5690kHz USB, and surrounding areas. Fig. 5: A Weather Fax from Pinneberg, Germany, on 13880kHz USB (with SeaTTY).





On daytime LW, I had no difficulty in resolving Polskie Radio on 225kHz, and on the Beacon Band (below MW, **Fig. 2**) I detected a number of beacons, both during the day and in the evening, which were wholly new to me. This performance accords, as far as I can tell, with several reviews of the RSP1B currently out there. Conclusion: the RSP1B really is more sensitive in this sector, from time signals to MW, **Fig. 3**, and beyond.

Surfing Short Wave (SW) too, yielded some excellent results, both for utility stations (e.g. Aero HF on 10.051 USB, **Fig. 4**) and for international HF broadcasting stations. There is nothing at all to moan about here, certainly not if you keep in mind that this, after all, is an entry-level SDR. My RSPdx and RSPduo did not, on many occasions, bring in very much more, to be honest. On the amateur bands, much activity was evident in the evenings with good channel separation and clear audio resolution of the voices.

Fax, **Fig. 5**, and RTTY signal reception went without a hitch with the RSP1B. I chose Deutscher Wetterdienst (DWD, German Weather Service), my go-to WEFAX provider. The signal came in strongly during daytime on the 13,882.5kHz frequency (13880.5 USB). I employed external software, such as SeaTTY and Zorns Lemma (11.42) but you can also make use of the Black Cat Fax Decoder, which is one of the SDRplay plugins here.

Conclusions: a new gateway to SDR

I found the new RSP1B to be much more than a re-purposed version of the RSP1A in new clothes. In my view, this receiver is significantly superior to the RSP1A in almost all areas I tested. This new contender on the SDR block can be very warmly recommended. It represents a good choice for the SDR novice, as well as the budget-conscious radio enthusiast or DXer in the SDR field.

The receiver is available to purchase (online) from SDRplay or authorised resellers; it is expected to retail at ca. £106 (excl. tax/ shipping). A list of SDRplay's authorised resellers can be found at: **www.sdrplay.com/distributors**

My thanks, are due, once again to Jon Hudson, Sales & Marketing Director (jon.hudson@sdrplay.com) for the very kind, extended, loan of the review unit.

The Stampfl 'STRESSLESS' HF Receiver

Heinz Stampfl HB9KOC is well-known in the European radio fraternity for his innovative and educational radio kits, aerials and high-quality accessories. Among the latter are the UC-1S Long Wave Converter, the MWS-1 Standing Wave Barrier (see above), the Wave Star preselector and the new X One Active Dipole (90kHz-150MHz). The latest member of the Swiss Stampfl stable is the STRESSLESS HF receiver, **Figs 6** and **7**.

Swiss Heinz is the man wholly responsible for the hardware here, whereas **Ernst Kirschbaum DL2EBV** competently wrote and implemented the software. It seems to me that this radio is a great example of nominative determinism: 'STRESSLESS' by name, 'STRESSLESS' by nature. Let's see how.

Fig. 6: The Stampfl STRESSLESS HF Receiver (Front). Fig. 7: The Stampfl STRESSLESS HF Receiver (Inside). Fig. 8: The direct frequency entry screen on the STRESSLESS. Fig. 9: Tuning step selection for the STRESSLESS HF receiver. Fig. 10: A rare catch? A Dutch SW Pirate in the Tropical band (4940kHz).

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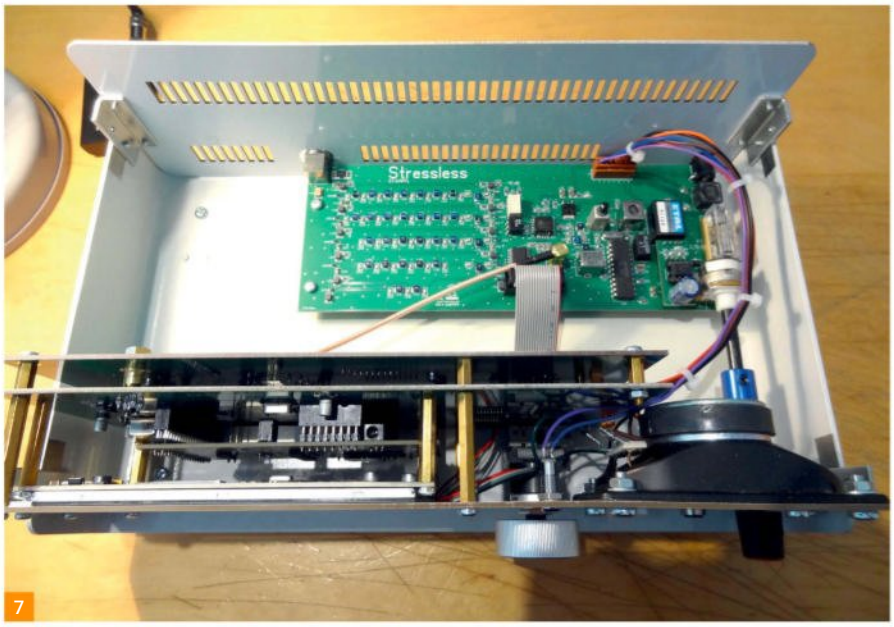

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Educational and stylish

The radio is a hardware AM receiver from Switzerland, with a clear emphasis on the reception of the Long-, Medium and Short Wave Broadcast bands. It does not offer SSB reception. Heinz was kind enough to send me a pre-assembled review unit. As standard, this radio comes in kit form (Empfängerbausatz). The latter consists of a pre-drilled metal case and the VFO and receiver units.

In my opinion, this easy-to-assemble kit makes an excellent, easy-to-follow, educational project, for younger hobbyists and old hands alike. According to Heinz Stampfl's product description, the target groups for this radio are beginners as well as the more demanding SW listeners. At the time of writing, there was just one sketchy online comment available on this radio, at the SWLing Post blog:

http://tinyurl.com/ywnxpxbb

Putting together the receiver requires largely mechanical assembly; you will require screwdrivers but will not need your soldering iron much. There is a detailed pictorial guide available online. Stressless from the beginning, it is then. Moreover, when I unboxed the radio, I was struck by its size and weight. At 305 x 120 x 185mm (W-H-D), it is about twice the size of an AOR7030 but weighs in at a mere 1.7kg. OK for mobile operation then.

What is more, with its clean, off-white paint coat and lean, attractive design, this machine makes a great style statement and has a noticeable visual impact. As I get on in life, I appreciate larger displays and tactile, hard-wearing controls. Top marks for this, and its looks. How about the famous Swiss precision and quality then? Read on to find out more.

Tuning and customizing

Tuning the STRESSLESS is via the front tuning knob or direct frequency entry, **Fig. 8**. You get to the latter by tapping on the frequency display on the pleasingly large touchscreen. The band indicator below, when touched, reveals the pre-selection for the choice of bands to jump to, from LW to 11m. 'Langwelle' is LW, 'Mittelwelle' stands for MW, and for 'Rundfunk' ('Broadcast'), read: 'Short Wave Band'.

The soft key labelled '<< >>' enables you to change the frequency in MHz steps, for speedier surfing across the bands. The STRESSLESS offers 50 memories, accessible via the 'MEMO' soft key, at the bottom right of the screen. You move through saved memories with the encoder. There are two VFOs, ('A' and 'B').

Moreover, a 10dB attenuator (ATT) comes in handy for signals from powerful nearby transmitters. There is no AFC and no bandwidth control, and in practice, neither was needed, the pre-chosen bandwidth is optimal. The LED labelled 'Field' shows the relative signal strength (Ger.: *Feldstärke*). The receiver includes a precise TCXO (Temperature-Compensated Crystal Oscillator), and the components are of very high quality; just take a look inside – and this shows in the reception quality, as we will see anon.

The STEP selector soft key on the display offers you a choice of steps (10Hz to 1,000Hz; **Fig. 9**) and the 'Field' LED helps with precision tuning. You can turn the main loudspeaker off, plug in headphones and regulate the volume with the red knob on the right. Turning this up considerably less than halfway already produces a room-filling sound. The Visaton speaker harmonizes well with the volume of the case.

The sound quality is good, and you might consider connecting an active or passive loudspeaker to enhance it even further. I use the bhi EXTSPK25 8Ω 25W single cabinet style extension speaker, which has shown a particular affinity with the STRESSLESS. A really good way then, to enjoy **Alan Roe's** tips for 'Music on Short Wave', language teaching courses and similar HF audio offerings.

Alan Roe:

http://tinyurl.com/43m4dsut

bhi:

https://tinyurl.com/55x6tybf

When you switch on the STRESSLESS, you will see a 'Settings' menu on the bottom-right of the primary screen. Pressing this leads you to some customization options or a full 'reset'. Touch 'Settings' again and you can change the tuning rate, memory settings and the display colour scheme. Operation is all very intuitive, ergonomic and simple.

8

9

10

In Use from LF to HF

I ran the radio on an external Lithium-ion battery (TalentCell YB1203000) and a good-quality PSU suitable for amateur radio (I still use an old SSE Jim PSU-500). Then I hooked the STRESSLESS up to my Wellbrook Loop (LN 1530) on the balcony during the daytime and was rewarded with a plethora of broadcast station transmissions across the bands. I immediately found that the selectivity, sharpness of separation and sensitivity of this AM radio were off the scale. Using it made me much more aware, once again, of just how many broadcasters are still out there on the HF waves, even if some of the large ones are too ignorant and short-sighted to be bothered any more.

But maybe this is an advantage too, because now you can see 'behind' the main frequencies of the formerly big stations and discover so many others you did not know existed. The LW 252kHz frequency is, perhaps, the best recent example of this: 'behind' the former RTÉ from Ireland, there is now Chaîne 3 from Algeria. The hunt for the signal behind the signal, as it were. This receiver enables you to do just that. If you are a Medium Wave DXer, like me, or are interested in radio science, signals analysis or such things as propagation dynamics or the Luxembourg effect, you may find the additional use of 'Carrier Sleuth' by Black Cat Systems a useful accessory to help tease the last Swiss ounce of performance out of this radio.

Carrier Sleuth:
http://tinyurl.com/7addcpwp

Special catches

Onto the dreaded Dutch Pirates next, and I tuned to just above 1600kHz on an evening at the weekend. *Erg goed!* Not only did I hear more of them than ever before, but the clarity of both speech and music impressed me, even with just the built-in Visaton speaker. With many other radios, I find I have trouble understanding announcements and lessons in foreign languages. But not here; it was as if the transmitter were right here in the Ribble Valley – an excellent result. I also found a weak Dutch Pirate on the Short Waves, in what used to be called the Tropical Band, **Fig. 10**; that was real fun!

On to the European NDB (Non-Directional Beacon) Band, where many signals are sent in AM. I am not an avid beacon hunter, but I do go on an occasional foray. Once again, there was more to catch, especially later at night, and signals were clear. The volume knob produces generously loud audio, and that helps too, for any further PC processing.

I had no trouble going down into the basement band to check on SFTS (Standard Frequency and Time Signal Stations), in this case, the French time signal carrier from Allouis at 162kHz. The European 2200m (135.7-137.8) experimental amateur radio band is here too and the German Weather Service (DWD) with its Long Wave utility signal on 147.3kHz. However, remember that these are non-AM modes (CW and RTTY).

Conclusions

I make no bones about it: this is my new 'go-to' receiver for the LW, MW and SW Broadcast Bands. In terms of what it pulls in, when and how. I am predominantly a content listener, and this is my new gold standard. During my tests, it proved to be several notches up from my older AOR AR7030 – my reference receiver so far.

This, arguably, demonstrates what can be achieved when you concentrate on just one simple task – monitoring HF AM broadcasting – and do it well, by harnessing the best technology and components to achieve it.

Here you have solid, classic, high-frequency technology. Take a look at the technical specifications on the Stampfl website to see what I mean. The 'KSB' ('Knob-Screen-Balance' – definitely NOT an official term!) feels just right here, and the large touchscreen makes available just the controls you need. In other words, there is no '*Schnick Schnack*' here as the Swiss would say; i.e. no unnecessary gimmicks, bells and whistles.

You'll rediscover the SW hobby all over again with this truly stressless receiver. But do treat this noble radio to a decent antenna, to bring out the best. The new Stampfl X One Active Dipole, perhaps? Last but not least, pared down to the essentials as it is, this is, in our times of mounting international crisis, exactly the kind of classic hardware receiver for makers to invest in, and for listeners to acquire and build.

I do not doubt that the Stampfl STRESSLESS will be a new modern classic. Well, I did buy it, actually. Take it on your next DXpedition and report back to me. My warm thanks go to **Heinz Stampfl**, at Stampfl Ham Electronics, for the kind loan of the radio.

Stampfl Ham Electronics
www.heinzstampfl.ch

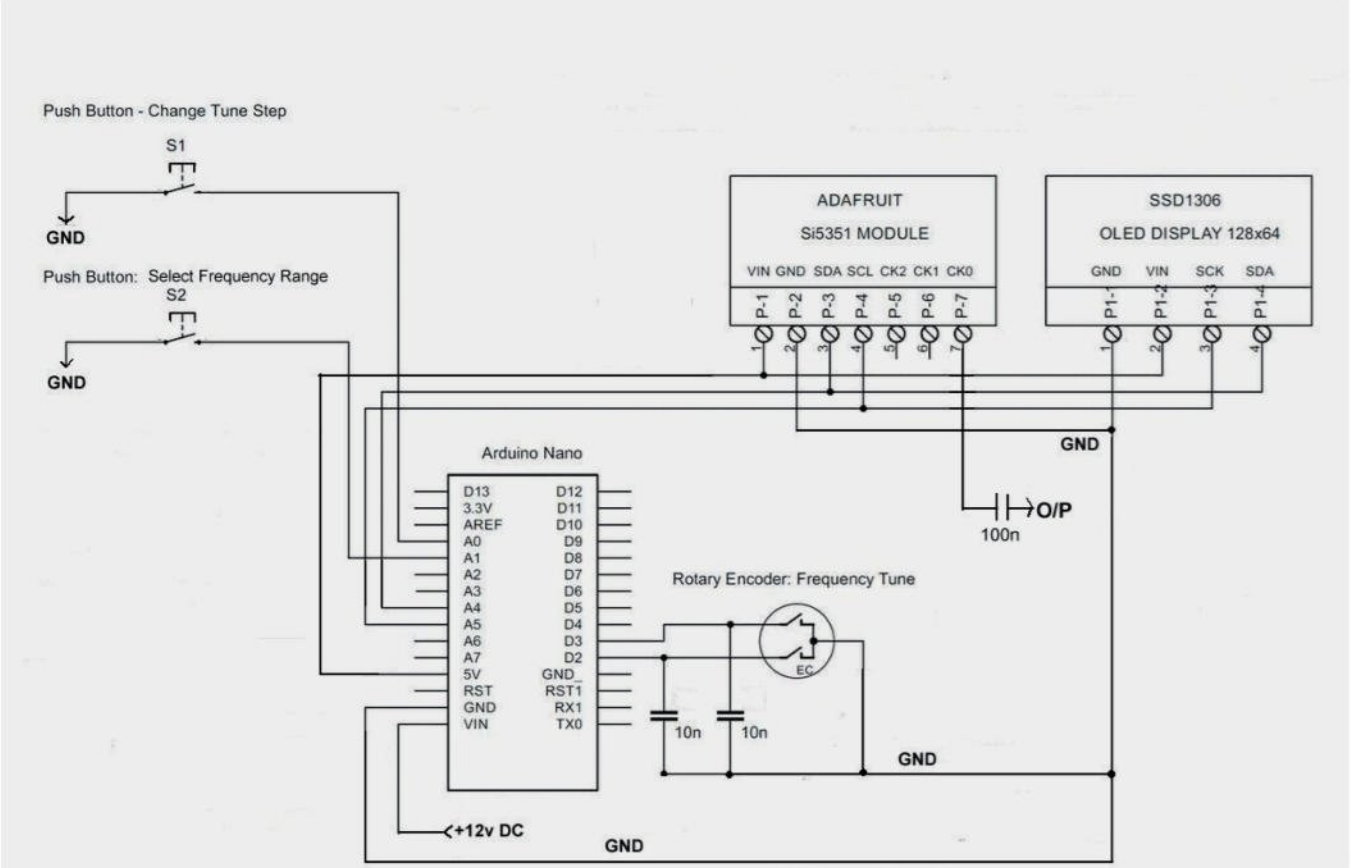
References & Resources

Barron, A. (2016) *Software Defined Radio: for Amateur Radio Operators and SW Listeners* (Radio Today Guides, RSGB)

Instructions (with English subtitles):
https://tinyurl.com/4vckjz3x
https://tinyurl.com/yev7c8ea

Mersey Radar: Review SDRplay RSP1B:
https://tinyurl.com/4ywdred4

Wiessala, G. *LW in Europe Today* […] (The Spectrum Monitor, April 2023: 84)



1

Steve Macdonald G4AQB
practicalwireless@warnersgroup.co.uk

An Easy Arduino Nano VFO and Signal Generator

Steve Macdonald G4AQB offers a simple-to-build project based on low-cost modules.

The *Take 20* series has been about construction projects that consist of 20 components or less and cost less than £20 or 20 shillings in the old days. Nowadays, modules can be bought on eBay and other suppliers that can cost less than the cost of single components. With this in mind, I have written this *Take 20* project that should cost less than £20, but uses only a handful of easy-to-obtain small modules.

The project is an Arduino Nano based VFO or RF Signal Generator using only three modules. The VFO/Signal Generator gives an output from 10kHz – 225MHz. I have built several of these in the past and have found them easy to build and get going without having to get too involved in the programming.

Circuit

The circuit is shown in **Fig. 1**. This is a simplified circuit which shows the wiring of the modules. Once this is built and tested, the circuit can be expanded to take in additional features. The modules consist of an Arduino Nano Microcontroller, si5351a Programmable Clock Generator and SSD1306 OLED Display. These are controlled by the software that is uploaded to the Arduino Nano. The circuit can be powered from the USB on the Nano board or can be powered externally with 12V. Two push-button switches are used, one to select the frequency or band and the other to select the tuning frequency steps. A rotary encoder is used for the tuning. When ordering the modules, make sure that they have headers already fitted or carefully solder them on yourself before starting.

Construction

The circuit can be built on a breadboard to try out, but for a more permanent construction, I have used DuPont connectors and copper clad board. I used single sided copper clad board 9cm x 7cm with the copper side underneath. This can act as an earth plane for linking the earth connections, **Fig. 2**. The Arduino Nano module is glued to the plain side of the board with a glue gun and the Clock and Display mounted on some small stand-off pillars. Short DuPont connectors are used to link together the connection pins on each module.

First, decide where you want the modules mounting on the board and where to put the push-button switches and rotary encoder for tuning. Drill the holes for the stand-off pillars, push button switches and rotary encoder. Carefully glue the Arduino Nano to the plain side of the board, it is best to just apply small spots of glue to the corners, **Fig. 3**. I have mounted

Fig. 1: Circuit and wiring diagram.
Fig. 2: Starting off.
Fig. 3: Modules and layout.

the OLED display on the same side as the other modules, but it is easy to mount on the other side of the board by cutting out a slot for the wires to pass through.

Next, make up some spliced DuPont connectors, these are used for the wires that connect to pins on all three modules, **Fig. 4**.

Carefully connect the DuPont connectors as shown in the circuit diagram and wire up the push-button switches and rotary encoder. Note that you will need to decouple the rotary encoder pins with 0.01µF capacitors. It is not necessary to use pull-up resistors for the encoder. I also added a socket and 100nF decoupling capacitor for an external 12V supply.

Programming

Now that the hardware is finished, it is now time to upload the software into the Arduino Nano.

First, you will need to have installed a copy of Arduino IDE and libraries on your computer. You can find it here:

www.arduino.cc/en/software

Arduino IDE is used to upload the software that you need to the Arduino Nano.

You will also need to select the Arduino Nano library of boards. To do this, start up Arduino IDE and select 'Tools', 'Boards', 'Arduino AVR Boards'. You will then see a list of boards, select 'Arduino Nano'.

Now go to 'Tools', 'Processor' and select 'ATmega328P (Old Bootloader)'. If you get errors after compiling, then go back and select just 'ATmega328P' and compile again.

Next, go to:

http://tinyurl.com/4h38cj6b

and save the file on your computer.

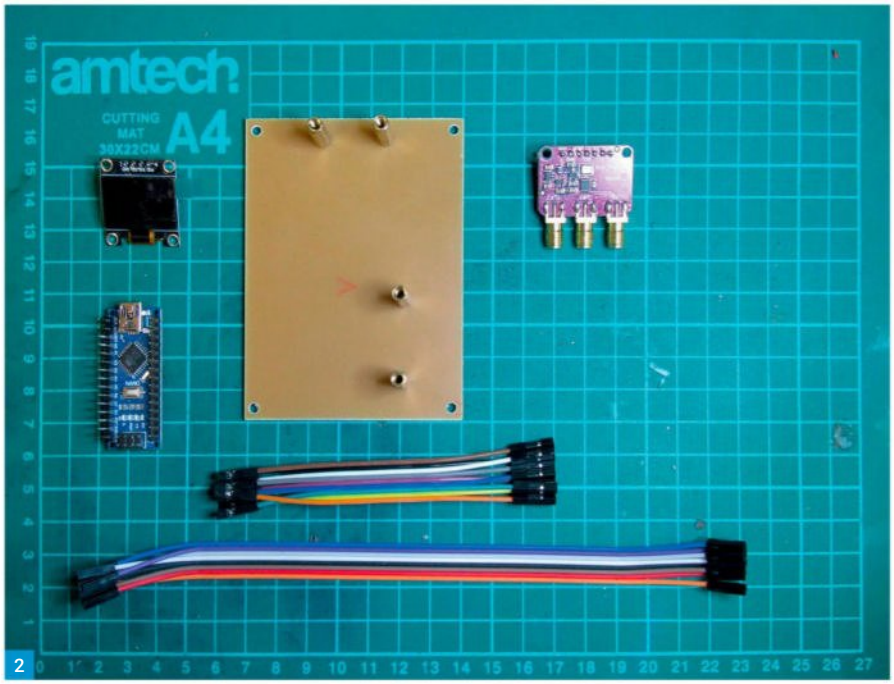
You now need to open the Sketch that you have saved on your computer into Arduino IDE. The Sketch file is the one ending with .ino.

If you are using Arduino IDE for the first time, you may need to install the necessary libraries required. To do this, look at the Sketch under 'Libraries'. These are the ones with #include at the beginning of each line, **Fig. 5**. Search for these using 'Tools', 'Manage Libraries' in Arduino IDE and download each one. (More information is shown in the comments on the Sketch)

Now that the Sketch is loaded you may want to make some changes to the code. In the Sketch look in the 'User Preferences' (Fig. 5). Here you can set the IF offset frequency if being used as a VFO and initial start-up band. If you are using it as a Signal Generator, then change the IF to 0 and BAND_INIT to 1. (This is explained in the comments in the Sketch)

When you are ready, select 'Sketch', 'Verify /Compile'. The code will now be compiled and show up any errors. This may take a few minutes. Once compiled, connect a suitable USB lead from your computer to the Arduino Nano board USB socket. Go to 'Tools' and select 'Ports', choose the port that you are using. If you are not sure which port is in use, disconnect the USB lead and look again at the listed ports. The active port will not show, plug the USB in again and it will appear. Go to 'Sketch' and 'Upload' (This will take a few minutes to first compile again and then upload)

If everything is correct, the VFO/Generator Display should burst into life when upload has completed, **Fig. 6**.



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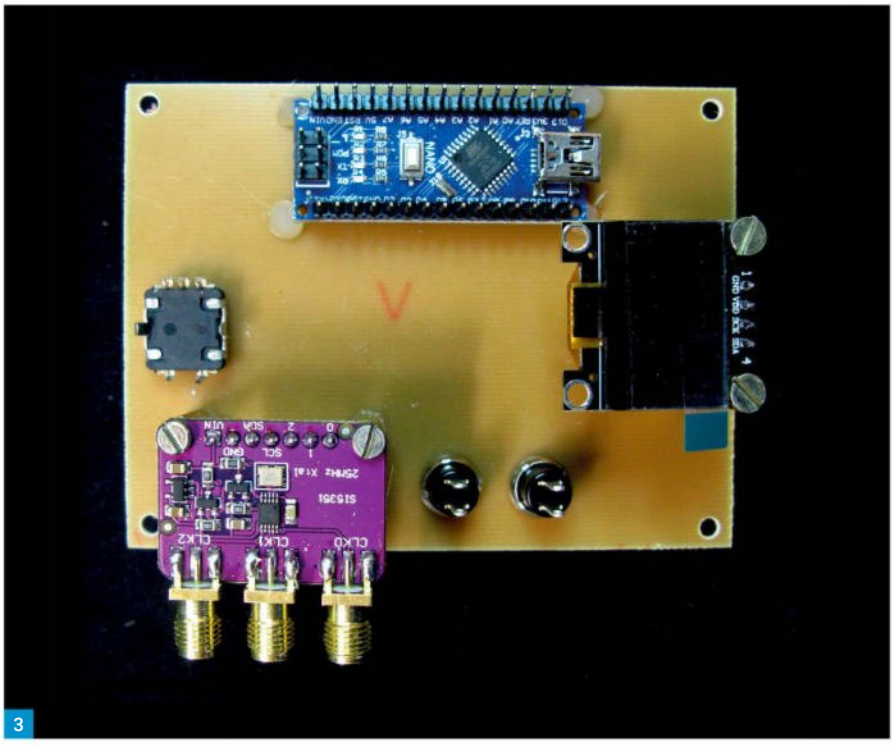
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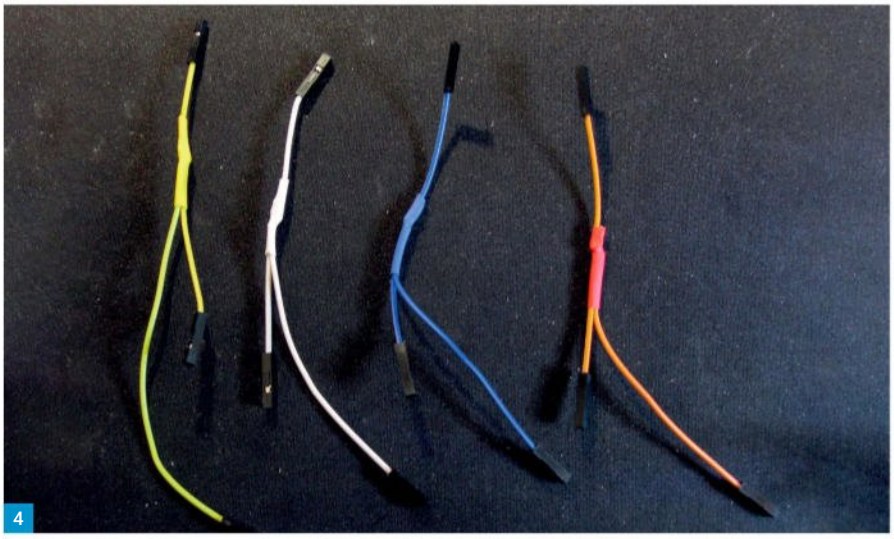
Testing

First of all check that the display is working correctly and the rotary encoder moves the display frequency up and down. Press the 'Step' and 'band' push buttons several times to check that the frequency changes in the correct tuning steps and the band changes accordingly. If one is available, connect an oscilloscope/ frequency counter to the output of the si5351a



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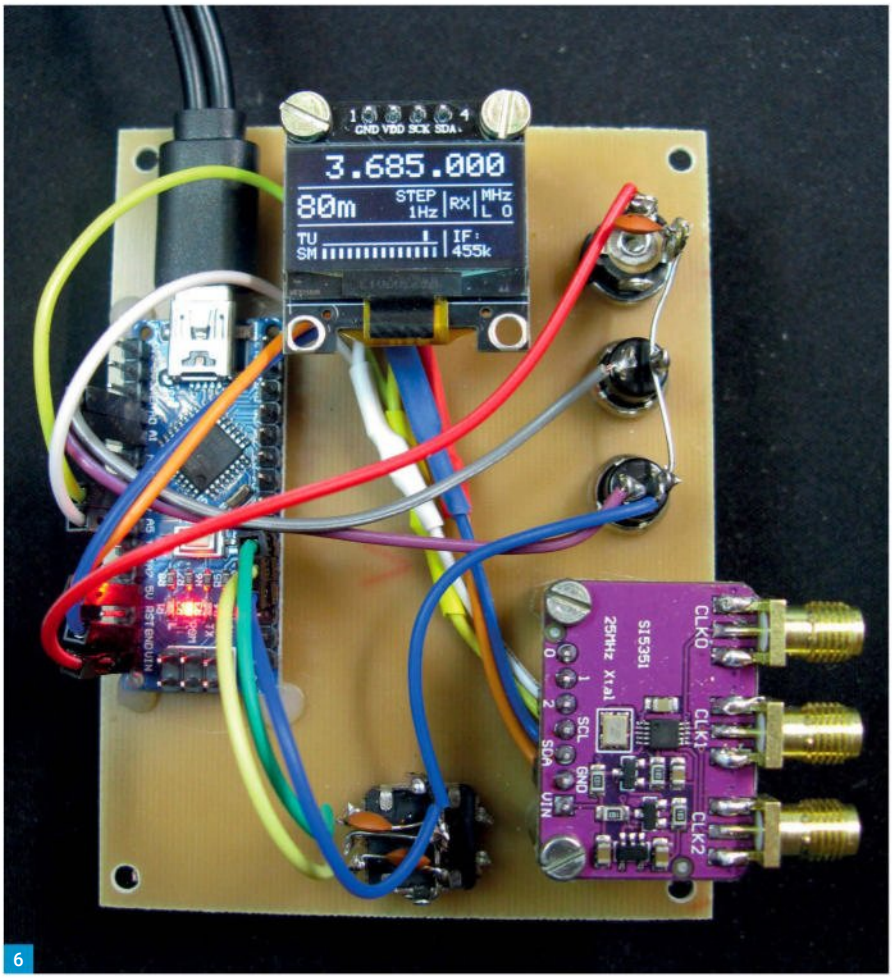

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```
//Libraries
#include <Wire.h>
#include <Rotary.h>
#include <si5351.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>

//User preferences
//----------------------------
#define IF          455
#define BAND_INIT   3
#define XT_CAL_F    33000
#define S_GAIN      303
#define tunestep    A0
#define band        A1
#define rx_tx       A2
#define adc         A3
//----------------------------
```

5

Parts List

Modules
Arduino Nano V3.0 ATmega328P
Si5351A Clock Generator
SSD1306 OLED Display 0.96in (128x64)

Capacitors
2 x 10nF Capacitors
1 x 100nF Capacitor

Miscellaneous
Rotary Encoder (EC11)
DuPont Connectors (10cm / 20cm)
2 x Push Switches
4 x Stand offs
SS Copper Clad Board

Fig. 4: DuPont splices.
Fig. 5: Sketch #Libraries and #Preferences.
Fig. 6: Completed project.

clock generator board (CLK0). Make sure that the frequency corresponds to those in the software taking account of any IF offset. There are three clock outputs, but only one is used in this project.

Conclusions

Different versions of this kind of circuit using the Arduino Nano have been around for a while now. Some can be quite complex and off putting to prospective constructors. This version has been kept as simple as possible and the software is already available with just a couple of easy changes to the Sketch for preferences.

The project can be used as a VFO for a receiver, transmitter or transceiver, or it can be made into a piece of test equipment as an RF Signal Generator or Signal Source. It can be mounted into a suitable box or mounted behind the front panel of a larger project.

Additional features can be added later if needed. For example, adding a push switch (PTT) on A2 of the Arduino Nano gives transmit/receive facility and applying a signal to A3 gives a simple S-meter display.

References and Acknowledgements

VFO / RF Generator by J CesarSound
http://tinyurl.com/bdzata92
Sketch Download
http://tinyurl.com/4h38cj6b
Universal VFO using si5351a by PA0RVE
http://tinyurl.com/yc5ptrsx

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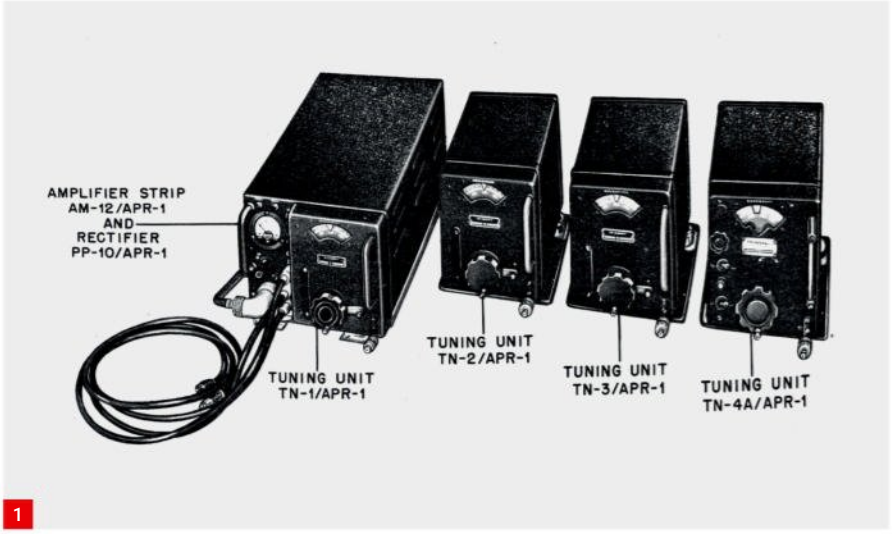


1

Electronic Warfare

Keith Rawlings G4MIU this month drifts off amateur radio antennas to a historical incident that happened in the Pacific in WWII where what he initially assumed to be an omnidirectional antenna was used for direction finding.

The first use of radio and the telegraph/telephone by military forces inevitably led to the exploitation of these systems by their prospective enemies. Radio signals were (are) intercepted and telephone lines 'tapped' (or is that nowadays hacked?). When found, advantageous signals were 'jammed' although in many cases it is more fruitful to allow communications to continue and glean as much information from them as possible. Even a signal just being there can give away important information about an enemy's activities. With the onset of WW2 Electronic Warfare started to come of age.

During early August 1939 the German airship *Graf Zeppelin* carried out what is now often referred to as a 'Ferret' mission along the east coast of England to try and analyse signals that were coming from the series of masts that had been erected along the coastline. These were of course the British Chain Home radar masts and although the *Graf Zeppelin* picked up signals from them it seems that their significance was misunderstood and the strange signals received were believed to be interference from the National Grid system. The consequences of this misunderstanding would have serious implications for the Luftwaffe come the following year.

What was likely the first true RAF airborne ferret mission (but I stand to be corrected) was carried out in 1940 with the intention of finding evidence of what were suspected radio beams being used by the Luftwaffe to guide bombers over Britain.

In June 1940 Avro Anson N9945 was suitably equipped with a receiver which was able to pick up the 'beams' operating around 30MHz (Mc/s in old money). The radio operator, from the Y-Service, and navigator were able to plot the beams, which were actually found on 31.5MHz and on that evening pointing over the Rolls Royce factory in Derby. For this task a Hallicrafters S-27 was purchased from a store in Lisle Street, London. No doubt after WW2 many more of these receivers which had subsequently been acquired were eventually sourced on the second-hand surplus market from the very same Lisle Street!

So, by the time of the entry of America into WWII on 7 December 1941 both Britain and Germany had amassed a fair bit of experience in 'Electronic Warfare' (EW). The case for the United States was somewhat different.

It is fair to say at this time they were lagging behind in EW capability, but this had already been recognised and the situation did not last for very long. With some forward thinking the US Government/military partnered itself with universities to set up research laboratories focused on radar and radio countermeasures (RCM). Also, with the selection of talented engineers and help from Britain, the US was soon producing some excellent RCM equipment in large quantities. These would equip US land, sea and air forces and also supplement types used by their allies in all theatres of the war.

APR/1

One such piece of the many types of electronic equipment that played a part in foiling the axis forces was the APR/1 ELINT (electronic intelligence) search/intercept receiver. This originated from the 'MIT Radiation Laboratory' (Massachusetts Institute of Technology, the RRL had been set up immediately after the Pearl Harbour attack) and has its design based on the earlier SCR-587 receiver but with many improvements.

The APR/1, **Fig. 1**, and similar APR/4* (designated SPR for naval use), were capable of reception over a wide spectrum by utilising plug-in modules, otherwise called pre-selectors or 'Tuning Units', for different ranges. Designated 'TN' the TN1(/APR-1) covered the range 38-95MHz, the TN2 76-300MHz, TN3 300-1000MHz, TN4A 1000-3200MHz. Some variants of the tuning units could be set to sweep automatically by mechanical means to cover any part of the tuning range of the unit.

https://maritime.org/doc/ecat/cat-0272.php

There were a number of ancillary modules that could be added externally to the receiver such as Pulse Analysers for the characterisation of radar emissions and also Panadaptors for signal searching.

These receivers found use in many types of allied aircraft and ships with the APR-1 first appearing in 1942. Both the APR/1 and APR/4 started to be manufactured in large numbers by the autumn of 1943.

Antennas

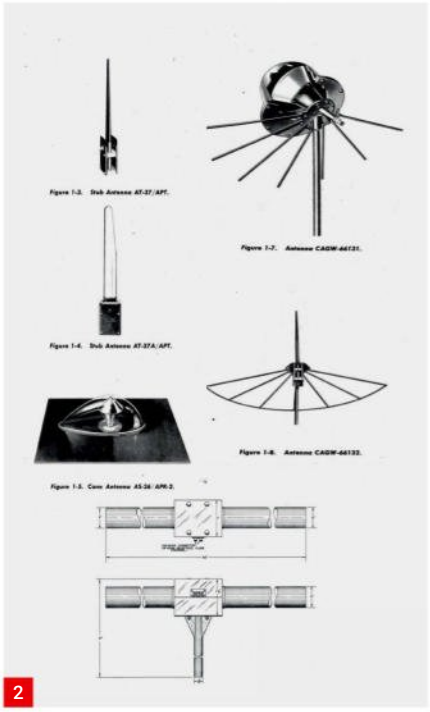
With receivers there are antennas and due to the wide bandwidth of the APR/1 there were a number of types available, including for the higher frequencies, 'cone' antennas. A selection listed in the APR/1 manual can be seen in **Fig. 2**.

Common for VHF was the AT-37/APT Stub Antenna, **Fig. 3**, which was some 23in in length and made from phenolic impregnated maple, which was then coated with a thick layer of 'metal' and was used with the TN1 and TN2 tuning units. It was fitted extensively on aircraft where one or more of this type of antenna was used.

USS Batfish

During the COVID lockdown period I was reading online of the exploits of a US Navy Balao class submarine *USS Batfish*, SS-310. While on her sixth war patrol and during a Japanese evacuation of personnel on Formosa she sank three Japanese submarines on successive nights by using an APR/1 receiver (it was not designated as SPR/1 at this period it seems) and a stub antenna to direction find the enemy submarines while they were on the surface, happily giving away their position by the use of air search radar, more concerned with air rather than surface attack it would seem.

Fig. 1: APR/1 and modules. Fig. 2: Some of the types of antennas that could be used with an APR/1. Fig. 3: AT37 stub antenna drawing. Fig. 4: Antennas as seen on the shears of a WWII USN submarine. Fig. 5: Depiction of the USN plot from a horizontal stub: Thanks to Ben M3EUO. Fig. 6: AN-SOF 3D simulated plot of the horizontal stub. Fig. 7: APR/4, similar to the APR/1. Image of the example in the RAF Signals Museum.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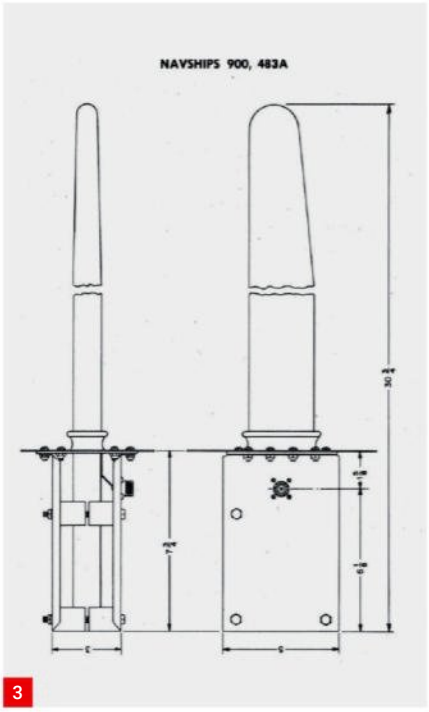

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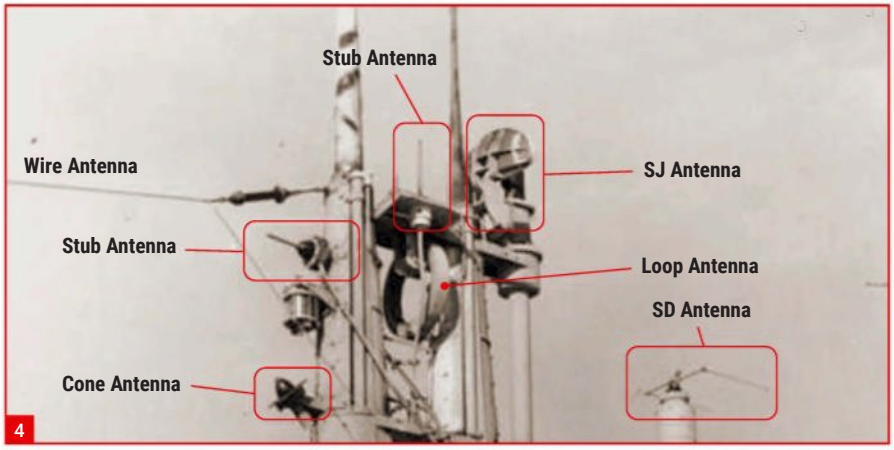

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The point is how do you direction find using what would at first look appear to be a vertically polarised omnidirectional antenna?

I did some more research and came up with this online document from Loughborough University, under creative commons license. **https://tinyurl.com/ywskcu2y**

This gave a better insight into the three actions by describing them in much detail.

The publication's author, highly respected **Dr Alfred Price**, attributes the radar signals to Japanese MkII Model 4 radars (but sources online report they were Type 13 Air Search Radars) on 150MHz. However, Dr Price stated that a dipole antenna was used, not a stub. I can understand how a dipole's pattern could be used for DF, with a 180° ambiguity, but, all references online stated the use of a stub antenna.

I looked for images of the Balao class online. Batfish has been preserved as a museum but as she was recommissioned after WWII. I suspect that the antenna arrangements were changed from her wartime period so current photographs probably don't depict her antenna setup of WWII. There are many online photos of others of the class and it would appear that most had not only a vertical stub, similar to (but almost certainly not the same as) the AT-37, but also a horizontally mounted one as well, pointing along the axis of the boat. Also present were antennas for the SD VHF early warning receiver and an SJ radar scanner dish, plus a DF loop antenna mounted between the two shears, but no dipole, **Fig. 4**.

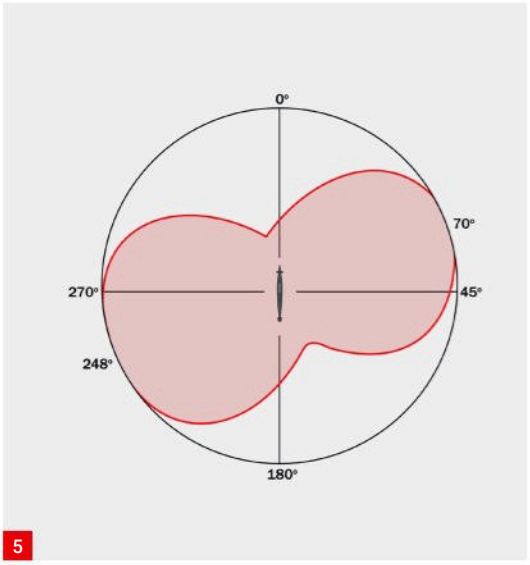
A horizontally mounted stub puts a different light on the matter. If we imagine the theoretical pattern of a vertically polarised monopole, and we then turn this on its side, the pattern should resemble that of a dipole when in the horizontal field. If it is close to ground, much of the signal will be reflected upwards.

Indeed, further research revealed that the Price document is actually a copy of the text from the book *The history of US Electronic Warfare Vol 1* without illustrations. Within the book is a drawing and description of the horizontal polar diagram of the stub antenna at a frequency of 150MHz as was used by the Japanese radar, and confirming the stub was mounted horizontally. This description was published as *APR and the Batfish* by the US Submarine Force Pacific Fleet in response to questions on the antenna's directional properties and how Batfish had achieved what she did.

It depicted plots at 150, 300 and 800MHz. It is not stated if the results were obtained empirically or otherwise but it is clearly demonstrated that a horizontal stub antenna could be used to direction find in this fashion. The plot at 150 and 300MHz is similar to that expected of a dipole although slightly distorted, but why is this plot not at 90° with respect to the mounting of the horizontal stub? **Fig. 5** is a reproduction of the diagram at 150MHz.

It can be seen that there was a null offset from the centre line fore and aft of the boat. With the antenna being fixed it was necessary to swing the boat to find the null points of the signal. No mean feat, especially as the RCM officer would first need to find the signal, which would initially likely to have been weak, and then determine the bearing he was going to follow while instructing the crew on the course to steer. From reports it would seem that the task was made slightly easier because the Japanese subs stayed practically motionless while literally broadcasting their position by radar. The offset of the antenna's pattern from the centreline allows the operator to find the bearing.

With today's technology it is possible to model the antenna to confirm the wartime findings, although an accurate depiction would be quite complex. I made up a basic model in AN-SOF depicting a stub antenna of 23in long assuming that Batfish's stub was of the same dimensions as the AT-37. The two vertical shears are simply modelled and 'guestimated' as being 7m above 'real' saltwater 'ground.' It is not wholly accurate as the Balao class boats have quite a lot of metalwork above the deck as seen in Fig. 4, but should be good enough to prove the theory. The simulated 3D Directivity plot may be seen in **Fig. 6**.



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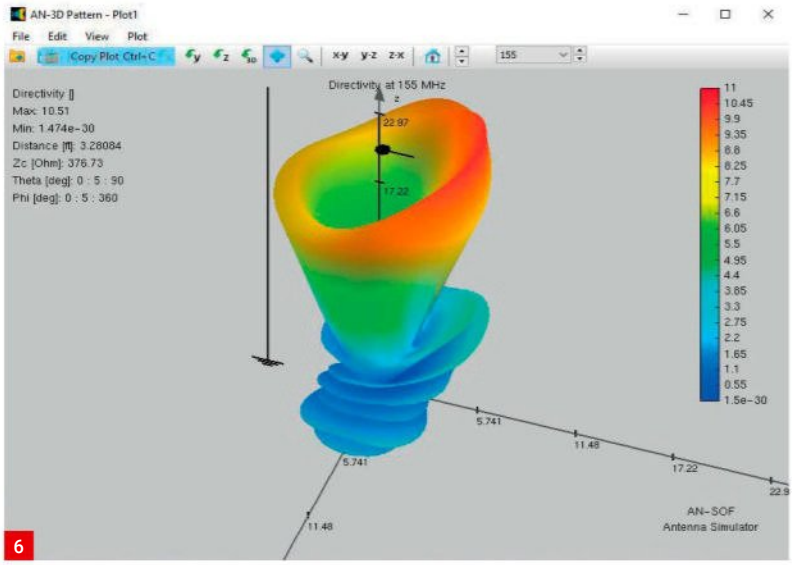

6

7

Here we can see that most of the radiation is going up vertically but, at 90º to the stub, there is a definite dipole figure-of-eight plot at low angles which would have suited the interception of the radar emissions on the surface.

I am still unsure why the USN horizontal stub plot is offset from the centre line in the way it is. Could it be the way the feeder runs away from the antenna, unbalancing the radiation pattern? Or is it due to hardware on the deck distorting the pattern, although I would have thought the antenna was mounted high enough in wavelengths for this not to be too much of an issue? Then consider there is what looks like an HF antenna in close proximity to the stub.

Batfish was not alone as there was another known occurrence of this technique that has been credited to **USS Bluefish**, a Gato class boat but with similar antenna mounting. She gleaned information to characterise radar positions located on the Japanese homeland in the same way.

I have no information on who it was that first discovered that it was possible to DF signals by turning the boat.

I guess that the horizontal stub was originally fitted along with the vertical stub to provide the option of both vertically and horizontally polarised reception.

Your thoughts on the subject of this antenna pattern are welcome!

—·—·—·—

While nearly almost identical the APR-4 was an adaptation of the APR/1 and built by Crosley. They were used by US Army Air Forces and flown in B-17, B-24 and B-29 aircraft in the European and Pacific theatres. Post war they were flown on missions using EB-66, RC-121C, PBM-5S and P-2 Neptune's, well into the 1950-60's. They were also used on post-war British ferret flights with aircraft such as (but not limited to) Lancasters, Lincolns, Shackletons, Canberras, Comets and probably B29 Washingtons. The APR/4 seen in **Fig. 7 is presented to give an idea of the layout of the SPR/1. This receiver resided in the RAF Signals Museum, RAF Henlow, Beds, which by now will have been closed. Another two reside at the Norfolk and Suffolk Aviation Museum along with many other EW related items, including an S27.*

AN-SOF DX

A new version of AN-SOF has been introduced. This is a special edition known as **AN-SOF DX**, and is specifically tailored exclusively for radio amateurs. This version offers a lower-tiered alternative to the Professional edition of AN-SOF, offering a **500/50/5** combo, that is:

- Up to **500 segments + connections**.
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AN-SOF believes that these features will adequately cater for the diverse range of antenna design needs encountered within the realm of amateur radio. AN-SOF DX represents a response to the numerous requests from radio amateurs seeking a software edition that aligns more closely with their budget constraints, particularly acknowledging that many enthusiasts in this community are hobbyists or engaged in non-profit amateur radio activities.

Priced at approximately half the cost of the Professional edition, AN-SOF DX is designed to be accessible and affordable for individuals.

AN-SOF point out that this version is exclusively marketed for personal, non-commercial usage by individuals and is not intended for business purposes.

https://antennasimulator.com

That's all for this month! **PW**

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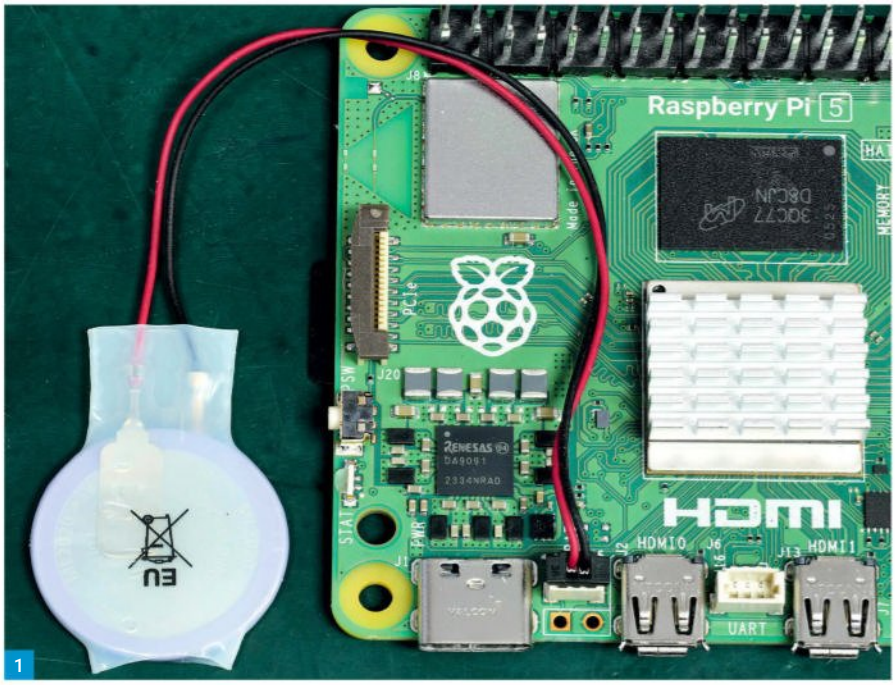


1

More Pi along with other useful advice

This month's column highlights the real-time clock in the Pi 5, takes the Si5351 clock oscillator to the next level, a new SDR Sharp and covers VarAC's translation facilities.

Raspberry Pi 5 - Real-Time Clock

Before the launch of the Pi 5, we had to add a hardware real-time clock module if we wanted to use the Pi for time-critical applications, i.e. data modes when not connected to the internet. However, the latest Pi 5 includes real-time clock (RTC) hardware, which can be battery-backed using an external battery. The consistent time source makes the Pi 5 ideal for use off-grid, such as when operating in remote locations with no cellphone signal. The RTC hardware uses a standard 32.768kHz crystal reference for the clock functions and integrates with the Linux operating system. As a result, the RTC can be used to schedule events and keep track of time.

The RTC reference crystal is a standard 50ppm unit, which, at its extreme, would give an error of around four seconds per day. However, I've tested the drift of a couple of Pi 5 units and have only experienced minimal drifts of less than two seconds in 24 hours. The accuracy will be temperature-dependent, so keeping the Pi 5 temperature relatively stable will help. For my stability tests, the Pi 5s were mounted in the official cases with the fan connected and running with the default settings. Keeping the RTC running with the power off requires a backup battery, and the official unit is a Panasonic ML-2020 lithium manganese dioxide rechargeable battery. The battery capacity is 45mAh and is fitted with a socket for connection to the Pi 5 RTC battery connector, **Fig. 1**. The official RTC battery costs just under £5 inclusive of VAT, and some include a self-adhesive pad to stick the battery inside the Pi case.

Bench Clock Generator—continued

Last month, I covered a simple application using the Si5351 breakout board from **Makis SV1AFN** and I thought it might be helpful to show you how to convert it into a full-blown VFO for a home-constructed SDR rig. A full description of the software is beyond this column, but there are several programs available that their authors have generously shared. For this illustration, I shall use the VFO software by **Nick Kennedy WA5BDU**. In addition to sharing the Arduino-compatible software, Nick has produced a PDF manual to help with the construction. In addition to the Si5351 breakout board and controller from Makis, you will need four pushbuttons, an I2C 2-line LCD, a rotary encoder and a few other bits and bobs, all listed in his manual. When completed, the VFO has the following features.

Si5351 VFO - feature summary

- Coverage from 3.5MHz to 146MHz
- LCD to show operating frequency and menu options
- CW pitch plus Phone/CW/USB/LSB selection
- RIT control
- Tuning step selection: 1Hz, 10Hz, 100Hz, 1kHz, 10kHz, 100kHz & 1MHz
- Band selection for amateur bands
- CW sidetone

Construction

Although the software supports parallel and serial I2C displays, I recommend using the I2C option as the connections are much more straightforward, requiring just four wires. For my version of this project, I used the DFROBOT DFR0063 display available from many suppliers for around £12. For this display to work correctly with this project, you need to move the three I2C address links on the rear panel so they are disconnected, see **Fig. 2**. As I couldn't locate the Arduino I2C LCD library used initially by the author, I made a minor change to the code (lines 512 & 3) to support the readily available Arduino LCD I2C library by **Frank de Brabander**. I have made the updated software available via my GitHub site at:

https://tinyurl.com/3chchdy6

You will see that two files are in the repository, and both are required. When you've downloaded the zip file, create a new folder in your Arduino sketch folder titled:

Si5351a_quad

Copy the unzipped files into that folder. Next, open the Arduino IDE and choose the Nano board and the appropriate COM port. You must also set the Processor to: ATmega328P (Old Bootloader). You must include the correct LCD library before successfully compiling and installing the code.

Here are the steps:

- From the Tools menu, select Manage Libraries
- In the Search box, enter LCD I2C
- Look through the search results list for LiquidCrystal I2C by Frank de Brabander v1.1.2 and click the Install button.
- You should now be able to compile and upload the code to the Nano board on the Si5351 Controller. Even without the controls wired up, you should see a quadrature output from J1 and J2 on the Si5351 board. My board produced a quadrature output at about 7.59MHz with the default settings. While the VFO can be powered over USB, I recommend using a good quality external 5V power supply connected to the +5V and GND pins on the SV1AFN Controller board.
- You can use most rotary encoders for tuning control. However, the cheap mechanical versions can become unreliable and feel clunky for tuning, so I suggest using an optical encoder. These are a bit more expensive (starting at

Fig. 1: Raspberry Pi 5 RTC battery connector.
Fig. 2: DFROBOT I2C address selection links.
Fig. 3: Si5351 LCD connection diagram.
Fig. 4: Si5351 quadrature output waveform.
Fig. 5: DFROBOT display in use with the VFO.
Fig. 6: New SDR Sharp r1920 release.
Fig. 7: Google Translate controls.
Fig. 8: VarAC Broadcast panel.

around £12) but well worth the investment. I prefer using an encoder without detents to give a smooth feel to the tuning control. The push-buttons can be any normally open type, and the diodes are general-purpose small-signal types (1N914 or similar). I've shown the updated LCD connections in **Fig. 3**. This assumes you're using the modules specified in this article. In **Fig. 4,** I've shown the output waveform as measured by my 3000 series PicoScope. The small error from a perfect 90° is due to the bandwidth limitation of the scope that softens the leading edge of the squarewave. **Fig. 5** shows the LCD in action.

Si5351 VFO - easyroute

If you would prefer to build from a well-documented kit, QRP-Labs have a similarly specified Si5351 VFO kit available. Their Si5351 VFO/Signal Generator kit costs around $55, including postage to the UK. You can view and order the kit via this link:

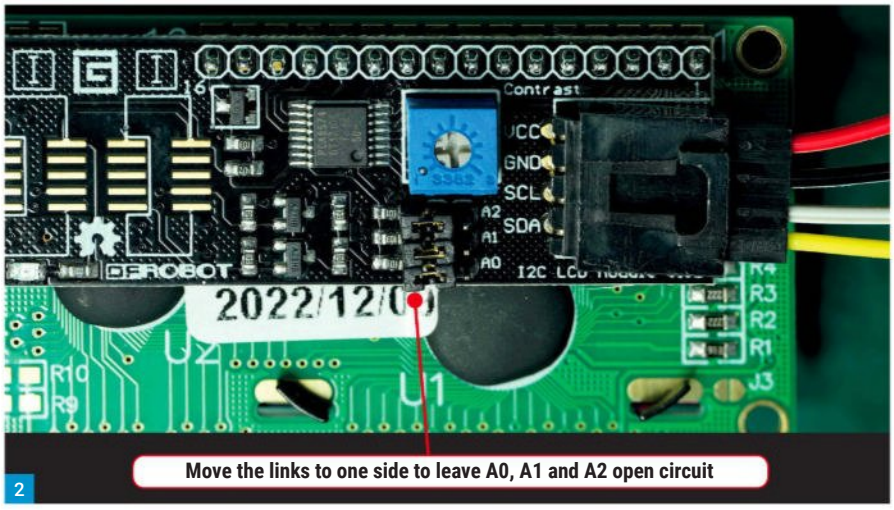
https://shop.qrp-labs.com/kits/vfo

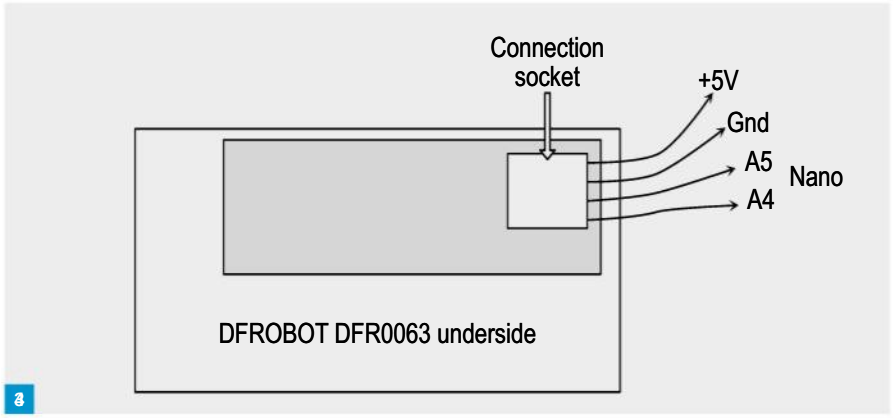
The kit includes many of the features of the WA5BDU homebrew version. QRP-Labs can also supply (at extra cost) a matching bank of relay-switched lowpass filters. These filters tame the output into a reasonable sinewave. It's not exactly signal generator quality, but it's still a potentially useful generator. To finish the project, QRP-Labs can supply a custom case to house the completed unit.

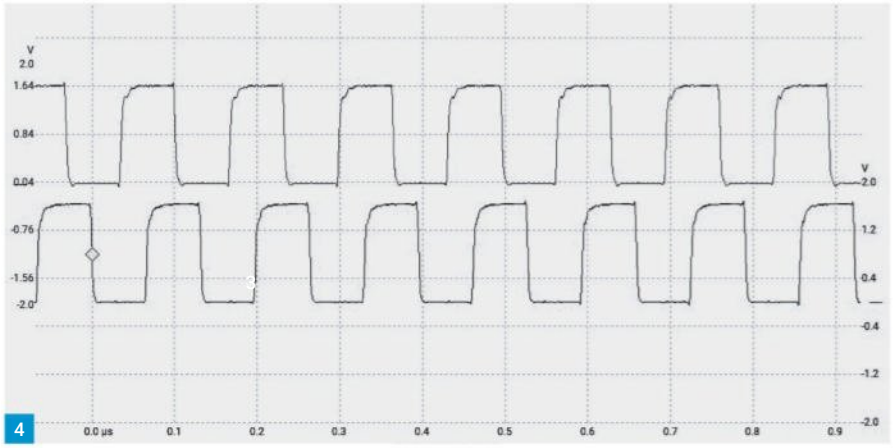
That concludes this look at the versatile Si5351 clock oscillator and controller. In a future column, I'll show you how to use the Si5351 controller board as a WSPR beacon.

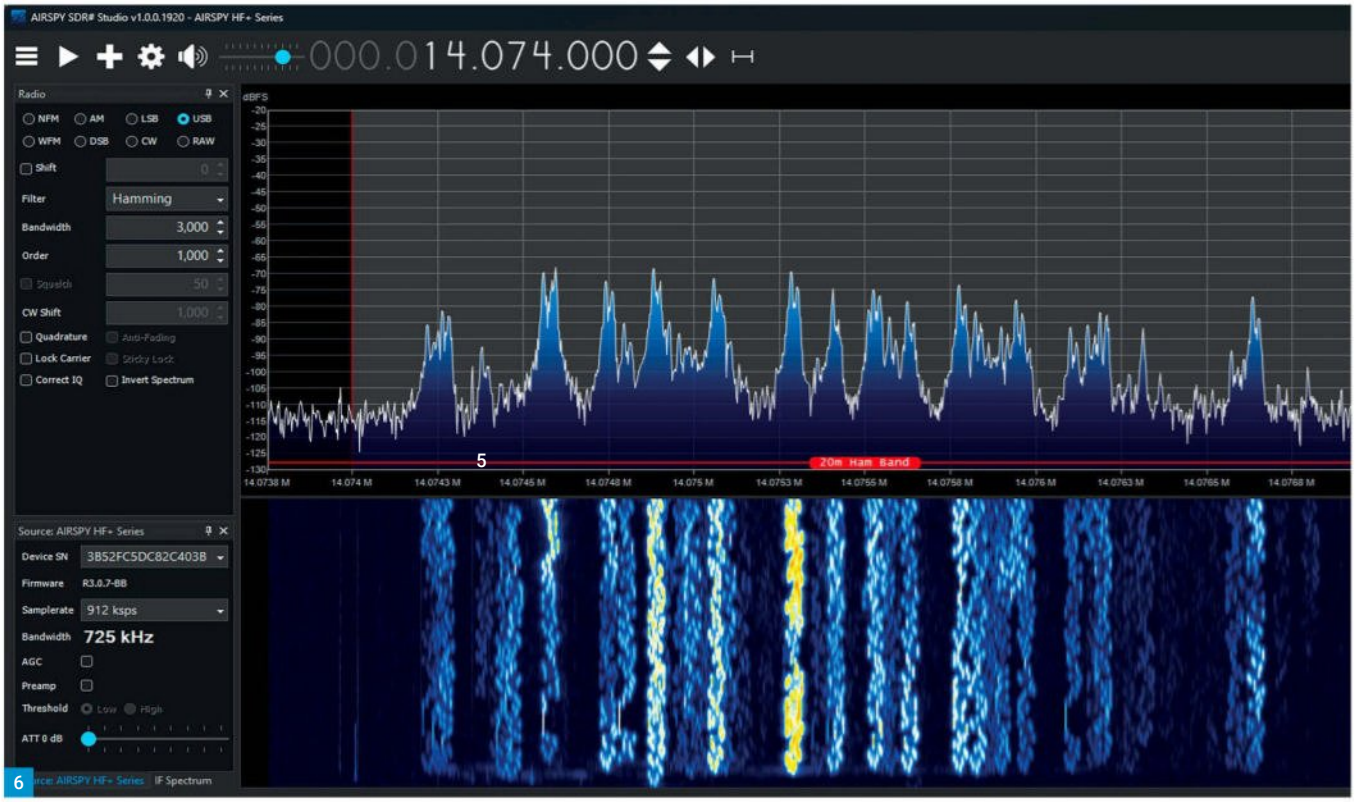
SDR Sharp r1920

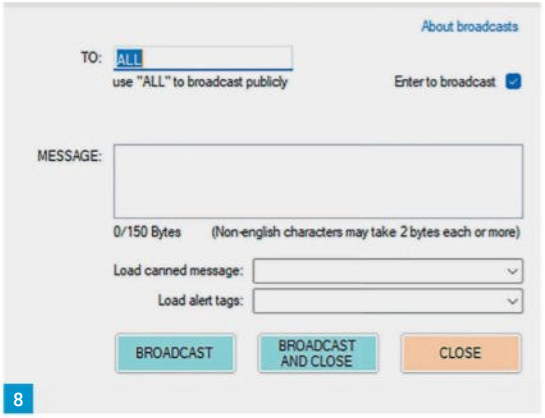
SDR Sharp continues to be one of the most popular SDR applications and is packed with useful and powerful features. The author, **Youssef Touil**, recently rewrote the User Interface (UI) to use his bespoke code instead of the previous Telerik UI software. By cutting out the overhead of the Telerik components, SDR Sharp has benefitted from a significant performance boost. As an added benefit, some of the user-developed plugins that had stopped working are now working again. At the time of writing, release 1920 is only available via the Airspy group on Groups.io. However, I'm sure it will be on general release very soon. In **Fig. 6**, I've shown a screenshot of SDR Sharp r1920, providing a detailed view of FT8 activity on 20m.











VARA-HF update and VarAC bits and bobs

In addition to the new version of VarAC, which I briefly mentioned last month, we now have a new version of the VARA HF modem. VARA-HF version 4.8.7 fixes the COM port list issues affecting some Windows 11 users and adds a new DRIVELEVEL command that VarAC uses when setting the transmit power with the slider next to the tune button.

One useful but often overlooked feature of VarAC is its link to Google Translate. Added a few versions ago, this feature facilitates holding QSOs in non-native languages. The VarAC team have made the facility very easy to use, as I will show you.

Let's begin by looking at how to deal with an incoming message in an unfamiliar language. In this case, you simply right-click on the data stream message and select the last option, which should be Translate. This will open a Google Translate window with the source language already identified in the left-hand pane and the translation already provided in the right-hand pane! Providing you have a reasonable internet connection, the conversion is immediate. If the incorrect language is selected, you can use the tabs above the source and translation fields to correct it. To send messages using a non-native language, keep Google Translate open and enter your English text in the left-hand panel with the language set to English and set the right-hand panel to the desired target language. You will see the translation appear on the right-hand side as you type. Once your message is complete, click the Copy icon to copy the translation and paste it into the new message box at the bottom of VarAC. I've shown the main Google Translate controls in **Fig. 7**.

VarAC group chat

The VarAC team runs a group chat using the Broadcast mode every Sunday between 1400 and 1600UTC. The chat operates on 20m slot 15, which is 14.108,750MHz. If you only want to monitor the chat, use the slot slider to tune to the appropriate band and slot. Broadcast messages will then be automatically decoded and displayed in the central Broadcast message panel.

To join in the chat, click the Broadcast button on the right-hand side and ensure the To field says ALL. You can enter your message in the pop-up Message panel and click BROADCAST to send. In its default state, messages typed in the Message panel are sent whenever you press Enter, **Fig. 8**. Note that the Translate facility also works on Broadcast messages, so mixed language chats are possible, though I've yet to witness one in progress. **PW**

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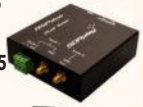

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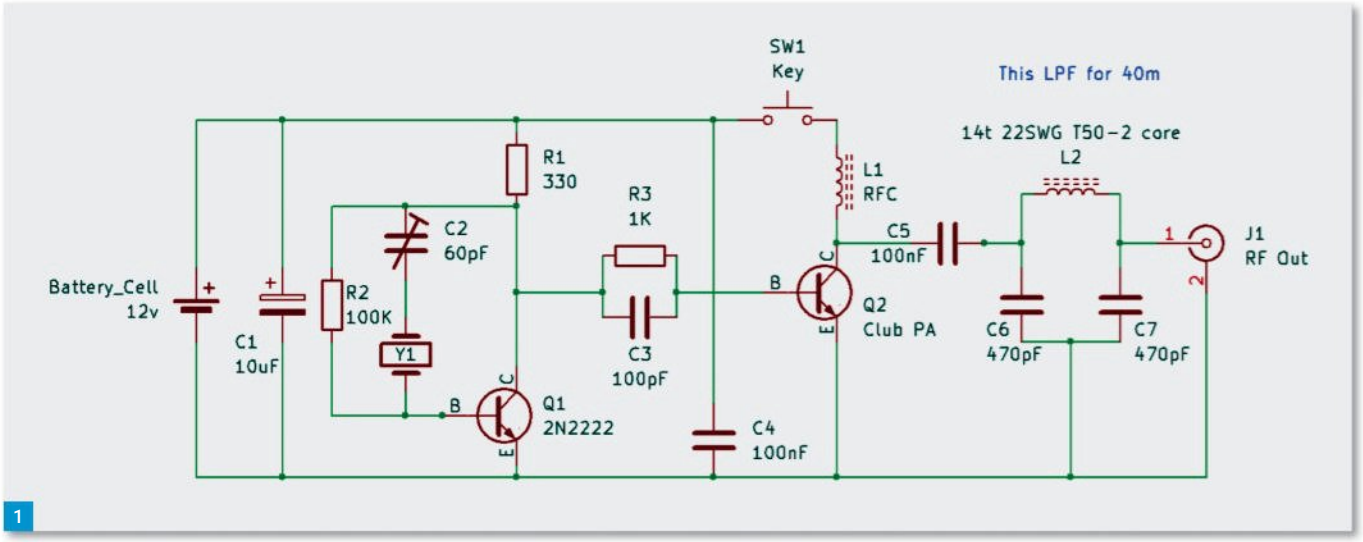


Daimon Tilley G4USI
practicalwireless@warnersgroup.co.uk

Build one, Buy one!

Daimon Tilley G4USI describes a simple yet highly effective transmitter design, built in a matchbox, as well as take a look at a recent addition to his shack, a 1984 vintage Yaesu FT-77S, 10 watt HF transceiver.

In the February edition of this series I took a trip down memory lane and built a Matchbox MW receiver of the type first described in the late 70s and built by me in the early 80's. It was a fun yet effective project.

The building of that receiver got me thinking about the possibilities that a matchbox may hold as a project enclosure and I began to consider if I could build a transmitter in one. Not just a novelty but a transmitter that could bring real-world CW contacts cheaply and in a tiny package.

Back when I was first licensed in the early 80s, I was a member of the G-QRP Club and an avid reader of their magazine, *SPRAT*. Indeed, I am still a member today. In those days, there were lots of designs for simple crystal-controlled transmitters in diminutive packages. A couple that stuck in my mind were the *Oner* on a one-inch square PCB and the *Fag Box* transmitter. Other small designs include the *OXO* and others. Back in those days I was only a young teenager and while I loved reading about these transmitters I never really had the confidence to try and build one.

SPRAT is one of the great benefits of the G-QRP Club, which members receive four times a year as part of their membership, which is just £12 yearly. Another great benefit is 'SPRAT on a Stick'. For the princely sum of £5, members can purchase a USB stick with an indexed archive of every edition of SPRAT back to number 1 in 1975! It is a true treasure trove of practical construction projects.

I began to browse to get ideas. I set myself some basic criteria. The transmitter should be entirely self-contained in a matchbox, needing only an external power supply. It must have an internal key as well as the ability to add an external one, and it must contain its own Low Pass Filter (LPF) for harmonic reduction.

In the end there are only so many ways to arrange a crystal oscillator, so I can in no way claim originality for the circuit, but I experimented on breadboard and came up with the design in **Fig. 1**. This is actually nothing more than a bit of a hybrid of the *OXO* and the *ONER* – both classic circuits in their day, but still very capable now. Indeed, Kanga Products still offer an *OXO* kit, which sells well. Both the *OXO* and the *ONER* were designed by the legendary **George Burt GM3OXX (SK)** with the *OXO* appearing in *SPRAT 28* in 1981 and the *ONER* in *SPRAT 45*, in 1985.

Playing on the breadboard and considering the enclosure size led me to leave out the keying transistor used in the *OXO* and *ONER*. Instead, the oscillator is left running all the time and the key merely keys the supply to the PA transistor. Not keying the oscillator has the benefit of reducing chirp.

Clearly other compromises were required to fit the space available. One was frequency agility. The trimmer capacitor in series with the crystal does allow the transmit frequency to be shifted a few kilohertz, but to fit inside the matchbox I had to use a small trimmer, adjusted by a screwdriver, rather than a polyvaricon, so frequency adjustment is a little fiddly. I decided to build for the 20m band and the trimmer allows me to choose a frequency either side of 14060kHz.

The final compromise was in the LPF. It is common these days to use a 7-pole Chebyshev filter for best harmonic reduction. However, for space considerations I opted for a three-pole filter using just a single toroid and two capacitors. At the low power levels concerned my tests deemed this adequate.

Based on my Matchbox receiver, I used my 3D printer to fabricate a matchbox design, and then scanned, printed and glued a matchbox cover to the outer box section. This allowed a more robust enclosure than thin cardboard, making the rig more durable.

In terms of the circuit, C1 decouples the 12V (or so!) supply. The supply is not critical and leaves room for experimentation and power output changes. R1, R2, C2, Y1 and Q1 form the oscillator and this is both RF and DC coupled to Q2 – the PA transistor. L1 is a Radio Frequency Choke (RFC) and prevents RF entering the supply line as well as acting as a load on the transistor. It consists of as many turns of fine wire as you can get on a small ferrite bead. I think I got about ten turns on mine.

So, a word about Q2. There is plenty of room here for experimentation. I used a G-QRP Club PA transistor, available to members through the Club Shop, but you could try any number of NPN transistors here such as a BD139 or 2N3866, 2N3053, BFY50/51, etc.

In order to squeeze it all in I opted to build using 'ugly' construction. Effectively this is just point-to-point wiring, using the component legs in lieu of PCB tracks. The photo, **Fig. 2**, shows the finished construction and highlights the key components. While a little fiddly, I was pleased to fit it all in.

Fig. 1: Circuit diagram of the matchbox transmitter. Fig. 2: Component layout using 'ugly' construction. Fig. 3: Cutting the heatsink depth. Fig. 4: 20m LPF design.

If you are not familiar with 'ugly' construction, then a close look at Fig. 2 should show you how one component 'hangs' off another. Things like sockets and switches fixed to your enclosure are particularly good anchor points as they cannot move around in the box. It is also possible to use superglue to fix certain components in place, and I did that with Q1 and Q2 in this case. Once complete, the skeleton you create can itself be quite rigid and robust. As with any RF circuit, try and keep leads as short and direct as possible.

Q2 does need a heatsink and I used a clip-on star type, but with the transistor fitted it was too deep for my box. I therefore cut the depth of the heatsink to match that of the transistor (as in **Fig. 3**) and superglued the upturned heatsink and transistor to the base of my matchbox to act as an anchor-point for other wiring.

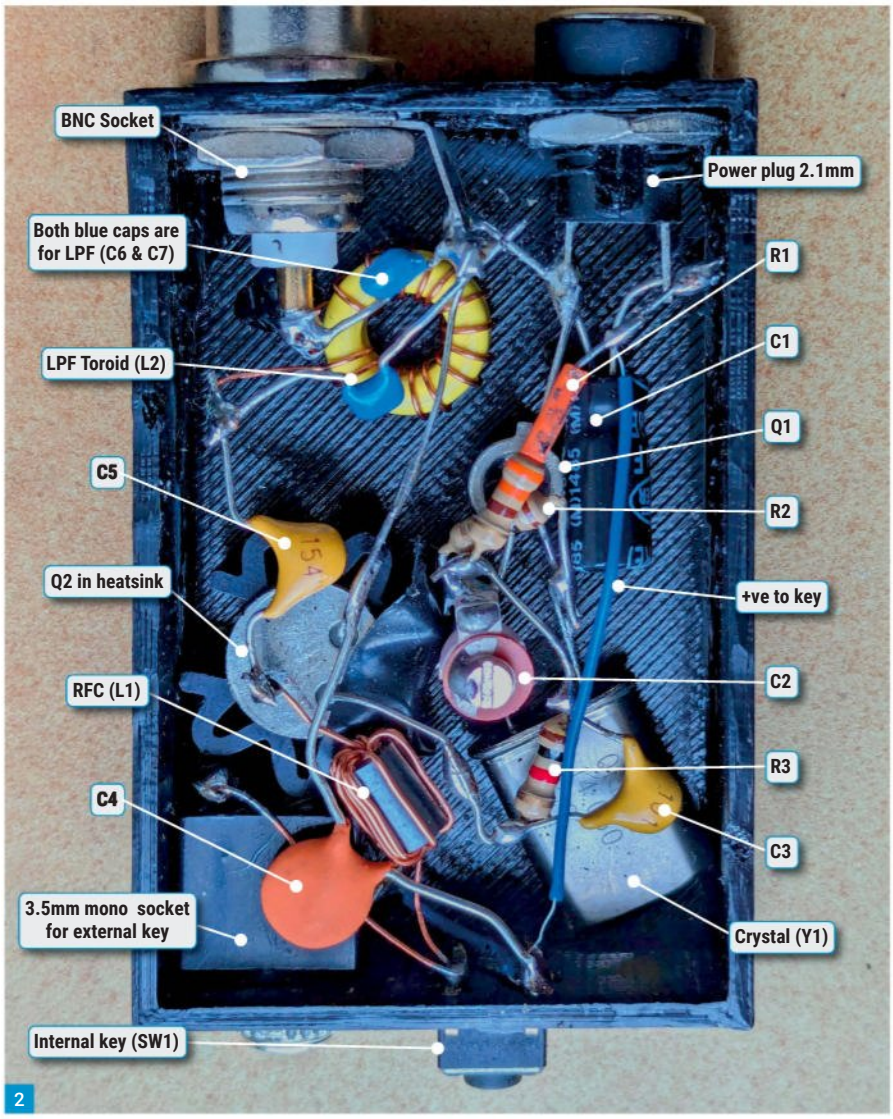
The only other components in the circuit that warrant further description are those of the LPF consisting of C6, C7 and L2. I tend to use high quality NP0 or COG capacitors for my filters as I get better results. As mentioned earlier, this is a three-pole filter, and there are plenty of designs on the web for five and seven pole designs. With some judicious stacking, it would be possible to fit a 5 or 7 pole filter in this box. The LPF shown in Fig. 1 is for 40m. In **Fig. 4** is the LPF design for 20m which I used.

The photo, **Fig. 5**, show the rig in its matchbox with cover, quite a neat job I think!

So having constructed the rig, I popped it onto my dummy load, oscilloscope and frequency counter. Adjusting the trimmer to put the frequency on 14060kHz, the QRP centre of activity, I measured a healthy 1.4 watts of output power. Band conditions were not great that afternoon before Christmas, but I put out some CQ calls and saw I was spotted on the reverse Beacon Network as far away as 2,700 miles to the East into Russia.

A couple more calls and DL1DTX responded. I was using the transmitter with my SDRPlay receiver, and as I tried to complete the QSO I watched my transmit signal drift 700Hz up the band! I soon realised the problem. It was a very cold day and a cold draught was coming into the shack. I was operating the rig without the matchbox cover on and I think the draught was causing the drift. Sliding the cover fully on, the crystal was free from draughts and remained stable. QSOs then followed with DL1HBL and SM4RYF.

Christmas was fast approaching and with it, the G-QRP Club Winter Sports. This is an informal QRP activity over the six days from Boxing Day to New Year's Day inclusive and is designed to encourage members on the air. Each year I set myself a different challenge for this event, all at below 5 watts, but some years I will use only homebrew gear, other years, I will use a different rig each day and so on. For this event, what better challenge than to limit myself to the 1.4 watts from the 'Matchbox Marvel' for the whole event on 20m?



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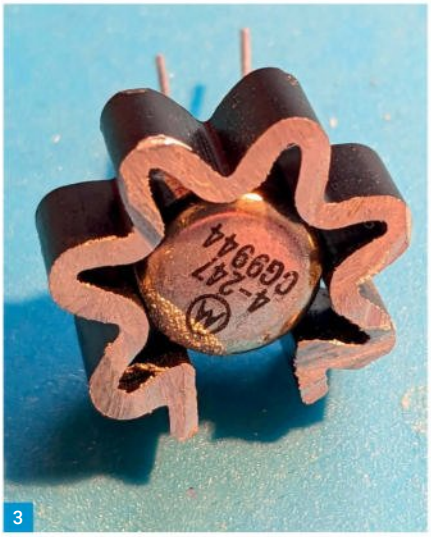
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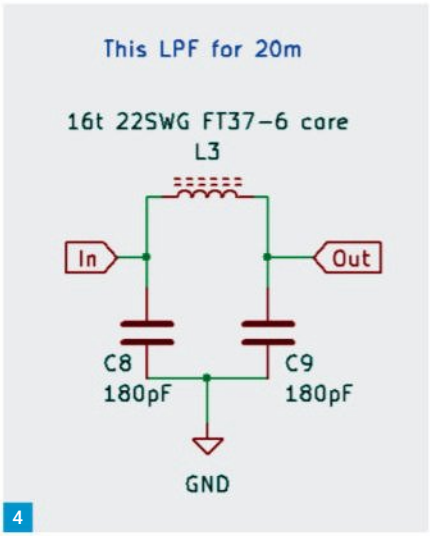

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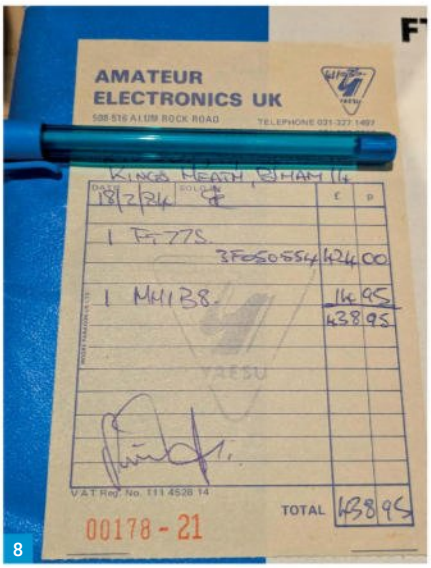

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Fig. 5: The completed rig in its matchbox. Fig. 6: The FT-77S. Fig. 7: Original boxes and manual! Fig. 8: And the original sales receipt from 1984! Fig. 9: The VFO knob as it came. Fig. 10: With the 3D-printed knob cover.

Things went pretty well. Often I was able just to land on 14060, but sometimes that was occupied, so out came the screwdriver to tweak the trimmer capacitor and shift frequency and away I went again. 'Netting' (ensuring I was receiving on the same frequency as I was transmitting) was easily achieved with the free running oscillator and my SDR waterfall.

In the end, over the six days, I worked 46 QSOs with 14 DXCC and was very pleased with the results. Many QSOs were over 1,000 miles and a number at over 2,000 miles. The highlight was working **Ari OH9VL** at 1 watt in each direction and with a received report of 589!

I have made quite a few transmitters over recent years, and have scoured countless articles on those of other people, but I always get a thrill out of using gear I have made myself. Despite all my research though, this is the first transmitter, including a key and LPF, that I have seen in a matchbox or similar size container, with many designs having required the LPF to be external. It matters not in any event, to me this is a little 'Matchbox Marvel!'

As a postscript, one could easily tinker with this design on a slightly bigger scale, and an obvious starting point would be replacing the trimmer with a polyvaricon or similar capacitor, that can be tuned by hand. If you are new to this type of construction, then it is perhaps worth pointing out you would get a greater range of coverage by trying a few additional tricks. These include putting two crystals of the same frequency in parallel, and adding a series moulded inductor in line with the variable capacitor and the crystal. You just need to be careful that you don't try to swing the frequency too far and end up with instability or other problems. Why not have a go?

A used bargain

Just yesterday I collected (yet another!) HF transceiver to add to my collection. You will know by now that I have an affinity for QRP CW working, and own a number of 70's/80's QRP rigs. Browsing through a social media site I came across an amateur in Exeter (about 45 mins south of me) selling a Yaesu FT-77S. This rig, in the 'S' version is the QRP (up to 10W) HF transceiver of its bigger brother the FT-77 (**Fig. 6**). Manufactured by Yaesu during the early 80s, I am not sure how big a seller it was as I haven't seen many around, and even less of the S version. Production ran, from what I can discover, from 1982 to 1986.

Both versions cover 80 – 10m, including the WARC bands (30, 17 and 12m), and by default are SSB/CW rigs, with the ability to add an optional FM board. The rig was advertised as working, having been stored for 30 years, and was for sale at £250. When I first saw the rig, I was mildly tempted, but did not progress it. A week or two later its price had been reduced to £200. I dropped the fella a message and we struck a deal at £180 collected.

Yesterday I collected it and was delighted to see that it was pretty much immaculate, with the exception that the rubber cover for the VFO knob had long since perished and disappeared. It was in the original Yaesu double-boxed packaging with original foam, the MH1-B8 microphone (also boxed) and with the power lead and original instruction manual, **Fig. 7**. Finally, it contained the original sales receipt for £438.95 dated 18/2/1984 for the rig and microphone, **Fig. 8.** Putting these numbers

into an online inflation calculator revealed that that would be £1,768.20 in today's money, interesting especially as all of the advertising literature, and indeed the manual, announce the rig as *"The Thrifty Transceiver"*.

Lifting the covers revealed unmolested internals, and while the optional FM board was not fitted, I was delighted to see that someone had later installed the Yaesu 300Hz CW filter, which was great news, as trying to copy CW on an SSB filter on a busy band is not my idea of fun!

Connecting to the dummy load I was pleased to see a full 10W of output on each band, but there is a Drive control, so I will mostly use 5W or less. Switching to my Yagi, I immediately worked II1GM/IT9 on 28MHz.

I am really looking forward to getting acquainted with, and using this rig. It hails from the time that I was first licensed and is as simple and no-frills as it gets, with all controls on the front panel and no menus to concern yourself with. Front panel controls include a Mic Gain / Drive control, Attenuator, Noise Blanker, Fast AGC, a fixed frequency mode (with optional crystal) and a Clarifier control, as well as the usual band and mode switches. The only thing I miss, commonly not included on rigs of this era, is an iambic keyer, so I will either use one of my external units, or perhaps build one inside (there is plenty of room).

Another hint to a bygone era is a comprehensive manual that, as well as including specifications and operating instructions, also includes full circuit diagrams, component lists and alignment instructions!

To end, within a day, the lack of the cover for the VFO knob was troubling me. I couldn't see that spares were available, so I decided to design and 3D print a cover for the dial that would look similar to the original and have a detent for fast tuning. After some careful measuring and CAD work (the knob is slightly conical in diameter) I came up with a design, printed it in PLA and it fitted well first time (a rare treat!). The photos, **Figs 9** and **10**, show a before and after picture. I have uploaded the 3D STL file to Thingiverse.com for others to use if they wish:

www.thingiverse.com/thing:6565641

So that is it for this month's *On a Budget* with a simple transmitter you can build for pennies and vintage transceiver for little money. Until next time, 73. **PW**

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10

Steve Telenius-Lowe G4JVG
teleniuslowe@gmail.com

Looking back and forward

Steve Telenius-Lowe G4JVG looks back at a month of significant DX activity and forward to what we can expect during the month to come.

Welcome to the June *HF Highlights*. This is the first column I am compiling from England, having moved back to the old country from Bonaire in late March. As we are renovating our home I am unlikely to be active for a while yet, which makes it all the more important for me to receive your input to the column. This month we have contributions from no fewer than six countries including, in what must surely be a first, the Solomon Islands. But if you are at all active on the HF bands, no matter on what modes and whether running QRO or QRP, please do let us know about your activity or your plans for your station. Do you enjoy DXing, working special event stations, collecting certificates, or do you perhaps prefer just to have a 'natter'? Do you take part in contests, whether seriously or just to give a few points away (or do you avoid them like the plague!)? Please let me know. Photographs of your station, antenna(s), or just you in your 'shack', are particularly welcome.

The month on the air

April marked the 150th anniversary of the birth of **Marconi** and the certificate shown in **Fig. 1** is available for working a series of special event stations that were active from all over Italy during the month. Full details are at:
assoradiomarinai.it/marconi/regolamento.html

From Benin, TY5C was active between 3 and 29 March, making almost 46,000 contacts.

After their activity as FW8GC and TX8GC from Wallis and Futuna, **Stan** and **Ted** moved on to New Caledonia from where they signed **FK/LZ1GC** and **FK/LZ5QZ** between 10 and 18 March. They used SSB, CW, FT8, FT4 and RTTY on all bands.

The J38R DXpedition from Grenada continued until 16 March and created a lot of interest on the bands. They ended up with 91,000 QSOs, quite a few of which were with the contributors to this column: see 'Band highlights' below.

Six German operators were active as T32EU from Christmas Island, Eastern Kiribati, from 13 to 26 March with three stations on the air 24 hours a day.

Nobby G0VJG operated as 5H3VJG from Zanzibar (IOTA AF-032) in March and closed down on the 20th with about 4000 QSOs, mainly on SSB, in his log.

Eleven members of the EI DX Group, supplemented by well-known European operators **Ronald PA3EWP** and **Heye DJ9RR**, were active as 7P8EI from Lesotho between 21 and 29 March, achieving nearly 55,500 QSOs. They were active on all bands from 1.8 to 50MHz, using CW, SSB, FT8, FT4 and RTTY.
http://7p8ei.eidxg.com

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The Czech DXpedition Group started activity as A8OK from Liberia (normal prefix EL) on 5 April and by the deadline date of this column on 11 April they had already made around 70,000 QSOs with several days still to go.

CQ WPX SSB Contest

The CQ WPX SSB contest took place over the last weekend of March. This is a contest in which I have been lucky enough to have picked up a few winning plaques over the years, e.g. **Fig. 2**. As I had only just returned to the UK a few days before the contest I didn't participate this year, so I was interested to read the report posted on the '3830 Scores' website (www.3830scores.com) by **Andy Cook G4PIQ**: *"This was our first attempt at multi-multi for M6T for WPX. Usually we've been too short of operators, but on Friday this year, it looked like we just about had enough people (six full time, four part time) for a limited MM entry so we decided to go for it... On the Saturday, HF conditions were mostly great. Great runs on 10m to JA and W / VE plus remarkable activity from Brazil and China. 15m seemed less good – probably due to so many people being active on 10m. 20m suffered from day-time absorption to the US (and maybe activity moving to 10 / 15) and only really got going after 1900. 40 was steady, but 80 was disappointing – feeling very noisy (probably absorption again) and poor to North America, at least until the early hours of the morning.*

"On the Sunday, things were definitely impacted by the arrival of the CME from an X1.1 flare. The HF bands were less 'sparky' – though there were still JA openings on 10 and 15, but the afternoon brought no direct path 10m opening to North America which was a tremendous disappointment, and the 15m opening was less good..."

The ten operators, G0AEV, G0VJG, G0WCW, G4BUO, G4PIQ, G4PVM, G4TSH, G7TWC, M0BCT and M0SDV, made 11,486 QSOs and are believed to have come in second place world-wide in the multi-multi category, behind only CN3A in Morocco. Take a look at Andy's posting on the website for a list of the equipment and antennas used to make this great score:
https://tinyurl.com/5acuz34k

What to look for in May – June

The eighth rarest DXCC entity in the world (according to Club Log's 'Most Wanted' data), the Glorioso Islands, is scheduled to be activated between 24 May and 19 June. The call FT4GL has been allocated to **Marek FH4VVK**, who will be working on the island of Grande Glorieuse and operating in his spare time.

W6IZT and W8HC will be active from French St Martin (FS) between 25 June and 2 July. They also plan to set up a remote RIB station on the Dutch side of the island, PJ7.

Dave WJ2O plans to operate on HF CW from Pitcairn Island (VP6) between 30 May and 10 June.

Look for C91AHV to be on the air from Mozambique from 1 to 15 June. This will be **Pedro CT7AHV** who wrote on his QRZ.com page that he will operate FT8 on 10, 15, 20 and 40m from 4 to 7 June, SSB on the same bands from 8 to 11 June, and SSB and FT8 on 6m from 12 to 15 June. He added *"Probably I will operate CW too..."*

Special event station TM83JO, **Fig. 3**, is on the air to celebrate the journey of the Olympic flame from Greece to Paris. The station will be activated on 15 separate days between 16 April and 26 July: in June look for TM83JO on the 8th, 9th, 21st, 22nd and 23rd of the month using CW, SSB and digi modes.

Finally, the largest amateur radio get-together in Europe, the Ham Radio exhibition, **Fig. 4**, in Friedrichshafen, southern Germany, takes place this year from 28 to 30 June. This is an opportunity to see the latest transceivers, antennas and other equipment, pick up a bargain in the ham radio flea market and meet your fellow radio amateurs from all over Europe and further afield – indeed, for many amateurs it is as much a social event as an equipment exhibition.
www.hamradio-friedrichshafen.com

Readers' news

It was good to hear from an old friend, **Bernhard Stefan H44MS/DL2GAC**, who I first met in 1991 when he visited Papua New Guinea, where I was working at the time. Bernhard has been visiting that part of the world almost every year for nearly

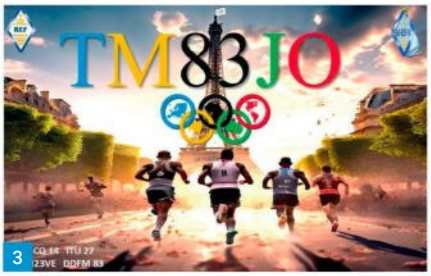
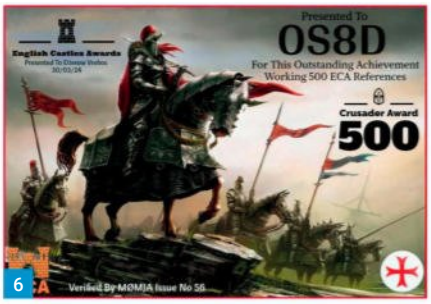


Fig. 1: This certificate was available for making contacts with Italian special event stations in April. Fig. 2: The CQ WPX SSB contest is one of my favourite operating events of the year. Fig. 3: Special event station TM83JO celebrates the journey of the Olympic flame from Greece to Paris. Fig. 4: The Ham Radio exhibition in Friedrichshafen. Fig. 5: A Solomon Islands sunrise close to the H44MS QTH. Fig. 6: Our man in Belgium, Etienne OS8D, received this certificate for contacting English castles.

a quarter of a century, these days mainly staying in the Solomon Islands. He wrote from there saying: *"Attached some pictures from local Malu' town market last Saturday shortly after sunrise, about three kilometres from here over an unsealed road with lots of water-filled potholes."* Bernhard was active as H44MS from Malaita Island (IOTA OC-047) from 10 February to 24 April on SSB and FT8. **Fig. 5** shows the fish market at Malu', with the Pacific Ocean in the background.

Jim Bovill PA3FDR said that he had less than usual time for the radio this month but still managed a respectable number of DX contacts. *"New countries were Cambodia (XU7GNY), East Malaysia (9M8HAZ) and Lesotho (7P8EI). Among the others were several rarer previously worked stations including Fiji (3D2AG), Cayman Islands (ZF2OO), Vietnam (3W9T) and Mexico (XE2J). The latter was only the fourth contact with this country in the past four years, and it has intrigued me that so few stations are seen by me from such a large country compared with those from the USA and South America. I also worked for the second time in two months PJ5/SP9FIH on the Caribbean island of St Eustatius. This time I looked up this Polish operator in QRZ.COM and discovered that he has spent 40 years DXpeditioning between 1984 and 2024 operating from various places and in that time has managed to log over 600,000 QSOs, a quite incredible achievement. Another interesting QSO was with FG5FI from Guadeloupe who was operating from on board a ship off the West African coast."*

Our Belgian castles activator, **Etienne Vrebos OS8D**, made around 1300 QSOs in March, of which 1000 were made activating castles. *"Being the source of the pile-up is definitely my passion actually and [it's] easier to get to a Belgian castle than being somewhere on an isolated island middle of the Pacific Ocean! Got my 300th castle activated in Belgium and got a nice UK award for chasing 500 English castles"* (see **Fig. 6**).



Carl Mason GW0VSW sent in his regular QRP report. Normally a CW aficionado, Carl wrote: *"I entered CQ WPX with the Xiegu G90, 5W SSB, into the inverted G5RV. Things started well but by the evening of the first day I began losing my voice. It seems I had picked up a virus and even after an early night and dosing myself up Sunday was a struggle. Eventually I called it a day, which was a shame as conditions seemed pretty good on most bands with plenty of DX around."* Carl worked a

Fig. 7: The portable station used by Ken EA5/G4VZV from the *salinas* near Alicante.

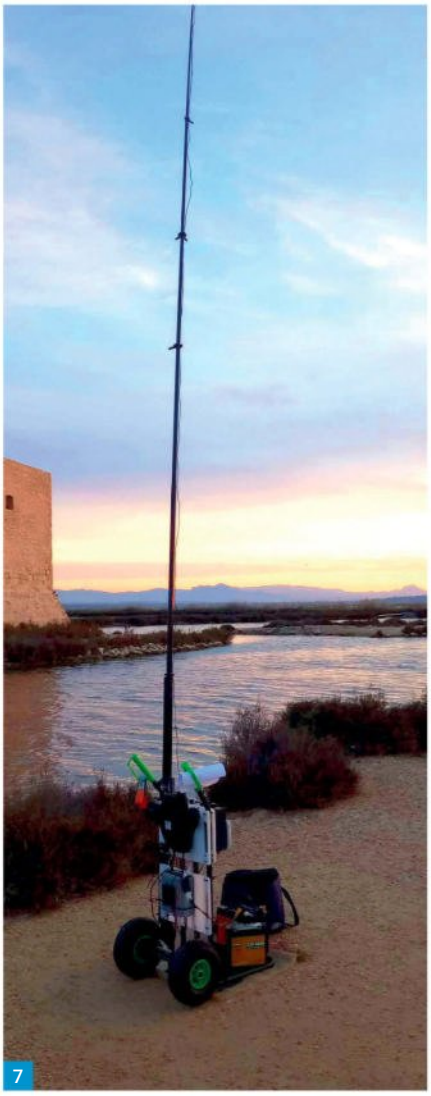
total of 54 DXCC entities: good going using SSB at QRP power levels and with only a wire antenna.

Owen Williams G0PHY had a quiet month on the air: *"Activity this month was curtailed due to two weeks spent in a wet and windy Cornwall. I made use of the new power limits to work J38R on 14MHz using 600W, but apart from that everything else was worked using 200W. Further contacts were made with J38R on 7 and 18MHz. I was particularly pleased to get them on 7MHz as conditions were not that good. I managed to work A80K on 24MHz but checking on Club Log Livestream I was logged as G0PHW. I was not too surprised as I was using my 14MHz dipole and there was heavy QRM, but there's still some time left to get them. The rest of the month promises to be busy with the SES for the 75th anniversary of the Spanish national society."*

Tim Kirby GW4VXE wrote that conditions seem to have been markedly poorer over the last month than we had become used to. The combination of lower solar flux and the onset of 'summer conditions' made the higher bands, in particular, much harder work. Nevertheless, Tim said: *"I've heard VKs coming through in the morning on 10m on a fair number of mornings. One evening, admittedly on FT8, I was surprised to work VK long path – always an interesting path."* Tim wrote that generally he doesn't operate much FT8 from home, but when he is away from home it's easy to control the shack computer and make a few FT8 contacts. Tim feels that you get a real sense of how the propagation is moving on FT8 in a way that would be unlikely to happen on CW or SSB.

On the subject of remote control, Tim said he thought it would be fun to also try to operate CW when he is away from home. *"Fortunately, the TS-590SG offers a fairly simple solution, with separate applications to send sound from the host to remote stations and a second application to control the rig. A small amount of work on the internet router was required, but I was very happy to have **Allan GM4ZUK** test the remote control of the TS-590SG and report that the audio quality was excellent – Allan was able to tune the rig and control it successfully. The TS-590SG control program allows you to type into a window which is then converted to Morse to be sent, which will work fine, but with the K1EL Winkeys, it looks like you can use a paddle at the remote station, which will be fun to try."*

Ken Churms EA5/G4VZV operated for most of March from the salt lagoons south of Alicante using his two-wheel sack trolley station, **Fig. 7**. Most of his activity was on 14 and 21MHz, with some activity on 7MHz in the early evenings. There were many CMEs in March but despite the frequent solar activity Ken worked numerous VK and ZL stations especially during the early



morning long-path opening to the Pacific area. Ken contacted **Alex VK2PRC** several times when Alex was operating portable using QRP by the sea or in a local park. Other stations worked included E51JD, YB3RPS, J8NKI, HS0ZHO and FK8GU. Ken is a member of the Denby Dale radio club and worked many of his colleagues on 14 and 21MHz. He is returning to the *salinas* again in May.

28MHz beacons

Neil Clarke G0CAS reports that during March the number of 28MHz European and World-Wide beacons that were logged declined. In North America 4U1UN 28200 was heard on 19 days but W6WX only on 10 days. The US call areas 1 to 5 were heard on more than 20 days during the month but beacons further west, for example in W6 and W7, were only heard on 10 and 2 days respectively. Further north in Canada VA3KAH 281168 was logged on 19 days. Now looking towards the Pacific, VK6RBP and ZL6B were logged on 16 and 2 days respectively. The Italian beacons IT9EJW 28250 and IQ8CZ 28230, along with OH5TEN 28230 and OH9TEN 28267, which had all been logged almost daily since last autumn suddenly (but expectedly) stopped being logged a few days either side of 14 March. In the Middle East, 4X6TU 28200, 5B4CY 28219 and YM7TEN were heard almost every day of the month. April usually signals the start of the summer Sporadic E season, so hopefully more European 28MHz beacons will find their way into this report next month.

Band highlights

Key: Q = QRP, M = 100W, H = >100W, S = Single-element antenna, B = Beam (see January *HF Highlights* for a more detailed explanation.)

Jim PA3FDR (MS): 7MHz FT8: 9K2ES, HS60RAST, W3UA. **10MHz FT8:** FG5FI, HK3W, V31DL. **14MHz FT4:** KZ9DX, ZL3IO. **14MHz FT8:** 9M8HAZ, AF6O, HS0ZOY, VK3IK, VK7XX, XE2J, XU7GNY, YC7UFI, YV5JLO, ZF2OO. **18MHz FT4:** 7P8EI, AD8IO. **18MHz FT8:** 3D2AG, 3W9T, AF8Z, CE3BT, CO8LY, HI180RD, JA1OVF, JR8NOD, PJ5/SP9FIH, R9CA/QRP, UN7ZZ, VE2FVV, VK1OO, VK2WN. **21MHz FT4:** JH2RIH, K6AFW, RU0LL, UN7QAT, VE2YFI, W7MWR, YE4FNN. **21MHz FT8:** A71UN/P, CE6UFF, JA1YIL, LU1HB, R9LF, VE3NOO, ZL3IO. **24MHz FT4:** JJ2IJU. **24MHz FT8:** JR7RHO, KF7PG, OX3LX, RX0F, UN8PC, VR2XMT, ZL4AS. **28MHz FT4:** JJ2IJU, RA9H. **28MHz FT8:** A92AB, BG8GAM, JH8FIN, UA0QNE.

Etienne OS8D (HB): 7MHz SSB: J38R, J62K. **14MHz SSB:** J38R. **18MHz SSB:** J38R, UN/R6DVV. **21MHz SSB:** J38R, V85NPV. **24MHz SSB:** 7P8EI, AP5ARS, HR5/F2JD, JY5FA. **28MHz SSB:** 3W9T, 7P8EI, CA4OMQ, LU9DNR, NP4DX, PJ4KY, PY2BRP, UK8GL, UN/OH7O, V4/WB8IZM/P, YJ0CA.

Carl GW0VSW (QS): 1.8MHz SSB: M6T. **3.5MHz SSB:** HB0DX. **7MHz SSB:** CG3A, CN3A, D4C, K1LZ, VO1KVT. **14MHz SSB:** 3V8BB, A44A, AC6ZM, CN3A, D4C, FM8QR, HZ1MW. **21MHz SSB:** 3V8SS, C4W, CN3A, RA9P. **28MHz SSB:** C4W, PR1T, TA2NC.

Owen Williams G0PHY (HS): 7MHz SSB: J38R. **14MHz SSB:** J38R. **18MHz SSB:** J38R. **28MHz SSB:** V31XX.

Tim GW4VXE (MS): 14MHz FT8: 5Z4VJ, VK1RD, VK3XV, VK5XB, ZL3RIK. **28MHz FT8:** A61BG, CX4RL, EK/RX3DPK, HC1DAZ, HI180RD, JR6EZE, PJ2/DK5ON, V31DL, VK2HJ, VP8LP.

And, as **GW4MM (MS): 7MHz CW:** DU7ET. **14MHz CW:** A8K, V26K, VK2GR. **18MHz CW:** 4K0CW. **21MHz CW:** 5R8AL, 9K2NO, HK1MW, HP1IBF, KP2/WP3C, KP4DX, PJ2/WI9WI, UN1L, V26K, VE7NZ, VK6T, VY1AAA, XQ6CF. **28MHz CW:** 7P8EI, 9J2BO, J38R, TA1BJ, PJ2/WI9WI, UN5G, VU2TMP, ZD7BG.

Signing off

Thanks to all contributors. Please send all input for this column to teleniuslowe@gmail.com by the 11th of each month. For the August issue the deadline is 11 June. 73, Steve G4JVG. **PW**

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A 160 and 60m Antenna for the Small(ish) Garden

"160 metres: you need acres of land to operate on 160!" Not so: while no efficient 160m antenna can be said to be truly small, this one is smaller than most and will fit into many a suburban plot. What's more, it performs well on 60m too!

Steve Telenius-Lowe PJ4DX (G4JVG)
teleniuslowe@gmail.com

When I moved to Bonaire in 2013 I was lucky enough to be able to put up a good DX antenna for 160m. It was a quarter-wave inverted-L with ground radials, made with an 18m Spiderbeam fibreglass pole sitting on top of a 6m aluminium pole. The vertical part of the antenna was 22.5m (73ft) high, while the horizontal part was tied off with string to a lamp post some distance away. I put the antenna up on an empty plot of land adjacent to ours.

It performed very well and I worked over 100 DXCC entities on 160 using CW and SSB (this was before FT8 had been invented!). Serendipitously I discovered it was also an excellent low-noise receive antenna on 80m, outperforming both a K9EL loop and a 200ft 'BOG' (Beverage On the Ground). Unfortunately, after being in use for seven years the wire broke off at the top and for various reasons I was unable to replace it. Instead, I made a 35µH loading coil and turned the antenna into a loaded vertical (see *Base-Loaded Verticals for the Low Bands*, *PW*, June 2020). This also worked, though I felt it was never quite as effective as the big inverted-L had been.

The time came when the adjacent plot of land was sold, so this antenna had to come down. The empty plots around our house were gradually being built upon: any new antenna would have to be in our own garden. For a while I was off 160m altogether. I did not think I had enough space for a 160m antenna as our own garden already had a Hexbeam and separate quarter-wave verticals for 30, 40 and 80m in it. However, pacing it out, I realised that a quarter-wave inverted-L would fit in – just.

The design

There's nothing special about this antenna: it's simply a quarter-wave wire inverted-L with the vertical section wound around the fibreglass pole used for the earlier antennas, **Fig. 1**. However, what had originally been an 18m-long fibreglass pole was now considerably shorter. The top section had been deliberately removed: it is fine for a pure vertical but far too thin to support a horizontal wire, particularly one as long as this would need to be to work on 160m. On top of that, the pole had been in the tropical sun with its very high UV radiation for ten years and this caused the fibreglass to split. One day the pole broke into two about 2m from the bottom and the repair job meant the total height was now only around 15m. Furthermore, because I had guyed the pole too low down, it bent dramatically with the weight of the horizontal wire, meaning the top of the pole was lower still, **Fig. 2** (hindsight is a wonderful thing

Fig. 1: The new inverted-L. To the left is the Hexbeam. The inverted-L's horizontal wire can just be seen above the Hexbeam. Fig. 2: The 'banana vertical': view side on, and from a distance. Fig. 3: Support for end of the antenna on the front fence. Fig. 4: Elevated radial lying on top of the cactus side fence. Fig. 5: The end of the antenna is not far above the house roof. The double insulation can be seen here.

and if I were to make this again, I would guy it somewhat higher up the pole).

The 'horizontal' section is not actually horizontal at all, but slopes down to a short pole (made from a rusty old mop handle) fixed on the front fence, **Fig. 3**. A number of random-length wire radials lie on the ground or are 'slightly elevated' (not really elevated enough), lying along the top of two cactus fences, **Fig. 4**.

Making the antenna

I used 1.5mm solid copper wire for the vertical part of the antenna, and wound it around the fibreglass pole with two or three turns every metre. This was mainly for aesthetic reasons, to stop the wire flapping against the pole in the wind and so that it was unnecessary to secure the wire with sticky tape, but in theory it also provides a (very) small amount of loading and approximates to a 'fat' vertical, making the antenna (slightly) more broadbanded. (Whether or not it really has any positive effect I can't say, but it can't do any harm.)

At the top of the pole I fixed a small insulator and soldered a length of lightweight stranded wire to the solid copper wire, covering the solder joint in self-amalgamating tape. The insulator was simply to provide strain relief, so that the weight of the horizontal wire did not fall on the soldered join.

I 'guesstimated' the length of the horizontal wire to be around 23m, based on the calculation that the total length of wire would be around 38m for a quarter-wave at 1.87MHz (the vertical part was around 15m, so 38m minus 15m = 23m). 1.87MHz was chosen as the design frequency because, although I would mainly be operating on FT8 at 1.84MHz, I might also want to operate SSB above 1.9MHz. Having the minimum SWR at 1.87MHz would mean it should be usable, with an SWR of 2:1 or better, from close to the bottom of the band to somewhere above 1.9MHz.

At the far end of the horizontal wire I fitted a lightweight insulator, followed by a short length of insulated wire and then light string to the pole on the front fence. The reason for this double insulation is that experience has taught me that, when using high power, the voltage at the end of the wire is sufficient to bridge the first insulator and can (and will!) burn through light string. The end of the antenna ended up

only a few centimetres above the house eaves, **Fig. 5**.

At the feedpoint initially I just connected the inner of the coax to the antenna wire and the braid to the radials. I used cheap 50Ω RG-58 coax, as its loss at 1.8MHz is negligible (unless you have a *very* long run of feeder which, if you have a small(ish) garden, is never going to be the case).

Making measurements

Using a calibrated NanoVNA, I checked the frequency of lowest SWR – and found it was well below the bottom of the 160m band: the antenna was too long. The nice thing about making antennas for 160m, as opposed to VHF/UHF antennas, or even ones for 10m, is that you don't have to be too accurate with your measurements: there is a lot of leeway! I removed 1.5m of wire and did the measurement again. It was closer, but still below the bottom of the band. I removed a further 1m of wire and the minimum SWR point was now at 1.832MHz, although the SWR was close to 2:1. I decided to quit while I was ahead: 1.832MHz would be perfect for use on CW and FT8 as well as the lower part, at least, of the SSB band.

But how to reduce the SWR to closer to 1.0:1? I decided to try a small coil at the feedpoint, in series with the vertical part of the antenna. Bingo: 1.4:1 at 1.832MHz (see **Fig. 6**) – good enough for me. There was no science involved here, I just tried a small enamelled coil, **Fig. 7**, I had in the junk box and tried opening it out and squashing it until I found the best result (which was squashed as much as possible). The 2:1 SWR points were now at 1.77MHz and 1.88MHz. I could have shortened the antenna further so that the 2:1 points were both within the band but I believe in something being 'good enough' rather than always striving for perfection!

Performance

So, how does it work? The antenna was put up in autumn 2023 and at first I heard no activity at all on CW or SSB and was only able to decode some weak US stations using FT8 (bear in mind we are nearly 3000km from Florida and over 6000km from the US west coast). Even so, this was disappointing! But on 5 October, to my surprise, ZD9W from Tristan da Cunha was decoded on FT8. Although he had many callers I got through quickly. Thinking that might have been a fluke, I called **Eva PJ4EVA** into the shack and she worked him with her callsign only eight minutes after my QSO. The antenna *was* obviously working! Working ZD9, on 160m, through a US pile-up, as the first and second contacts on a new antenna was quite impressive.

Several days later ZD9W was spotted on the *DX Cluster* on 80m FT8 but I was unable to decode him. Remembering how good the earlier 'big' 160m inverted-L had been as a receive antenna on 80m, I tried the new one and, sure enough, the noise level was reduced sufficiently for me now to be able to decode him. Although very noisy on receive, the 80m vertical works well on transmit and once I was able to receive

Fig. 6: NanoVNA showing SWR dip at 1832kHz. Fig. 7: The matching coil, housed in a Haribo box (devour the contents first!). Fig. 8: Third harmonic SWR dip: not too far from the 60m band. Fig. 9: Early-evening session on 60m FT8 using 25W (2215UTC is 6.15pm here).

ZD9W a QSO followed quite easily.

In December I gave the ARRL 160m CW contest a try. Once again it was very disappointing, but I later discovered that propagation had been particularly poor that weekend and everyone – even the big 160m contest stations – had found it hard going. Conditions were better, though still not spectacular, for January's CQ 160m CW contest, when I worked 16 US states, Ontario and Quebec in Canada, several Caribbean, Central and South American countries and, best DX, D4Z in Cape Verde and IG9/S57DX on the island of Lampedusa.

As we approach the peak of Solar Cycle 25 propagation on 160m is well down on that of a year or two ago when solar activity was lower. There are still some good days, though, and on 7 January I hit upon one and had 160m QSOs with Cyprus, Switzerland, Serbia, Latvia, Belgium, Finland and Poland, as well as with more local stations in the Caribbean, Mexico and USA. These contacts were all on FT8: like it or not, outside CW and SSB contests or some major DXpeditions, most activity on 160m is now on FT8. The TX5S Clipperton Island DXpedition was worked with ease on 160m CW on 25 January using the new antenna.

The 5MHz (60m) band

When 5351.5 – 5366.5kHz was allocated in Bonaire, in my enthusiasm to try the new band I put up a quarter-wave vertical on a 14m fibreglass pole. At that time I was only active on SSB and CW and I soon discovered that almost all activity on 5MHz was on the then new mode of FT8, which I had never tried. I made very few QSOs on 'the legacy modes' and, disappointed with the lack of activity, I took down the antenna and used the pole for other antenna projects.

I started using FT8 at the end of 2020 by which time the 160m antenna was the base-loaded vertical. Unfortunately this did not work on 5MHz: the relatively high *Q* of the loading coil prevented its use on other bands. The 80m vertical worked on 5MHz after a fashion, but was not very efficient and there was a high SWR at 5MHz.

It's well known that antennas can also be used on their third harmonic (e.g. a 40m dipole also works on 15m: 3 x 7MHz = 21MHz). As the third harmonic of 1.8MHz is 5.4MHz, I figured the new inverted-L should work on 60m. The NanoVNA showed the minimum SWR to be at 5143kHz (a lower frequency than I had been expecting), where it was about 1.7:1 (**Fig. 8**). At the FT8 frequency of 5357kHz the SWR was above 2:1, but I found the Icom IC-7300's internal ATU was easily able to match it to 1.0:1. As we're only allowed 25W EIRP and the rig's ATU allows me to put out full power, I have to reduce the IC-7300's output to remain legal on 60m.

The results are impressive: the new inverted-L was a revelation and at last people started to reply to me! On 23 January decodes from the TX5S Clipperton Island DXpedition were coming and going due to their weak signals but I still managed a completed QSO using 25W. A couple of days later, an early-evening session on 5357kHz FT8 is shown in **Fig. 9**: this is now typical of evening or late-night operating on 60m.

Summing up

I called this article *A 160 and 60m Antenna for the Small(ish) Garden*. But how small is 'smallish'? The horizontal part of the antenna ended up being about 20.5m (67ft) in length – short enough to fit into many suburban gardens. The reason it was shorter than I had calculated is probably because, in terms of wavelength, the antenna is very close to the ground and is capacitively coupling to it.

If I wished, I could have shortened the antenna by further trimming it to have minimum SWR at the original design frequency of 1.87MHz. And, if I could have made the vertical section greater than 15m, the horizontal part would have been shorter still. Note that the longer the vertical section, the better the antenna will perform. When I was using the 'big' inverted-L, I received reports that my 160m CW signal in USA was at least as good as that of a contest station here on the island. I admit I haven't had similarly fantastic reports with the new, much lower, antenna but my experience over the last five months is that it is working 'well enough': beggars can't be choosers and given the restricted space it was the best I could do. Far better to radiate some sort of signal on 160 than not be on this fascinating band at all! **PW**

Inverted-Ls

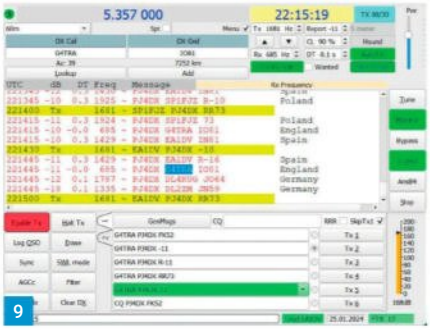
I've long been a fan of the inverted-L antenna, and my experiences both with the 'big' one used from 2013 to 2020 and now this new one have confirmed this. Back in the 1980s when I was active from South Oxfordshire the best DX antenna I had on 80m was a quarter-wave inverted-L made from a full-size 40m aluminium quarter-wave vertical with just four quarter-wave radials lying on the lawn. At the top I connected a wire about 8.5m long using a small hose clamp and tied the end off to the upstairs shack window. Before going into work in the morning, I would regularly work ZL stations via long path on 80m SSB, often receiving genuine reports of 55 to 57.

When I wanted to operate on 40m I simply released the string from the window and secured the wire towards the bottom of the aluminium vertical. I can't really explain why such a simple antenna worked so well on 80m (possibly the ground conductivity was particularly good in that area?) but it was certainly a good performer.

6


7

8



9

Colin Redwood G6MXL
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Print-on-Demand QSL Cards

Colin Redwood G6MXL looks at the Spanish QDure print-on-demand QSL card service.

While Logbook of The World (LoTW) is increasingly popular with amateurs seeking confirmation of QSOs for award purposes, many amateurs still like to send and receive paper QSL cards. This month I am looking at an alternative way of producing and sending QSL cards.

There are several ways that QSL cards can be sent and received. One way is to send cards individually by post direct to the station that you've contacted, usually enclosing some sort of payment (typically US$2) for return postage or a stamped addressed envelope for contacts within your own country. A second way is to post a batch of QSL cards to a QSL bureau, such as the one operated by the RSGB. A third way, probably best suited to stations making many contacts, for example DXpeditions, is to use a QSL Manager, to whom you send your log to have contact details printed onto QSL cards that you have previously supplied, which the QSL Manager despatches on your behalf via the QSL bureau system.

This month I'm going to look at a fourth way, using a facility offered by some national societies, where cards are printed on-demand including the images and contact details, and submitted to the QSL bureau. Like me, you may already have received cards from one of these services, **Figs 1** & **2**.

Apart from receiving QSL cards direct from stations you've worked, if you use any of the methods listed above, you'll need to send stamped addressed envelopes to your QSL bureau's submanager. In many cases, receiving cards through the QSL bureau will require either membership of your national society (the RSGB in the UK), or you'll incur a fee for non-members to receive cards through the bureau.

Print on demand

I am aware of two national societies that offer print-on-demand QSLing services, the German society DARC and the Spanish society URE. You don't need to be a member of either society to use the service, but in the case of URE, its members are entitled to a discount on its print-on-demand service. I have focussed my attention on the Spanish society's QDure print-on-demand service. The Spanish society gives a small discount to members of other IARU societies (such as the RSGB).

The print-on-demand service has two phases. The first phase is essentially a set-up phase, where you register and design your QSL card. The second phase is where you submit your log in .adi format. You can then request which contacts you wish to be printed and submitted to the QSL bureau. Apart from the fact that the bureau that first receives your card is the Spanish URE bureau and not the RSGB bureau, the process is then the same as if the RSGB bureau in Halifax receives your outgoing QSL card by post from you, with your QSL card starting its journey through the international QSL bureau system in Spain or Germany.

Advantages

The print-on-demand service can mean significant cost savings, especially if you only send small quantities of QSL cards. Most QSL printers offer a minimum of 1000 cards at around £50 to £60, so around 5p per card assuming you buy 1000 cards. Add to this postage costs of at least 75p to send about 12 cards to the bureau (about 6p per card), plus the cost of an envelope (say 1p) and you end up with a cost of around 12p per QSL card sent to the QSL bureau. You might also have costs for sticky labels and printer ink or toner. And don't forget that you'll also need to be a member of the RSGB (£65 per annum at the time of writing) to send cards through the RSGB bureau. With QDure, you can also include up to six QSO details on one card – useful if you have worked a station on more than one band or mode (a common occurrence if you chase DXpeditions), which might give a further saving over sending single cards.

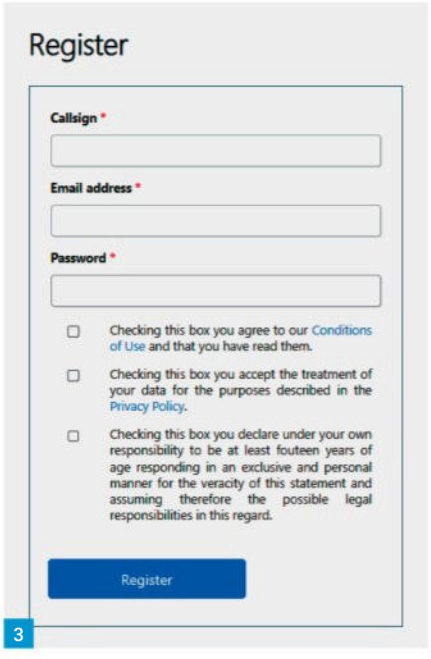
Apart from costs, another consideration is that you don't need to spend time writing out QSL cards and sorting them into the preferred sequence for the QSL bureau – you can spend the time on the air making more contacts! You'll also save yourself a trip to the local post box. Some will no doubt value the speed with which their outgoing QSL card gets into the QSL bureau system. Amateurs with a shaky hand will also benefit from sending legible QSL cards.

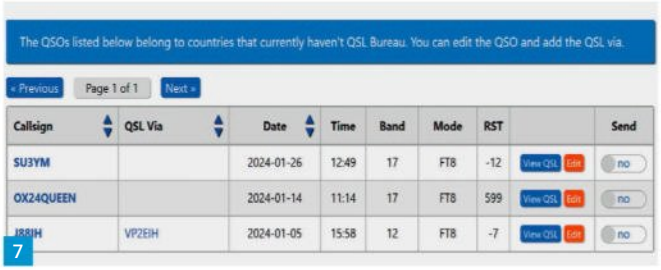
How does It work?

I am using the Spanish Society's QDure service as an example, as their website provides an English translation for non-Spanish speakers, although I did find an occasional word of Spanish crept in:
https://qsl.ure.es/en

Getting started

Registering with QDure is very straightforward, **Fig. 3**. This then triggers an email for you to confirm your email. Once confirmed, you'll get the QDure menu. One option allows you to list QSL cards that have been sent to you. My list was mainly from Spanish stations, **Fig. 4**. I could select cards to view, seeing both sides. This might be useful as you can see cards that are still making their way through the bureau system, where the station uses QDure.





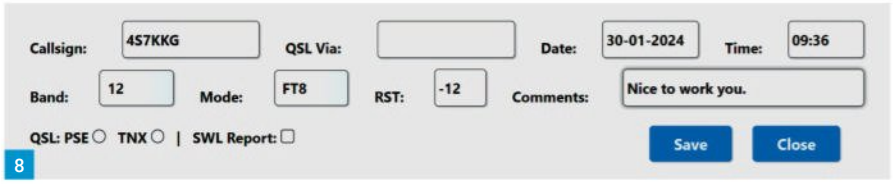


Fig. 1: The front of EA5HM's QSL card produced and sent by QDure and received via the bureau system by the author. Fig. 2: The rear of EA5HM's QSL card showing typical details. Fig. 3: QDure's registration is straightforward. Fig. 4: List of QSL cards on their way from stations signed up to QDure on their way to the author. Fig. 5: The front of the author's QSL card as uploaded to QDure. Fig. 6: The rear of the author's QSL card designed on the QDure website. Fig. 7: QDure showing QSOs with no QSL bureau in the country. Fig. 8: The facility to add comments to a particular QSL card in QDure.

Design your QSL card

Before you can send QSL cards through QDure, you'll need to design your QSL card. QDure have a number of designs you can select from, and edit as you wish. Alternatively, you can choose your design. I chose to design my own, **Fig. 5**. For the front of the QSL card I chose to upload the image which I've previously used for my pre-printed, handwritten QSL cards. QDure has the logos available for most IARU Region 1 national societies, so it is easy to add the RSGB logo, for example, if you wish on the front or rear of the card. On the rear of the card you can add whatever information you wish to appear on every card produced. Typically, this might be your callsign, name, postal address, DXCC entity, locator, WAB square, names and/or logos of any clubs and societies of which you are a member. If you always use the same transceiver, power and antenna you might choose to include this, **Fig. 6**.

Logs

Logs can be submitted to QDure in two ways. Logs already on computer can be submitted to QDure in .adi format. This should not be a problem for any modern logging system such as Log4OM. I found that a log containing just date, time, callsign worked, band, mode and report sent was sufficient for a QSL card to be produced. A useful facility is included in QDure to view the QSL card before printing. Having submitted a log, you can go through and review it, selecting which QSOs you wish to send cards for. In the absence of appropriate fields on the uploaded .adi file, it defaults to sending cards, but you can individually select not to send.

Contacts can also be keyed into QDure through the QDure website – a facility which might be useful if you have used a paper log, or to capture an SWL report that you wish to confirm by QDure.

Each log that is uploaded to QDure is recorded separately. In the event of mistakes, individual contacts can be edited or deleted. Likewise, the whole of an upload can be deleted, and assigned to a different QSL design.

QSL via managers etc.

QDure is aware of some stations requesting QSL cards via a different station (such as a QSL manager). Links are also provided to QRZ.COM for both the station worked and their QSL manager. I found I had a small number of contacts with stations where the station or their QSL manager was not a member of the QSL bureau system, **Fig. 7**. In one case, being able to click on the link to QRZ.COM allowed me to quickly establish that the station in question, OX24QUEEN was actually requesting cards via OZ1ACB and that I could edit the contact in QDure to add OZ1ACB to resolve the issue, so that I could now send a card from QDure via OZ1ACB.

FT8/FT4 contacts

When I reviewed my log that I had uploaded into QDure, I noted a number of reports for FT8 contacts that QDure had changed to 599. I had previously uploaded the same log to both QRZ.COM and eQSL, both of which show the same report for

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2m transequatorial propagation

Tim Kirby GW4VXE has news of some interesting experiments on the 2m band.

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We have become relatively familiar with transequatorial propagation on 6m from the UK and certainly from southern Europe, it's very common. Two metre openings, though, have been a very different thing. Based on the paths that were being seen from the Caribbean to South America, there was little doubt that the propagation was there, it was just that the activity from Africa wasn't there.

Over the last few weeks, though, this has all changed with a series of tests being made with the Q65 and Q65-B digital modes (in the WSJT-X suite). V51WW was the first to be active from the southern end of the path. The path has proved very reliable since the tests started with QSOs being made on most days. At the northern end of the path, there have been stations from Italy, Greece, Sicily and Malta. Although most contacts have been made on Q65 with fairly weak signals, if the propagation is right and you are in the right place at the right time, signals have been good and some SSB contacts have been made. You can see a short video from V51WW at the URL below, which shows the strength of SSB signals from Greece.

https://tinyurl.com/4ara2b6v

Further east, FR4OO from Reunion Island has been active on 2m and has worked **Oleg A65BR**. Oleg commented that the path seems reliable and although they had worked on Q65, signals seemed to be strong enough to support CW and perhaps even SSB. Oleg has also worked 3B8FA on both Q65 and SSB. FR4OO has also worked A71XX and 9K2GS. FR5DN has been active too, although unfortunately his QTH is not so good, but he has been able to make some contacts.

ZD7GWM has been active on 144.300 on SSB testing with EA and CT stations, but to my knowledge no QSOs have been made so far.

Even further east, the 2m path from Japan to Australia has been open as well.

It's great to see all these 2m TEP QSOs being made. It seems a long time since any 2m TEP QSOs were made – or at least reported – so it's good to see the propagation being exploited in this solar cycle.

What about 70cm? Experiments in previous solar cycles have proven that it is possible to make TEP QSOs on 432MHz. With the digital modes capability that we have now, it ought to be easier to detect and exploit the openings on the band. It'll just need someone, like V51WW or FR4OO, to have the appropriate equipment and start making the tests. The geometry of TEP is such that you really do have to be in the right place at the right time. Could 2m TEP QSOs be made from the UK? Nothing is impossible, but it seems relatively unlikely, unless we see a combination of propagation modes extending a TEP path from the Mediterranean, which of course, we see fairly regularly on 6m.

You can keep up to date with 2m TEP happenings on **John EI7GL**'s blog:

https://ei7gl.blogspot.com

Do also note that John has started an interesting newsletter on the Substack platform. You can find more details on his blog. Another good source of information on 2m TEP is **Alex SV1NZX**'s account on Twitter (X) @sv1nzx

RMNoise

Jef Van Raepenbusch ON8NT reported a few months ago on some software which claims to be able to reduce noise levels. Jef says that he has now tested this out on SSB and CW on HF and VHF as well as on FM on VHF. Jef says he's impressed. He said that the best setting to reduce noise on FM was the 1.SSB option. You can download the software at:

https://ournetplace.com/rm-noise

iFTx

I recently became aware of an FT8 decoder for the iPhone – the application is called iFTx and it decodes both FT8 and FT4 signals, **Fig. 1**. The cost is £1.99. I tried, it with audio coupling, to the little Quansheng UV-5K running 'hacked firmware' allowing it to receive on 10m CW/SSB. Placing the microphone of my iPhone near the UV-5K I found I was able to get plenty of good decodes of FT8. This might be quite a fun portable setup and of course, should work on 6m and 4m receive when those bands open up.

Although I've not tried it so far, iFTx will also generate transmit tones.

As far as I can see, iFTx is only available for iOS devices, but there is the FT8CN application available for Android users.

More on RSLs

Keith Ballinger G0ROQ (Lincoln) wrote, in particular, about the new provision for English stations to use a GE or ME prefix. He writes, *"If using Morse code, it would be necessary to be very careful with letter spacing - for example GE1ABC could end up sounding like Z1ABC. Even worse would be ME0ABC sounding like G0ABC! Could you imagine the havoc with me working ME0RQQ? It could sound as if I'm working myself!"*

As Keith says, watch that character spacing!

The 8m band

Dave Thorpe G4FKI (Ampthill) says that he has finally got his Innovation and Trials Licence for 8m. As yet he hasn't made any two-way contacts but has had a few reports on PSK Reporter from stations in the UK. Dave is very interested to do tests and asks that anyone with a permit, or who has receive on the band, gets in touch to do some tests. Dave says he has seen some activity from South Africa on FT8 in late March and early April. Dave mentions that a good source of information on 40MHz propagation and a list of worldwide beacons is:

https://www.g4ogi.uk

(Actually there is also a very good explanation of TEP which I am sure some readers would find interesting).

Roger Lapthorn G3XBM (Cambridge) is going to try 10mW ERP WSPR during the Es season and will try to enlist the help of some locals to prove that the system is working ok.

And Spanish amateurs have recently gained

Fig. 1: A screenshot from the iFTX iOS application decoding FT8 signals (on 10m!). Fig. 2: The 7P8EI team who made 570 QSOs on 50MHz from Lesotho recently. Fig. 3: Thirty days of FM as logged by Simon Evans in Twyning

access to the 8m band – see our *News* pages this month.

The 6m band

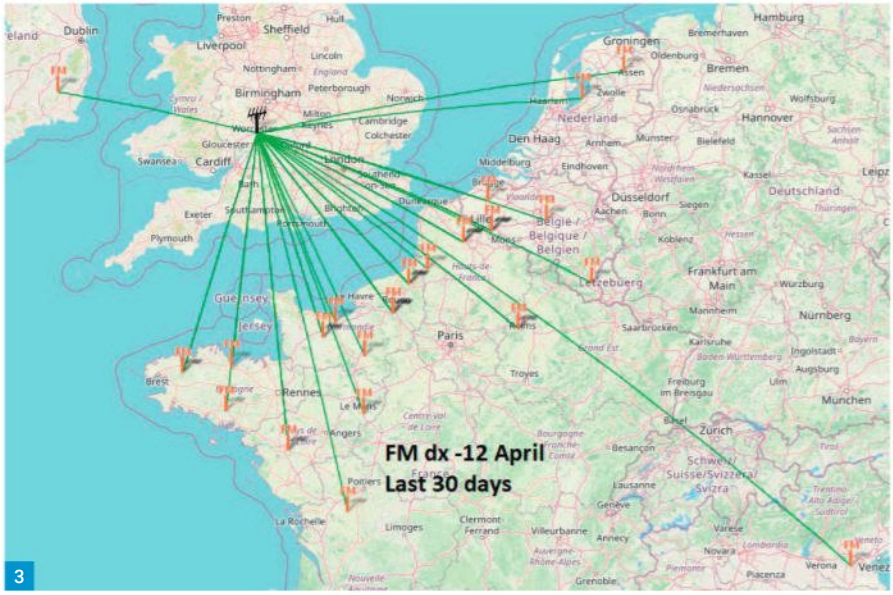
Roger Greengrass EI8KN (Co Waterford) just missed the last deadline, but enjoyed a good opening to South America on 10 March, working CE2SV (FF47), LU5FF (FF99), CE3SX (FF46), PY2BS (GG66), PY5HOT (GG46), LU8GMM (GG02), LU3CQ (GF05), CX2ACB (GF25), PY5EJ (GG54), PY4AQA (GG88), PU4MHO (GG79), PY2DS (GG66) and PY5EW (GG46).

Roger also kindly included a summary of the 6m operation from the recent 7P8EI expedition, in which Roger took part. He writes, *"From the 19 to 31 March 2024, I was fortunate to be part of the thirteen-strong EIDX Group DXpedition to the Kingdom of Lesotho* (**Fig. 2**). *The callsign was 7P8EI. We had approximately ten days of operating from the Molengoane Lodge, Nazareth, Lesotho. The locator was KG30VO. We only had a basic setup for 6m consisting of an IC-7300, running around 60 watts to a Diamond HB9CV with no rotator. Software was MSHV. We experienced TEP openings on 24 to 27 March, and again on 29 March. 573 contacts in total were made consisting of 481 uniques. 35 DXCC were worked, with the majority being in Europe (98%) with Italy the highest country (28%). Seven stations were worked in Africa, and five in Asia. Only one G station was worked – G7RAU (IN79). The openings did not extend to EI unfortunately".*

Don G3XTT (Wells) caught a good opening to South America on 26 March and says that it was very nice not only to be called by CX2ACB but to work two more CX stations. Although Don had worked Uruguay before, he'd not had it confirmed on the band. Don continues, *"My log for that opening is: PP5AM, LU3CQ, LU8ADX, CX2ACB, CX2CC, LU9AEA, LU8EX, PP5JP, L71D, CX2SA, LU2FGL, PY5KD, PY5JO. Then nothing copied from SA until 6 April, with PY2XU, PY2JA, PU2TXZ. But nothing much else recently, yet last March/April I see I was regularly working around Europe at least. And it's so frustrating to see 5Z, 3B9, A80K (EL-land), TY etc being regularly spotted by Southern European stations!'* All worked on FT8, of course, and using a 6-element LFA Yagi at about 30ft.

Interestingly, here at **GW4VXE** (Goodwick) virtually nothing was heard during the opening on 26 March, although there was some good scatter from UK stations at times.

Roger G3XBM has occasionally been operating on the band using FT8 but really, is waiting for the Es season to get started.



Andy Adams GW0KZG (Letterston) caught an opening to South America on the evening of 6 April when he worked PY1MHZ (GG98) and says that the only other DX was when he worked AO75MU. Andy hopes that the DX, like the weather, will improve soon.

The 4m band

Dave G4FKI says he hasn't heard any DX so far this season but there is local FM activity in the Bedford area on Monday and Friday mornings, there's local FM activity in the Mliton Keynes area at around 1900 local time as well as GB2RS on a Sunday morning at 1000. The GB3MBD beacon near Bedford is now active on 70.050MHz, with the antenna at full height. The most distant reports received so far are from Merseyside and Northumberland.

The 2m band

Jef ON8NT (Aalter) made a few QSOs during the Activity contest on 5 March, including G0LTG/P (IO81). Next day, during the FT8 Activity contest Jef worked DK0TR (JO40), G8EEM (IO93), GW4FRX (IO82) and G4EII (IO83), On 21 March, Jef worked MW0AXA (IO81).

Roger G3XBM is active on his local FM net as well as the 2m Activity contests on SSB where he runs 10W and a big wheel omnidirectional aerial.

The 70cm band

Roger G3XBM says that he is always surprised how distant stations can be copied on 70cm FT8 (Germany and Eire) at any time. Roger says he worked a few locals in the 70cm FT8 Activity Contest with his 2.5W and 2m big wheel omni. Roger says that 70cm FT8 is a really under used

mode and similarly, that 70cm is a really under-used band.

Satellites

Jef ON8NT monitored the ISS schools contact on 27 March. He has also been busy on the RS-44 satellite using FT4 and has worked AA4SS (FM07), G1EYF (IO83), N2YZH (FN22), W3TI (FN20), EA3EA (JN01) and ON2ACO (JO11).

Patrick Stoddard WD9EWK (Phoenix) writes, *"GreenCube (IO-117) is still operational. More DX is being heard through it, including the recent A80K DXpedition to Liberia. A80K is also working RS-44. After many satellite operators completed their quests for the satellite WAS award, the next awards in their sights appear to be the Japanese AJD award (working all 10 Japanese call areas) and the WAJA award (working all 47 Japanese prefectures). And the JA guys are getting out and operating from many of the prefectures without regular satellite operators, too.*

"On 4 April, I gave a presentation on DX via satellite for the local DX club, the Central Arizona DX Association. I had given a similar presentation to this club a few years ago, and with GreenCube the possibilities for satellite DX from Arizona (southwestern continental USA) are much greater than we have had since AO-40's demise in 2004.

"I have worked GreenCube once, and am almost ready to start working it with my own gear. My presentation focuses on an Arizona ham, ***Fernando KF7R****, who has been able to get his satellite DXCC and WAZ awards with GreenCube. KF7R has worked 49 of 50 US states via GreenCube (he is only missing South Dakota for satellite WAS via GreenCube), and 46 of the 47 Japanese prefectures. His satellite VUCC is up over 1100 grids.*

"That presentation is online at: **https://youtu.be/QEW2mlmJvE0"**

"For FM satellites, AO-91 has had harder times lately. More often than not, it has not made its daytime appearances. Sometimes it is on, so it may be too early to write it off yet. The TEVEL satellites are still being activated, helping to fill in the mornings with some FM satellite activity, especially when AO-91 isn't active. During the week of 28 March, David Greenberg 4X1DG activated TEVEL-8's FM repeater for the first time. Up until that point, TEVELs 1 and 8 had not been activated, and TEVEL-4 has been silent since August 2023. No word on whether TEVEL-8 can be put in the rotation with the other working TEVEL satellites, and no word on whether we will ever hear TEVEL-1.

"The TEVEL satellites will relay D-Star transmissions, as well as FM. ***Endaf N6UTC/MW1BQO*** *and I regularly work the TEVEL satellites in both modes. Lately, I have started trying handheld D-Star radios on the TEVEL passes, instead of my mobile radios (Icom ID-4100 and ID-5100). The new Kenwood TH-D75 can receive two D-Star signals simultaneously, and D-Star (DV or DR) can be used in both VFOs at the same time. This makes it easier for me to work D-Star via satellite with a handheld radio – the upper VFO can switch between FM and D-Star for the uplink and the lower VFO can be put in DV mode with the 'FM Auto Detect on DV' (menu 617) and not have to change to hear FM on the downlink. I have received good reports on my audio using the TH-D75 in D-Star and FM via satellite.*

"I recently purchased an Icom ID-50A. A dual-band (2m/70cm) handheld radio supporting FM and D-Star, along with AM for receiving the airband. A decent little radio, but the sensitivity on 70cm could be a little better for working satellites. I have also used this radio to work the TEVEL satellites in FM and D-Star. The ID-50A is similar to the TH-D75, except that the FM auto detect takes a little longer than on the TH-D75 (and both handheld radios take longer than the DV Auto Detect function on the ID-4100 and ID-5100 mobile radios).

"A couple of days ago, I received my April issue of Practical Wireless *at my mailbox. I had to laugh a little at the cover, which had a picture of the ID-50E available in the UK and Europe. Other than the frequency coverage (especially on transmit), the main difference between these radios appears to be what is on the radio. The ID-50A has 'D-Star' below the buttons, where the ID-50E has 'DIGITAL'."*

FM and DAB

Simon Evans (Twyning) says that there has been hardly any tropo for either FM on DAB during the month, but on 12 April things improved and Simon noted a brief Es opening around lunchtime to Italy, when Simon received RAI Radio 1 on 88.1MHz from Monte Verde near Venice, **Fig. 3**. On DAB, there was some tropo propagation, also on 12 April from Holland and France. Simon received 9C and 5B from Goes in Holland and 7D, 8A and 8C from the Lille area. Two new DAB multiplexes have opened up near Simon, on 8B and 9B, which means that Simon will no longer hear any DX on those channels.

LORA

Dave Thorpe says that he has noticed a lot of interest in the 868MHz licence exempt band using LORA and the Meshtastic system. He says some experimenters are radio amateurs but many are not. Have any readers been experimenting with Meshtastic? On 439MHz LORA is being used for APRS. Again, any information from readers trying out LORA for APRS on 439MHz would be very welcome indeed.

That's it for this month. Thanks to everyone for their contributions. Hopefully next month, we'll have the first of the big Es openings of the year to report on! See you next time. **PW**

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the same contact correctly. This problem seemed to occur where the report was a single positive digit (e.g. 7). It was fine with negative (e.g. -7) and two-digit positive reports (e.g. 10). While I could go into the contact and edit the log in QDure, this shouldn't be necessary. As both WSJT-X and Log4OM log a positive signal report with a + sign (e.g.+09), the answer here is to make sure that your logging program correctly logs positive signal reports in FT8/FT4 as '+09' and not simply '9' for example.

Comments

If you are in the habit of adding various comments to your QSL cards, specific to the QSO, such as 'Nice to work you again Fred' or '5 W to dipole', then you'll no doubt appreciate the facility in QDure to edit individual QSOs and add such a comment, **Fig. 8**.

Useful

I think there are number of scenarios where print-on-demand might be particularly useful. I can see this being the case to stations with a relatively small need to produce QSL cards, perhaps when using a different callsign to their main callsign. This might include stations operating abroad or another part of the UK while on holiday, special event stations, or QSLing using an old callsign following a callsign change. In particular, the ability to reply to an occasional QSL card request sometime later might be quite attractive.

Payment

No fees are charged until your first cards are ready to be printed and despatched. You can enrol, design your card(s), upload your log(s) and select which QSOs you wish to actually have printed before committing any money. The checkout process is straightforward with finding your country in the long drop-down list of countries the most difficult part! Payment can be made by PayPal, making the international payment simple. Note that you will be charged the 12 Euros minimum fee even if you choose to print fewer than 100 QSL cards. Within a few minutes I had a receipt from PayPal and another from URE.

Points to note

There are a few points to note. QDure will prevent you from sending a QSL card to a non-member of Spanish, French or Argentinian national societies (so not eligible to receive cards via their respective national societies' QSL bureau). It will also prevent you from sending a QSL card to country with no national society QSL bureau. Both these features save money, and might prompt you to send a card direct.

Summary

The QDure system certainly is a useful facility if you like to send QSL cards. It can be cost effective and is certainly easy to use. **PW**

News

BRITISH SCIENCE WEEK EVENTS AT BLETCHLEY PARK: During British Science Week the Radio Communications Foundation (RCF) charity, the RSGB and the Bletchley Park Trust worked together to provide three events for young people. The aim was for them to find out more about radio communications, electronics and amateur radio.

The first event was an RCF-Arkwright Connect Day. That was attended by some 13 Arkwright Scholars, who are some of the most talented young engineers in the country. Essex Ham kindly set up a special course for the Scholars and those who took advantage of that free on-line training were very well prepared on the day. Activities included matching VHF and HF dipoles, making HF contacts with the Falkland Islands, Cyprus and the USA, and making local contacts on 2m FM. Unfortunately, not all the Foundation exam candidates gained a pass mark, but everyone enjoyed the day and several were very keen to get their own callsigns.

The other two events were 'Build-a-Radio' workshops. A total of 19 youngsters, accompanied by their parents or grandparents, were booked in by the Bletchley Park team. All the young folk built an FM Broadcast Receiver kit from Kanga UK. The kit is perfect for a first project with a pre-soldered surface mount device and a small number of through-hole components to be fitted. All 19 kits built on the day worked and the joy on the faces of the youngsters, and their parents/grandparents was a pleasure to see. Many of the youngsters also visited the RSGB National Radio Centre to see and experience amateur radio. Everyone enjoyed themselves, and it was a fantastic demonstration of what can be achieved through teamwork; thanks go to all of the volunteers who helped on the day and to those who worked tirelessly in the background to make it all happen.

The RCF stands ready to help out with similar events in schools and other youth groups. The scheme to fund amateur radio licence exams for those in full time education is now in place, and grants can be made available to school/university radio clubs. The RCF website has more detail, along with information on how you can donate to the RCF charity, with Gift Aid, etc to help fund more events like this. Steve Hartley G0FUW, RCF Trustee.

SCARLETTPOINT AMATEUR RADIO SOCIETY (GC0SP): (From *PW* contributor Billy McFarland GM6DX) Once a year my club meets up for a week to play radio away from our normal QTH's. This is mainly to give some of the newer operators experience in the planning and delivery of a radio trip, as well as the ability to experience propagation from other DXCC entities. Like all club trips we like to plan it as much as possible. Usually the dates of the trips go around my annual leave, as working within the emergency services means that it isn't easy to get time off. Once the dates were confirmed we had a Zoom meeting to talk through the main points. Firstly, who was going and then the location. Wales was chosen, as none of us had operated radio from there and it wasn't too far to travel for the G op's (who had a long way to travel on last year's trip). During the meeting tasks were dished out (usually by me) and Iain GM5YTT was given the responsibility of finding a QTH. We use Air B&B and Iain has the amazing luck of picking the perfect QTH on every occasion and did so this time too. As there were no ferries or flights needing to be booked we only had to pay for the QTH and then wait until closer to the time. About one month before the trip we had another Zoom meeting, to discuss times and equipment.

We agreed on a 40m vertical, 30m vertical, 80m dipole, 60m dipole and a Hexbeam antenna, with the relevant supporting masts and guys. We had also agreed to run three stations, one with an amplifier and the other two barefoot, we did include high power bandpass filters to help with interference between stations. The rigs would be 3 x Yaesu FT-710 with relevant laptops. Luckily all members could contribute something to the equipment list meaning nothing had to be purchased. We made our way to Anglesey where our QTH was, arriving around 4pm. As it gets dark early we decided to install the 40m and 30m verticals meaning we could be on air that night. We set up two stations and 30m was booming 24 hours a day. 40m didn't disappoint either so radio on the first night was great. The next morning allowed us to install the Hexbeam and dipole antennas. The weather was fine for antenna installation, which was a change. We decided to go to Holyhead for a takeaway and to visit the local amateur radio club. We were made very welcome by the Dragon Amateur Radio Club (DARC) and were able to see a presentation on VHF contesting by Simon MW0NWM. If you are in the area, make sure you stop by at the DARC.

We continued to operate the two stations until Rob G5ROB and Adrian G5ADY joined us midweek, where we then had the three stations in full swing. Conditions were great with prefixes worked such as, 3D2, T32, KH6, 7P8, 5W and FK to name a few. We worked a total of 152 DXCC in the five days of operating. We did as many modes as possible: FT8, FT4, CW, SSB and even SSTV. We did notice a lack of activity during the week on SSB and even CW but when you went to the FT8 frequencies the band was packed with activity. Possibly a sign of the times, conditions were present it was just that very few people were doing those modes. It was good to see everyone getting involved in the station operating as well as household duties such as cooking.

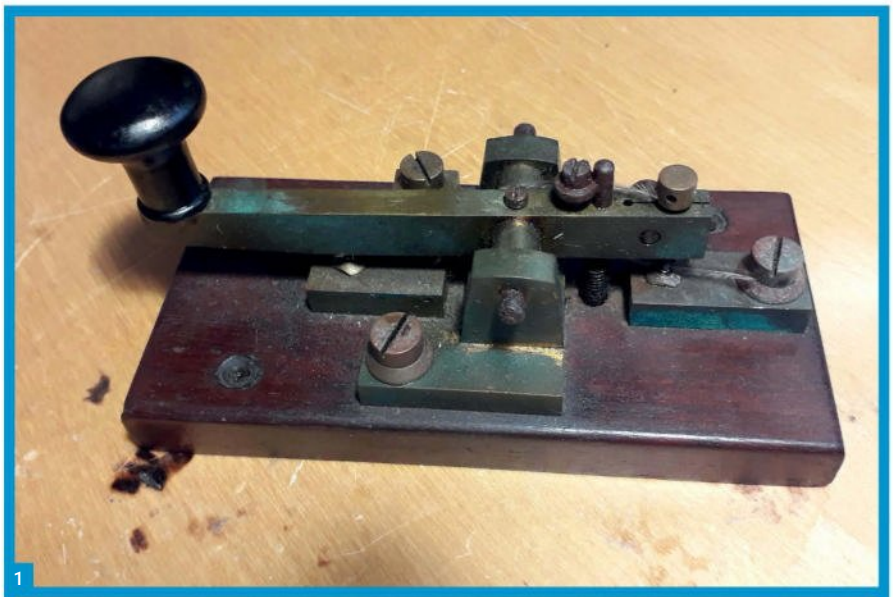
The last day comes around, very quickly I may add, and it was time to pack up the stations for our trip home. Overall, the trip was a success and everyone learned something along the way. You can see a short video of the trip here: **https://shorturl.at/yGNTZ**

Any questions about our trip, drop me an email at **gm6dx@outlook.com**

Cleaning Keys

Roger Cooke G3LDI has a miscellany of Morse keys and paddles to talk about this month.

Roger J Cooke G3LDI
roger@g3ldi.co.uk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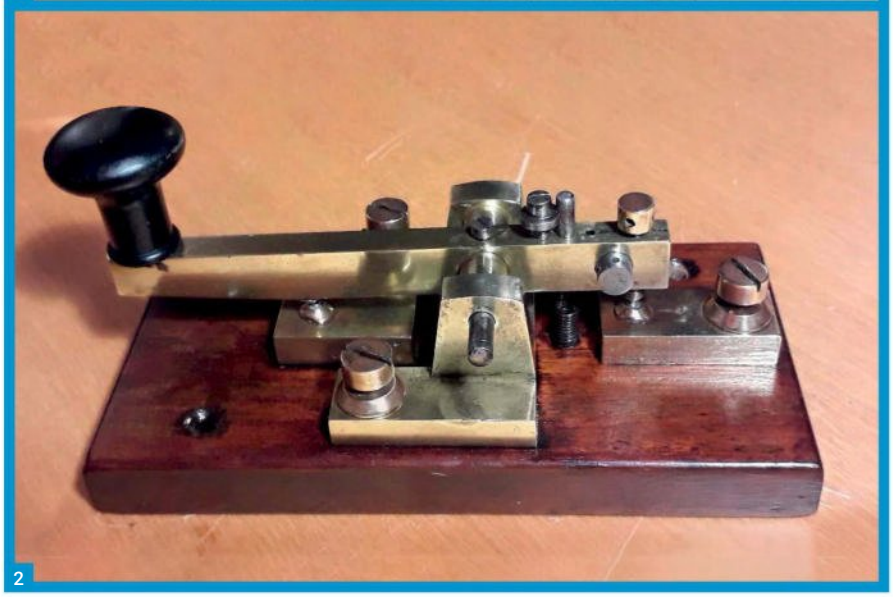
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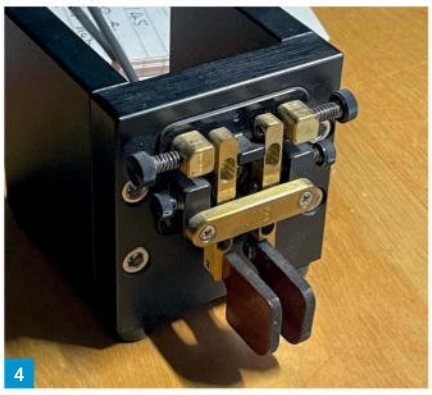
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Andy G0IBN spent two days, on and off, cleaning this key (see photos, **Figs 1** and **2**) which was given to him, a General Post Office type dated around 1900. Which just goes to prove it pays to spend some time cleaning a key and making it look presentable. It probably worked better too!

Nigel Hadley G4BSW has one of those that was given to him in the early eighties. It was found in a cellar in Dover in similar poor shape and he restored it in the same way. His Grandson **Oscar** is seen starting young and getting to grips with it recently in **Fig. 3**.

Donard M0KRK was in our classes here in Norfolk but then became distracted with something else. He is a member of the Engineering Club in Norwich so I guess he got involved there for about three years.

He is back again and called in on the Norfolk ARC net on 80m but says: *"I was determined to break the ice tonight after a silence of nearly four years. This was probably harder than when I first dipped my toe in the electromagnetic sea back then. Okay, my ability to copy has improved, but not as much as I would have liked. It is much the same with my other languages: Swedish and Portuguese. I catch enough to understand the context but am still a long way off fluent in them or in CW in spite of practice".*

This is one of the problems with CW. It is much like another language or learning a musical instrument. If you don't practice, you won't improve. It really is as simple as that. Donard is rejoining our nets again to get up to speed. Incidentally he does use a very strange key. It is a vertical paddle, **Fig 4**. I don't think I have seen one like this before!

Talking of paddles, I am waiting for a new one. I decided to buy one of **Yury UR5CDX's** paddles, the CT 755X. It had been stuck in the UK office of exchange for processing for the last two weeks. What do they do there? Anyway, the anticipation is palpable here so I do hope it arrives soon.

I was talking to one of our local students, **Stan G4BEW**, who told me that he too had just bought a new paddle. It was one that I did not know about. It is called a ZACH paddle and is shown in the picture, **Fig. 5**. It is made by **Slavek OK1TN** and looks very modern compared to some of the older models in the stables of paddles.

The ZACH Magnetic Iambic Paddle summary: *Short arms with a 1:1 leverage ratio, made from a lightweight alloy, four precision 624Z ball bearings, 925/000 silver contacts, finely adjustable contact gaps, magnetically controlled return force (repelling neodymium magnets used). Micro-threaded screws with position fixed using another security screw are used for all adjustments.*

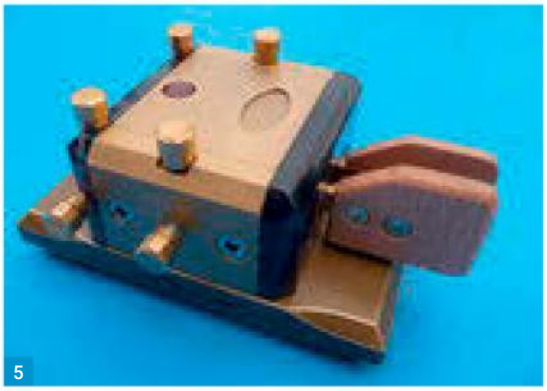

Fig. 1: The GPO key before cleaning.
Fig. 2: And after cleaning.
Fig. 3: Oscar learning the ropes.
Fig. 4: Donard M0KRK's vertical paddle
Fig. 5: The Zach paddle.
Fig. 6: The 'Collins' keyer and paddle.

This twin lever iambic paddle is manufactured using NC machinery for excellent precision. The base is a solid (3.937 x 2.362 x 0.393in, 2.2 pound) chunk of brass, topped with sanded finish, patina and a protective coating. This key uses a fully encapsulated construction, a separate block of 1.574 x 1.574 x 1.181in houses all mechanical elements. Contacts and bearings are completely protected from dust and moisture. There are no separate posts to hold the precision adjustments for the contact gap and the magnetic tension, just one block of metal which will not vibrate no matter how hard you hit the paddles, and which won't slide around on your table.

It looks very unusual and Stan says it is a pleasure to use too.

Roy G3ZIG sent me a picture of a keyer and paddle he saw on Facebook. It looks like a Collins keyer, but is it? Roy isn't sure that Collins ever made a keyer. The paddle is also unknown. I did ask locally and **Dave G0ELJ** sent the following information:

*"I finally found a link to **Mike March K4QU** whose company, March Magnetic Paddles, converted the Heathkit HR-1410 Keyers to match the 'S' Line, complete with Collins name. His QRZ page shows his station complete with one of those. They certainly look the part, as the cabinet style and colouration go well with the Collins gear. I don't know why he removed the paddles from the HR-1410 and substituted a jack, perhaps not to infringe a patent?"*

The keys that appear on his website appear to be mechanically identical to the one in the picture, so it looks as though Mr March originally provided both items.

Please send all your comments, offerings, information and especially pictures to: **roger@g3ldi.co.uk** 73 and May the Morse be with you! **PW**

BBC coronations Pt XIV

Keith Hamer and **Garry Smith** continue the special series looking back at the BBC's coverage of Coronations since 1937. There is also a vintage Coronation radiogram advertisement from the archives. There are more unique details about Roland Pièce, the pioneer of Swiss radio broadcasts, from family archives supplied by his Grand-Nephew and PW reader, Pierre-Yves Pièce. The series charting the rise and fall of BBC 198kHz corrects earlier official BBC statements about long-wave transmissions. The series describing the early years of BBC-2 jumps forwards with two kangaroos. We also continue the series about the development of Swiss Radio and Television since 1922.

Keith Hamer
Keith405625.kh1@gmail.com
Garry Smith
Garry405625.gs@gmail.com

Television coverage enabled viewers to participate in the solemnity and splendour of the 1953 Coronation, held on 2 June. At the time, the broadcast was the most complicated and prolonged Outside Broadcast in television history. The programme began at 9.15am with the *BBC Tuning Signal* being radiated for one hour to provide enough time for adjustment to receivers specially set up for the occasion in churches, shops, halls and homes. The correct Tuning Signal is shown in **Fig. 2**; an official BBC website depicts the incorrect image!

The actual Coronation broadcast began at 10.15am. The first pictures came from mobile units at the *Victoria Memorial* with one camera positioned on the roof of *Buckingham Palace*. A mobile unit just outside *Westminster Abbey* had one camera located high-up to capture the full spectacle. The commentators at the Memorial were **Chester Wilmot** and **Berkeley Smith**. On London's *Embankment*, **Max Robertson** set the scene. Outside the Abbey, **Mary Hill** and **Michael Henderson** were on-hand to describe the event. The *Coronation Service* began at 11.20am.

Vintage coronation radiogram equipment

This month's excursion through vintage copies of dilapidated newspapers and magazines has revealed an advertisement by *Regentone* for their Coronation auto-change radiogram, **Fig. 1**. The advertisement dates from 10 April 1953.

The *Regentone Auto 99/3 Console Radiogram* featured a radio for S/M/L-wave reception and a concealed record player adjacent to the wireless tuning dial. The record changer in the model advertised in April 1953 was probably the Mk1 version of a *BSR Monarch Prince*. The controls were for on/off and volume, tone, wave-change, and tuner.

It used *ECH42*, *EF41*, *EBC41*, *EL41* and *EZ40* valves. The ECH42, manufactured by *Mullard*, was a triode-hexode and used as a frequency changer. A screen was fitted around the entire device. This resulted in a much-improved version of the previous ECH41. On the ECH42, the conversion slope was variable, being 750µA/V at the operating point.

The Mullard EF41 was a variable-µ pentode, suitable for RF and IF amplification in AC receivers and car-radio sets. The 'near-equivalent' (rather than the 'direct-equivalent') valve manufactured by *Ediswan Mazda* was the *6F15*.

Mullard classified the EBC41 valve as a *Double Diode Triode*. The triode with two diodes shared a common cathode. The diodes were used for detection and AGC. The triode was suitable for AF amplification. Due to the high amplification factor of the triode, an AF gain of approximately 50 could be achieved with around 1% distortion. The AF gain was somewhat more than that normally required for receiving standard broadcasts. This characteristic was utilised to reduce distortion, which was often introduced by the output stage.

The EL41 was an all-glass output pentode valve, rated for 9W anode dissipation. It was designed to be used mainly in AC mains-operated equipment. Mullard stated that this valve should only be used with self-bias or semi-automatic bias. The EL41 marked the transition between all-glass valves and later devices, which incorporated metal base covers with locating spigots. By contrast, the EL41 had a locating pip moulded into the glass.

Finally, for our valve aficionados (and we know there are some who regularly read our columns!), the EZ40 was an indirectly-heated full-wave rectifier capable of delivering a maximum of 90mA DC. The maximum permitted alternating input voltage for each half of the valve was 350Vrms. This type of valve had the advantage over directly-heated rectifiers in relation to the cathode warm-up time. With directly-heated rectifiers, the filament reached its operating temperature soon after the receiver was switched on and quickly supplied voltage to all the other valves. Conversely, the cathodes of indirectly-heated rectifiers took much longer to warm-up and ensured that the HT voltage was supplied only after all the other

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"JUNE 2nd...
You'd better get a REGENTONE by the sound of it!
Auto 99/3 Console Radiogram
- just what's needed to make your Coronation Party go with a swing. Plays nine records, standard or long-playing, automatically and gives three waveband radio listening. Figured walnut cabinet of outstanding design.
Only 58 gns. tax paid. Regd. design No. 864-409
See Regentone at your Dealers or write for leaflets.
H.P. facilities available
Issued by Regentone Radio & Television Ltd., Eastern Ave., Romford, Essex."
The text has been left in its original format to reflect the spelling, grammar and punctuation of the time.

Fig. 1: An advertisement dating from 10 April 1953, for the *Regentone Auto 99/3 Console Radiogram* which was guaranteed to make a "*Coronation Party go with a swing*"!
Fig. 2: The *BBC Tuning Signal*, often referred to as the 'Wavy Greyscale', was radiated for one hour before coverage of the 1953 Coronation began to allow for final picture adjustments.
Fig. 3: Birgit Steinegger was the SRG-SSR *FM Fairy* at Küssnacht am Rigi in November 1978, purveying the Swiss speciality, *grilliert Bratwürste*, to entice listeners to change from MW to FM.

valves were in a position to safely take current. This arrangement drastically reduced the risk of switch-on surges and the electrolytic capacitors only needed to withstand the normal operating voltage. Mullard stipulated that the reservoir capacitor must never exceed 16µF.

Roland Pièce archives: Part VIII

The official opening of Switzerland's first radio station was on Saturday 14 October 1922. Dignitaries were invited to a banquet at the *Hôtel Beau-Rivage Palace* in Lausanne-Ouchy to celebrate the inauguration of the *Champ-de-l'Air* station at Lausanne's aerodrome. No doubt all the guests had a wonderful time, although most of them were blissfully unaware that the station was actually operating illegally!

The first radio broadcast in Switzerland was effectively from an illegal pirate station because the concession granted by the federal authorities only allowed the transmission of meteorological information to airmen! However, this misdemeanour was overlooked by the authorities and four months later, on 26 February 1923, a new Lausanne-based company called *Utilitas* began broadcasting general entertainment programmes from the Champ-de-l'Air transmitter, but only when there were no scheduled flights. Utilitas became one of only four European radio stations. However, it was soon replaced by the *Société romande de radiophonie*.

The rise and fall of 198kHz: Part VII

Last month, we said farewell to long-wave broadcasts from the Droitwich transmitter and the two relatively low-power stations in Scotland. However, due to misleading official statements by the BBC concerning *Radio 4 Long-Wave*, our farewell was somewhat premature! Originally, BBC press releases indicated that long-wave transmissions would end in March 2024. Special announcements were broadcast to that effect in 2023. However, it seems that someone at the BBC overlooked the fact that they had a contract with the *Energy Networks Association* (*ENA*) to continue long-wave broadcasts until 2025 to prevent the *Radio Teleswitch Service* (*RTS*) from being switched off. The RTS is a device that allows energy suppliers to switch large numbers of electricity meters between different tariffs, such as *Economy 7*. Due to the BBC's confusing announcements, the ENA were expecting the RTS system to stop working on 31 March 2024. However, *BBC Radio 4 LW* will now continue until 30 June 2025, assuming there isn't another BBC debacle!

60 years of BBC-2: Part III

The television manufacturers and retailers were delighted that BBC-2 had been given the go-ahead because it meant a big increase in demand for equipment. Viewers wishing to see BBC-2 on the new 625-line UHF standard had to buy a totally new type of aerial plus, of course, a new television receiver. People in the London area previously only had BBC-TV in Band I on channel 1 and ITV in Band III on channel 9. With the advent of BBC-2, they could tune-in to channel 33 on UHF.

Manufacturers and dealers were not given any advance information about forthcoming programmes. Naturally, they wanted to go ahead and sell sets but the public had no idea what to expect from the new service.

It was decided to devise a memorable symbol for BBC-2. After a lot of heated discussion, the idea of two kangaroos hopped into view. At the same time, a comprehensive series of *Trade Test Transmissions* began with over 70 films being shown during one week alone.

Service information, Switzerland: Part XVI

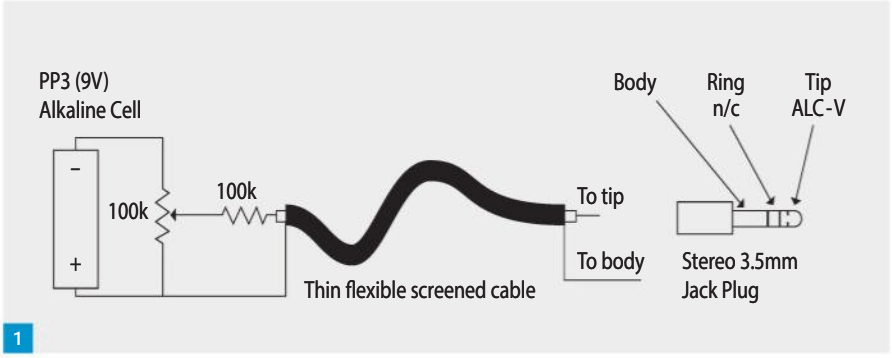
In November 1978, in an effort to persuade radio audiences to switch from medium-wave to FM (*Ultrakurzwelle* or *UKW* in German), SRG-SSR enlisted the help of actress **Birgit Steinegger** to assume the role of *UK-Fee*, or in English, the *FM Fairy*, **Fig. 3**.

Her sole task was to hand out *grilliert Bratwürste* – traditional Swiss large grilled sausages – in the picturesque lakeside village of *Küssnacht am Rigi*, located in Kanton Schwyz on the north shore of *Vierwaldstättersee* and neighbouring *Zugersee* to the south, dominated by the *Rigi Kulm* mountain. Unfortunately, the sausages weren't free – they cost SFr.1.50 each and didn't include the normal accompanying traditional Swiss speciality, *Rösti mit Zwiebelsauce*!

Stay tuned!

All photos this month are from Keith and Garry's archive collection. Please send archive photographs, information or suggestions for future topics via the email addresses shown at the top of this column. **PW**

Colin Redwood G6MXL
practicalwireless@warnersgroup.co.uk



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The 41st Annual Practical Wireless 144MHz QRP Contest

Colin Redwood G6MXL, our QRP Contest adjudicator, introduces the 2024 event, which takes place on Sunday 9 June 2024.

The popular *Practical Wireless* 144MHz QRP Contest is the ideal way for newcomers to the VHF bands and contesting to get a good feel for many aspects of amateur radio contests. It is an excellent way to experience the thrill of making contacts over many km on the 2m band. This year certificates will probably be distributed by email.

Power

The power limit will again be **5 Watts** at the transmitter so that participants with all types of UK licence can participate equally.

Equipment

The only equipment you'll need is a low-power 2m transceiver and an antenna. While you can expect to make some contacts with a basic 2m FM handheld transceiver, most of the activity is likely to take place using single sideband (SSB). Most stations use horizontally polarised Yagi antennas when using SSB or CW.

Location

As always at 2m, a clear take-off such as a hilltop will certainly help. Every year new entrants are surprised just how far their signals can travel between hilltops.

You'll need to find the 6-character IARU locator (sometimes known as 'Maidenhead Locator' or 'Grid') for your station's location, for example IO92KL. I think the easiest way is to visit: **https://dxcluster.ha8tks.hu/hamgeocoding**

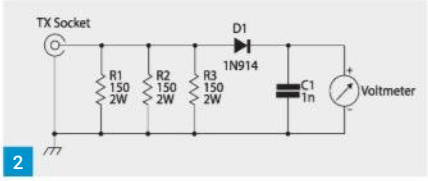
Contest exchange

For each contact to count towards your score, you'll need to exchange your callsign (**including any /P**), signal report using the standard RS(T) code, serial number and locator. The RS(T) code consists of readability on a scale of one to five and signal strength from one to nine.

The serial number starts at 001 for your first contact and increases by one for each subsequent contact you make. So, the fourth contact you make will have serial number 004. For Morse contacts there is also the tone (on a scale of one to nine).

Exchange example

Imagine your callsign is M6ABC/P, you are located in IO91GI and have a contact with M7ZXT/P as your fourth contact. You might transmit, "*Mike seven Zulu X-Ray Tango Stroke Portable from Mike six Alpha Bravo Charlie Stroke Portable, you are five and six, zero zero four, in India Oscar nine one Golf India*". Using phonetics will make sure that similar sounding letters (e.g. B, D, P, V) are clearly understood by the station you are in contact with.



2

Fig. 1: A useful technique to reduce power to 5W on higher power transmitters. Fig. 2: A small power meter, to verify the power output. A 21.7V level indicates 5W output. 2W metal film resistors are available from CPC (Farnell).

Hints and tips

Most newcomers to contesting find that replying to other stations' "*CQ Contest*" calls is a good way to start. As your confidence in exchanging reports, serial numbers and locators increases, then finding a clear frequency, calling "*CQ Contest*" and waiting for stations to reply to you is also a good technique. A mix of the two techniques can be an effective strategy.

Make a point of accurately recording in your log the details of each contact as required by the rules – in particular the callsign of each station you contact, **including any /P suffix**, their locator and the time in UTC (not BST). If you are transferring a paper log to a computer log, be careful to transcribe the details accurately. The format of locators is letter letter number number letter letter.

Directional antennas

If you use a directional antenna, then I would strongly recommend that you rotate it to point in different directions during the contest (e.g. South West England, Northern Ireland, the Republic of Ireland and Scotland). This will not only enable you to make more contacts, but will likely increase the number of different locator squares you contact, which is a part of your overall score.

Batteries

Many entrants use rechargeable batteries for power. Make sure you have enough power to run your station for the full duration of the contest. I'd suggest making three diary entries: the first a couple of days before the contest as a reminder to charge your batteries, the second for the day of the contest (Sunday 9 June 2024), and the third a few days after the contest to remind you to submit your entry. The rules appear on the next page. The contest website is also a valuable source of information and has a link for downloading log sheets and an online entry form (known as a cover sheet).
www.pwcontest.org.uk

Submitting an entry

Don't forget to submit your entry after the contest. Electronic entries via email are much preferred, make the task of adjudication easier and minimise the risk of transcription errors. Paper entries are welcome, and may be transcribed for adjudication purposes. All entries that provide an email address will be acknowledged.
entries@pwcontest.org.uk

Have a go

There will certainly be plenty of other *PW* readers on the air, keen to exchange reports, serial numbers and locators. Good luck in the contest!

The 2024 Rules

1. General: The contest is open to all licensed Radio Amateurs operating fixed or portable stations, using SSB, CW, AM or FM in the 2m (144MHz to 146MHz) band. Entries may be from individuals or from groups, clubs, etc. The contest runs from **0900 to 1500 UTC** on **Sunday 9 June 2024**.
All stations must operate within the terms of their licence. Entrants must observe the band plan and must keep clear of normal calling frequencies (144.300MHz and 145.500MHz) even for *"CQ"* calls. Entrants must allow other users of the band to carry out their activities without hindrance. Please avoid frequencies used by GB2RS (144.250MHz and 145.525MHz), ATV talkback (144.750MHz) and other frequencies in use for non-contest purposes.
The station must use the same callsign throughout the contest and may not change its location.

2. Contacts: Contacts will consist of the exchange of the following minimum information:
callsigns of both stations (**including any /P suffix**)
- signal reports, standard RS(T) system
- serial numbers: a 3-digit number incremented by one for each contact starting at 001 for the first contact.
- locator (i.e. full 6-character IARU Universal Locator for the location of the station.
- Information must be sent to, and received from, each station individually using **just** the 2m band, and contacts may not be established with more than one station at a time. Simultaneous operation on more than one frequency is not permitted.
- If a non-competing station is worked and unable to send their full Universal Locator, their location may be logged instead. However, for a square to count as a multiplier (see rule 4), a full 6-character locator must have been received in at least one contact with a station in the square.
- Contacts via repeaters, satellites, or using digital voice modes (including D-STAR, Fusion, DMR and Echolink) and data modes or machine-generated modes such as FT8, JT65, RTTY and PSK31 are not permitted. Neither is the use of DX Clusters, ON4KST chat (even just logging on), social media or any other method of enabling contacts or contest exchanges.

3. Power: The output power of the **transmitter or transverter** final stage must not exceed **5 Watts** peak envelope power (PEP). If the equipment is capable of higher power, the power must be reduced and measured by satisfactory means. With most modern transceivers, power can be reduced by using a menu setting.
An alternative is to apply a (variable) negative voltage to the transmitter ALC line reached via the accessory socket, **Fig. 1**. Stations cannot rely on feeder loss to meet the 5W power limit.
The output power can be accurately measured using the simple circuit of **Fig. 2**. Connect this to the 50Ω output of the transmitter and adjust the power so that the voltmeter does not exceed 21.7V on a 'good whistle' into the microphone.

4. Scoring: Each contact will score one point. The total number of points gained during the contest will then be multiplied by the number of different locator squares with which contacts were made (a 'square' here is the area defined by the first four characters of the IARU Locator).
Example: 52 stations worked in IO81, IO90, IO91, IO92 and JO01 squares; final score = 52 x 5 = 260.
Only one contact with a given station will count as a scoring contact, even if it has changed its location, e.g. gone /M or /P. If a duplicate contact is inadvertently made, it must still be recorded in the log and clearly marked as a duplicate (not necessary in computer log files).

5. The Log: Logs must contain the following information for each contact:
- time (**UTC – not BST**)
- callsign of the station worked (**including any regional secondary locator and any /P suffix**)
- report sent (e.g. 56)
- serial number sent
- report received (e.g. 54)
- serial number received
- locator received

The preferred form of a log is a computer file in REG1TEST, .log, .adi or .edi formats sent by email. This may be generated by contest logging software such as MINOS or EI5DI's SDV, provided it contains all the information listed above. Alternatively, a file in any other suitable format (such as the spreadsheet available on the contest website) or in plain text, provided each of the items above is separated by a separating character such as a comma or tab, is acceptable. Give the file a name including the station callsign (e.g. g6mxl-p.log), and send as a standard email attachment to
entries@pwcontest.org.uk
Email entries will be acknowledged within 8 days.
If there is any problem with your entry, you will be contacted by email.
Log sheets and covering information sheets for paper-based entries are available for downloading from the contest website:
www.pwcontest.org.uk

6. Entries: The covering information listed below must be provided with each entry. Please submit this using the online facility on the website. For postal entries, it should be written on a separate sheet of A4-sized paper.
The information required for every entry is:
- name of the entrant (or of a club etc. in a group entry) as it is to appear in the results table and on the certificate
- callsign you transmitted during the contest, **including any regional secondary locator required to identify your country and any /P suffix** (e.g. G6MXL/P)
- name and address for correspondence
- location of the station during the contest
- full 6-character locator you transmitted during the contest
- whether single or multi-operator (a single operator is an individual who received no assistance from any person in operating the station, which is either his/her permanent home station or a portable station established solely by him/her); if multi-operator, include a list of operators' names and callsigns
- a full description of the equipment used, to include transmitted PEP output power
- if the transmitting equipment (including any transverter employed) is capable of more than 5W PEP output in the 144MHz band, a description of the methods used to (1) **reduce** and (2) **measure** the 144MHz output power
- antenna used and the approximate station height in metres above sea level (ASL)
- the following declaration must be included in the email text or written and signed by the entrant: *"I confirm that the station was operated within the rules and spirit of the event, and that the information provided is correct"*.

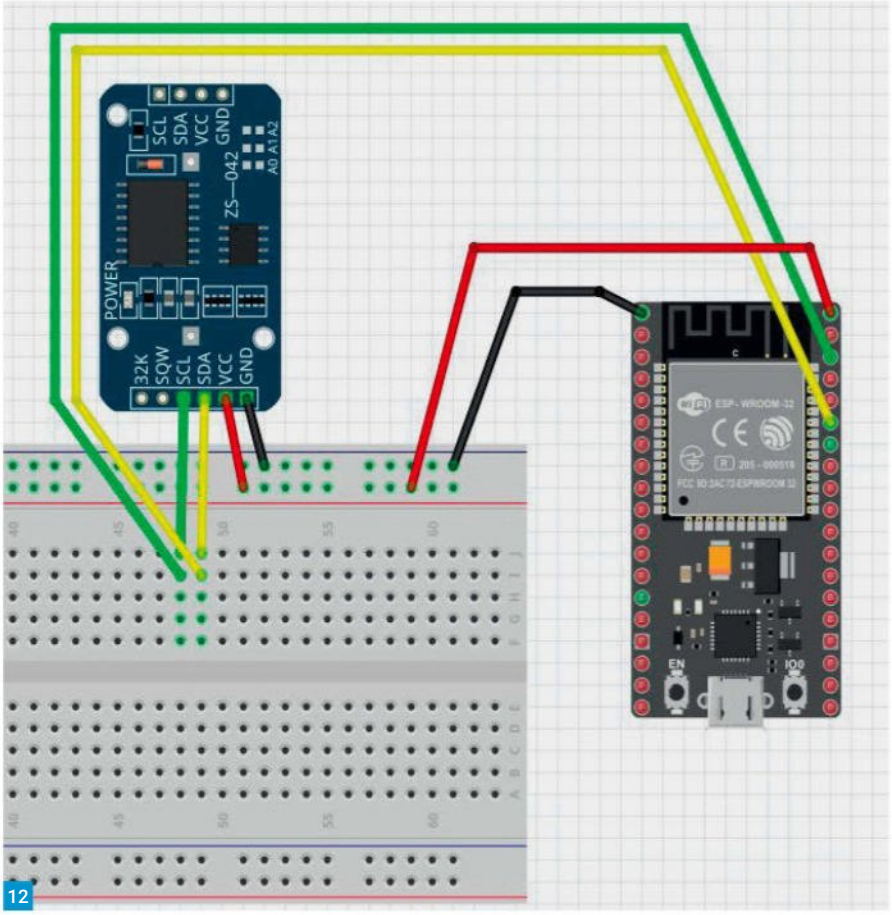
Failure to supply the required information may lead to loss of points or disqualification.
Entries by email must be sent to
entries@pwcontest.org.uk
Paper entries should be sent to: Practical Wireless Contest, c/o Colin Redwood G6MXL, 53 Woodpecker Drive, Poole BH17 7SB.
Entries must be received not later than Tuesday 2 July 2024. Late entries will be disallowed.
Any other comments about the station, the contest and conditions during it are welcome along with photographs. Please note these cannot be returned and may be published in Practical Wireless or on the contest website. Please send them by separate email or post, **to arrive by Tuesday 2 July 2024**.
When entering, you will be asked to agree to the storing and processing of your entry and to the publication of the results. Warners Group Publications data policy can be seen at:
https://tinyurl.com/f6m9z9hp

7. Miscellaneous: When operating portable, obtain permission from the owner of the land before using the site and observe any restrictions on access. Always leave the site clean and tidy, removing all litter. Observe the Country Code.
Take reasonable precautions to avoid choosing a site which another group is also planning to use. It is wise to have an alternative site available just in case.

8. Poor Signals: Make sure your transmitting equipment is properly adjusted and is not radiating a broad or poor-quality signal, e.g. by over-driving or excessive speech compression. On the other hand, be aware that your receiver may experience problems due to the numerous strong signals it will have to handle, which may lead you to believe that another station is radiating a poor signal. Before reaching this conclusion, try heavy attenuation at the received input. Using a high-gain RF preamplifier is likely to worsen strong-signal problems, so it is best to be able to switch it off when necessary.
If after making the checks above, you are certain that another station participating in the *PW* 144MHz QRP contest is radiating poor quality signals, please call the station, giving your callsign, and tell them about the problem. You cannot expect a station with a poor signal to do something about it if they are unaware!
If you receive or send a report of poor-quality signals, you must record on the cover sheet full details of the complaint including time, callsigns of stations involved, nature of complaint and actions taken **during** the contest to investigate and resolve.

9. Adjudication: Points will be deducted for errors in the information sent or received as shown by the logs. Unmarked duplicate contacts in paper-based logs will carry a heavy points penalty. Failure to supply all the information required in Rule 6 may also lead to deduction of points. A breach of these rules may lead to disqualification. In the case of any dispute, the decision of the adjudicator will be final.

Colin Campbell MM5AGM
mm5agm@outlook.com



12

A beginners guide to the Arduino IDE culminating in a single-band WSPR beacon (Pt II)

Colin Campbell MM5AGM completes the design and build of an Arduino-based WSPR beacon, starting with the addition of the real-time clock.

The RTC is a SSD1306 available from many outlets. First off, make up your circuit as in **Fig. 13**. Red = +ve 3.3V, Black = ground -ve, Green = GPIO21, SDA and Yellow = GPIO22, SCL.

You don't need the battery in the RTC, in fact there's some debate on the internet as to which battery you should use. Some RTCs are supplied with a CR2032, non-rechargeable, and some with an LR44, a rechargeable battery. Some of the RTCs have no charging circuit, some a 3.3V and some a 5V. Mine came with a rechargeable battery but I decided not to use it because if the power fails to my circuit, it doesn't matter, the RTC will reset to the correct time when the power is re-connected.

SDA is the data line and SCL the clock line. SCL is not the time, microprocessors do things in a uniform manner and at precise position on a square wave signal. The square wave signal is the SCL line. Open the Arduino IDE and load the sketch "WSPR_Examples/I2C_Scanner/I2C_Scanner.ino". This program scans all the addresses on the I2C bus, reports the number of devices it finds and their address. The address is a hexadecimal number. Now we humans use the decimal system 0,1,2,3 etc but computers use, as well as decimal (base 10), binary (base 2) 0,01,10,11,100 (0,1,2,3,4 decimal), octal (base 8) 0,1,2,3,4,5,6,7,10,11 (0,1,2,3,4,5,6,7,8,9 decimal) and hexadecimal 0,1,2,3,4,5,6,7,8,9,A,B,C (0,1,2,3,4,5,6,7,8,9,10,11,12). Hexadecimal 10, represented as 10x = 16 decimal.

The reason for these different number systems is that it's easier to manipulate individual bits of registers in the microprocessor when we use these notations. Just to complicate things further, as well as the number system we also have signed and unsigned, and different size allocations for different number types. This is important because the compiler needs to know how much memory to allocate for each of the variables in the program. There's lots on the internet about this subject if you want to read more. Suffice to say that my sketches use everything up to an unsigned long integer, 0 to 4,294,967,295. This is used for the frequency we want the si5351 to output, and since it has a resolution of 0.01Hz, we need really large numbers. 14MHz to the si5351 is 1,400,000,000. When you upload the sketch and open the serial monitor your output could be something like this:

Scanning...
I2C device found at address 0x57 !
I2C device found at address 0x68 !
Finished Scanning. Number of devices found = 2

Fresh scan starting in 5 seconds

Now you're thinking, hold on, I only have one device plugged in. How come it shows two? Well, the DS3231 real time clocks (RTC), also exposes the temperature probes inside the device that it uses for its TCXO, the temperature compensated crystal oscillator. If you get two addresses, the one you want is 0x68 for the clock, 0x57 is the temperature probe. Note that the temperature probe isn't very accurate, it's plus or minus 3ºC. The library I use for the RTC actually knows the address for the clock, so you don't need it. If you use another library, you probably will. Now that we've proved our circuit works, we'll use an NTP server to update the RTC. In the IDE go to "File/Open" navigate to "WSPR_Examples/NTP_Time_With_RTC/NTP_Time_With_RTC.ino".

When the sketch is in the IDE you will see that we have included another library, RTClib. We need to add this to our library list. This library is included with the Arduino so it's just a case of loading it. No need to go to GitHub and download a zip. In the IDE go to "Tools/Manage Libraries ..". This will open the inbuilt library manager. In the search box type rtclib. This should bring up "RTClib by Adafruit" version 2.1.3, or later. Click on install and a box will appear that informs you that this library has another dependency, "Adafruit BusIO" and asking if you also want to install this, we do, so click on "Install All". The output box will show that the libraries are installed.

Now navigate to where you unzipped WSPR_Examples and select "WSPR_Examples/NTP_Time_With_RTC/ NTP_Time_With_RTC.

Fig. 13: Schematic of real-time clock.

ino". Change the ssid and password to yours and upload. The serial monitor should show the RTC being updated every two minutes, and the time from the RTC every second with that slight delay. There can be a problem when using external libraries and that is they may define the same thing differently. This is the case with the NTP and RTC libraries I've used. They each use their own structures for the date and time and internally define them differently. The NTP library has days Sunday to Saturday numbered 1 to 7 whereas the RTC library has the days numbered 0 to 6. Before I spotted this, weekDays[6] was reported as "Sun" by RTC but as my password by NTP. That's because weekDays[7], Sunday in NTP, overflows the array and the next memory location just happened to be my password.

Adding the OLED

I included the OLED because I wanted the WSPR transmitter to be standalone. When it's standalone you don't have access to the serial monitor in the IDE so can't see what time it thinks it is etc. Some of these OLEDs have yellow writing for the top of the screen. You don't want one of these for my program. You want one that has white text all over. If you inadvertently get the yellow topped one, you will need to change the mainScreen() function to stop the second line being squashed up. Disconnect the ESP32 from power, add your OLED to the breadboard, connect it to the power lines and piggyback the SCL and SDA lines from your RTC. Power the ESP32 and load "WSPR_Examples/I2C_Scanner/I2C_Scanner.ino" and you should find that there are now three devices. Make a note of the addresses. You will remember the ones you had before so the extra one will be the OLED. In the IDE open "WSPR_Examples/NTP_Time_RTC_OLED/NTP_Time_RTC_OLED.ino".

You'll see that we have included another two libraries, "Adafruit_SSD1306" and "Adafruit_GFX". These are libraries known to Arduino so you add them using its inbuilt library manager the same way you added the RTC library. In the IDE go to "Tools/Manage Libraries .." and open the inbuilt library manager. In the search box type ssd1306. This will give you a choice, scroll down to Adafruit SSD 1306 and click "Install". You will get a popup telling you there are dependencies, select "Install All". This will also install the Adafruit_GFX_Library. One thing I find annoying with this OLED library is that when you write to the display, with for example display.println("Something"), it doesn't appear on the screen until the next time the instruction display.display() is sent to it.

After adding the libraries upload your sketch to the ESP32. The OLED should show your ssid on line 1, IP address on line 2 and the time on line 3. Remember, the time displayed will be slightly behind real time because of the one second delay in loop(). The RTC will always be slightly behind the time reported by https://time.is because the NTP library returns the number of whole seconds since 1 January 1970. If you query at half a second past the last whole second, the RTC will be out by that half second.

Add the si5351 square wave generator

Adding the si5351 is similar to adding the RTC. Disconnect the ESP32 from power, piggyback the SDA and SDC lines from the RTC or the OLED and connect VCC and ground. Power the ESP32 and open and load the sketch "WSPR_Examples/I2C_Scanner/I2C_Scanner.ino" to your ESP32. If you've wired the si5251 correctly you should see another device, at address 0x60.

The si5351 has a crystal oscillator, either 25 or 27MHz with 25MHz being the most common. On my si5351 the board says "25MHz xtal" to the left of the crystal. It's not temperature controlled so you do get some drift. We need a library to control the si5351 and the one I use is si5351 by **Jason Mildrum** and **Paul Warren**. If you don't have a 25MHz crystal, you'll need to read Jason's notes on how to initialise it. This library is known to Arduino so add it using its inbuilt library manager the same way you added the RTC library. In the IDE go to "Tools/Manage Libraries. ." and open the inbuilt library manager. In the search box type si5351. Select and Install "Etherkit Si5351" by Jason Milldrum. You need an 8-digit frequency counter to do the calibration but you can use a receiver if you don't have access to one. I used my receiver and the excellent WSJT software from **Professor Joe Taylor K1JT** et al. If you don't have WSJT, download it from: **https://sourceforge.net/projects/wsjt**

The instructions for the programs are at: **https://wsjt.sourceforge.io/wsjtx.html**

There is a calibration sketch in the "Examples" section of this library as well as sketches that explain how to use the library. Upload "Files/Examples/Etherkit Si5351/si5351_calibration" to your ESP32. As I was using the WSPR program in WSJT I modified this sketch very slightly to use the 30m WSPR frequency. The si5351 frequencies are indicated in units of 0.01Hz so if you are doing the same, go to line 32 and change target_freq from 1000000000ULL to 10140200000ULL. You can change the target_freq to anything you want but it alters the amount of deviation the program adds during the calibration process. For example, if you calibrate at the 28MHz frequency and input "k", then the enter key, your frequency will go down not 100Hz but nearly 300. The calibration factor the program works out will be the same however. In the serial monitor you should see the instructions for the sketch. If you don't, press the enable button on you ESP32 or unplug and plug it back into the USB port.

"The reason for these different number systems is that it's easier to manipulate individual bits of registers in the microprocessor when we use these notations"

Set up WSJT-X

If you already have WSJT-X working, for FT8 say, there's nothing you need to do apart from set up the waterfall. Open WSJT-X and select mode WSPR. If you haven't set it up before, go to "File/Settings/Radio/Rig" in WSJT-X and set it to "None". If you don't do that, you will need to set up cat control. Now go to "File/Settings/Audio/Soundcard" and tell it what input device to use. Available devices will be in the dropdown lists.

Next go to "View" and select "Waterfall". In the waterfall display, set "Bins/Pixel" to 2 and "Start" at 100Hz. Leave everything else as is. The si5351 has, as well as the SMA connector, an output on its board marked "0" for clock 0. You will see others marked 1 and 2 for clock1 and clock2. I use clock 0. If you stick a short bit of wire, six inches or so, into the breadboard at "0" it will act as an aerial but you might get a lot of harmonics. When the waterfall was checked I could see my transmission was around 1650Hz, **Fig. 14**, so I changed the "Bins/Pixel" to 1 and "Start" to 1100. This gives a wider span for 1400 to 1600Hz, the area that's decoded in WSPR. As well as my signal you can see some wavy lines between 1400 and 1600Hz. These are WSPR transmissions.

I needed to come down 133Hz. In the IDE, just under where it says "Output Serial Monitor x", there's a box that you can put the commands into. To adjust my signal to get to 1500Hz, I entered "k" in this box which brought me down to 1533 and then a few "j"

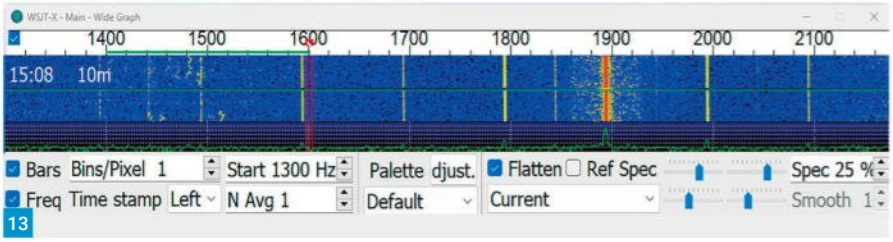


Fig. 14: Calibrating the WSPR frequency.

down 10Hz and "h" down 1Hz. This gave a calibration factor of 13100. When your happy you're at 1500 on the 30m frequency enter "q" in the program and it will quit and tell you the calibration factor. Make a note of the calibration factor as it's required in the final WSPR sketch. If you don't see, or hear the tone on your receiver, you'll need to hunt for it. Do this by changing your receiver frequency. You should eventually find it. Make a note if you had to go up or down in frequency and in the calibration sketch move in big steps until you see the trace when at the 30m dial frequency. The calibration factor can vary considerably between si5351's, I have two si5351's and the factors are 13100 and 131800.

The single band WSPR sketch

Upload "WSPR_Examples/WSPR_Single_Band /WSPR_Single_Band.ino"

At the start of the sketch you will see

#define DEBUG //

Comment this line to supress debugging to the serial port.

With this you will see lots of information about the initialisation of Wi-Fi, OLED, and real time clock in the serial monitor. You'll also see the variables you've changed and the time. The time is slightly delayed in the serial monitor but you'll know it is accurate by the fact that others are decoding your signal. Once you're happy with your setup, change #define DEBUG to // #define DEBUG.

We need two more libraries for this, the final sketch. We need "Time by Michael Margolis" and "Etherkit JTEncode by Jason Milldrum". Both of these libraries are accessible through the IDE. So, as before, "Tools/Manage Libraries .." and search for "jtencode" and "Time" and install them. Note that for this sketch I have changed the baud rate for the serial monitor to 115200 so you should do the same. There are some variables you will need to change. Change "callsign", "locator" first four characters," ssid", "password", and "cal_ factor". Leave the "randomChange" at zero, this is a random value that's applied to the transmit frequency each time you transmit and is used to avoid being on the same frequency as someone else all the time. Since everyone will change frequency at the next transmit time by a random amount it is more likely you'll get a clear slot. Leaving it at 0 will allow you to see where others claim your transmit frequency is and will give a guide as to how well the calibration was done. Since you have no idea how accurate these other receivers are you can only use them as a guide.

Once you're happy that you are in band you can change "randomChange" from 0 to anything from 0 to 100. I'd recommend less than 80 just in case the drift on your si5351 is excessive. In saying that, if it is excessive, no one will decode you. The writers of WSPR recommend transmitting for 20% of the time and as there are 30 timeslots an hour. We're looking to transmit in six slots, in other words, with ten minutes between transmissions. Some slot numbers are not possible. For example, to get 12 slots you would need to have five minutes between transmissions, and since that leads to transmission starting on an odd minute, it can't be used. My sketch only allows valid transmit times. There are two sets of periods you can transmit in in each hour. These start 0,4,8,12 etc minutes and 2,6,10,14 etc minutes. In the sketch you will see a detailed analysis of this showing that, if you go with the recommended transmitting 20% of the time, six slots, you will have three transmits in each period, which is ideal. Change "DST_OFFSET" and "TIME_ZONE" to yours if you want to display local time instead of UTC. If you're not in UK change "NTP_ Server" to one nearer to you.

Finally, uncomment the frequency you want to use, making sure that only one frequency is uncommented. I used WSJT-X on WSPR to check my frequency over a period of a day as I know my receiver is accurate. I saw how much my frequency varied and took it from there. **Table 1** shows how others reported my frequency with randomChange = 0.

Call	MHz	SNR	Drift	Pwr	Reporter	RGrid	km	# Spots
MM5AGM	18.106117	-17	-3	0.01	LX1DQ	JN39cq	968	9
MM5AGM	18.106037	-24	-3	0.01	F1EYG	JN18ar	897	3
MM5AGM	18.106110	-26	-3	0.01	DL0LU	N49cm	078	4
MM5AGM	18.106138	-24	-3	0.01	PE0MJX	JO31ai	826	2
MM5AGM	18.106101	-25	-4	0.01	DC5AL-R	JO31lk	868	1

Table 1: Reports received from the internet

Programming Notes

A Boolean variable is either true or false. In the "c" programming language false = 0, and true is any other value, so -24 and 6 would both be true. "X=5" means set x to 5. "X==5" means does x = 5?. "number++" means use the number then increase it by 1. "++number" means increase the number by 1 then use it. "number- -" and "- -number" do the same but subtract 1. "! =" not equal, "<" less than, ">" greater than, "<=" is less than or equal to, ">=" is greater than or equal to. The Modulus operator," %" returns the remainder after the division, for example "10%6" will return 4. This is handy for things like finding if you are at an even minute to transmit WSPR.

To test if a number is "even" you would use "minute%2 == 0". Boolean operators. "&&" is logical AND, "||" is logical OR , "!" is logical NOT and results in true if the operand is false and vice versa. So "!true" = false. There are lots of different looping structures, "for" "while" etc, and information on how to use these can easily be found on the internet.

A gotcha that catches many programmers is testing for equality with a floating-point number, a number with a decimal point, called a float in programming languages. Because microprocessors hold number values in multiple continuous memory locations, a float is nearly always an approximation to the real value. Floating-point numbers can be positive or negative and can be huge. They are stored as 32 bits (4 bytes) of information in the Arduino. Now because they are an approximation, you may have worked out that your answer = 3.4, but the Arduino may have stored it as 3.4000000000001. To a computer, these numbers are not the same so testing as equal will return false. In this example you would need to use something like "(x<3.4001) && (x>3.3999)" assuming you're happy with four decimal places.

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E-mail: practicalwireless@warnersgroup.co.uk

CEPT Radio Amateur Licence

Dear Don,

Recommendation T/R 61-01. Has the digital world we now live in made the CEPT recommendations irrelevant in a lot of cases?

As the recommendations only cover an amateur using their licence to transmit and radiate RF from their location, which may be identified by a country prefix when calling; when using the internet to connect to a transmitter (e.g. a Repeater) the amateur may be activating their transmission from any place on Earth and can use the callsign (regardless of the level of licence) registered and approved by the digital link.

For example, A station using Wires X will have a callsign embedded in the software and without any local RF can contact stations around the World; the amateur may be operating in a CEPT licence country without holding a CEPT approved licence (Novice, Intermediate licences). The same would apply to an amateur using the Peanut, Echolink, a radio free Allstar System or many other internet-linked amateur radio facilities.

Following the above, a novice licence holder on holiday in Europe may wish to use a local repeater. All they need to do is find it on Echolink and access it using their mobile phone or computer using their home callsign. A similar situation will apply to some remotely operated shacks.

I have no doubt than many readers will not agree with my interpretation of the licence terms and conditions but it's all worth further consideration.

John ButlerGD0NFN
Isle of Man

(***Editor's comment***: *I'm not at all sure I agree with your interpretation John, but let's see what other readers have to say. Personally, I think it comes down to where the RF is originating, regardless of whether the internet is used for access. So a UK amateur can transmit RF from the UK regardless of where he/she is located. But radiating RF from another country is dependent on local regulations in that country.*)

Clubs etc...

Dear Don,

I haven't got a clue as to what my local radio club has been doing (*Keylines*, May). Not heard about any 'significant events' either, for that matter. Perhaps there hasn't been any?

Yonks ago, I was a member of my local club (SDRS) here in Weymouth/Dorchester. I do recall though, that when I made my first visit I received a very frosty welcome. As if there was a bad smell in the room. In hindsight, I can't fathom why I bothered to join. Maybe my face didn't fit? Or perhaps somehow, most of the people I met that day thought I didn't cut the mustard in some way? However, barring the frosty welcome, I did join up.

One particular local amateur that did welcome me at a club meeting or two later, was **Fred G4JVQ** (SK). Well, I'd known Fred previously, because he knew my late father who delivered his daily milk supply (dad was a milkman – my father's name was also Fred). So not unsurprisingly, I was a regular visitor to G4JVQ's well-endowed shack. Fred was an HF addict. Consequently, his back garden sported a tower with the usual metal on top of it. Unfortunately, Fred was a heavy smoker, so I had to restrict my time with him while in his company. That wasn't an easy thing to do. I'd return home smelling of Senior Service cigarettes if I overstayed my welcome. But I still remember Fred with great affection.

G3MGW asks (May 2024 issue) *"where did the German WWII radio equipment go?"* I read somewhere that the conquering Allies destroyed a lot of it. Maybe it was spite? Or perhaps the Allies didn't want German RF technology being available to every Tom, Dick or Harry, or radio enthusiasts?

Ray Howes G4OWY/G6AUW
Weymouth

Radio Communication Equipment of WW2

Dear Don,

In May 2024 issue of *PW* (*Letters*) **Roger Wheeler G3MGW** asks of German WW2 wireless kit *"Where did it go to?"* He suggests, according to Google, *"Down the Scrapyard"*. That may be true for some of the kit, but like Bletchley's Colossus, apparently destroyed because it was 'so secret' the truth may well be stranger than the fictional joe public were expected to believe.

At the end of the war spoils were divided. My late friend, **Peter Matthews**, recounted an experience at the cessation of hostilities against the Germans. He was working for SIS and tasked with collecting technology of the Third Reich.

He relates working in a certain sports stadium, I think outside Berlin, where Enigma machines were stacked from floor to roof. There were other examples, Geheimeschrieber and Lorenz machines, but not in as large quantities.

He did not mention radio equipment other than the dumping of some in a German lake although he stated our Russian allies [then] were most interested in the Lorenz machines and to a certain degree, the Geheimeschrieber.

Peter used to relate how German PoWs were used to stack these machines against the walls. The more educated prisoners sometimes suggesting to him there was a history to be made and trying to pass the Enigma machine, with all paperwork for him to keep, for the odd pack of cigarettes.

We once sat in my office at Imperial College [he was an alumnus, having gained a Degree in Aeronautical Engineering] where he stated it was a pity he hadn't taken any of the offers up; we could have had a machine or two apiece!

Peter Matthews was an interesting person; he had lots of experience that he would not speak of; interestingly his two books, *SIGINT: The Secret History of Signals Intelligence in the World Wars* [2013] and *House of Spies: St Ermin's Hotel, the London Base of British Espionage* received variable reviews but generally favourable. That I am mentioned in one of the books is an honour for me.

So, what happened to the equipment stored at this sports stadium? By the end of WW2 Bletchley Park and its outstations were routinely decoding Enigma encrypted messages – our commanders indoctrinated for ULTRA use were reading the decrypts long before the intended German commanders.

The same existed for messages from Geheimeschrieber and Lorenz machines, decrypted via 'Heath Robinson' and Colossus respectively.

No Russian commander was ever ULTRA indoctrinated, was probably unaware of Bletchley Park and certainly had no knowledge of Colossus.

The fate of the Enigma machines, according to Peter, was the sending to governments not thought to be over friendly to Great Britain and its interests abroad. I was interested to learn that Egypt received a number of these machines which, like those given to other unfriendly governments,

could be routinely read. Having spent five years of my childhood in Aden at the time **Gamal Nasser** was attempting to promote his idea of a pan-Arabia government and the problems caused by the two factions FLOSY and NLF in Aden as a result, I often wonder what use the intelligence gained from this gift of encryption machines actually was!

Wherever the British were we had intercept stations; readers with an interest in SIGINT will certainly be aware of Little Sai Wan in Hong Kong, Signal Intercept Stations at Kormaksar Aden and Habaniyah Iraq. All were manned by extremely well-trained RAF Intercept operators. That does not exclude the Royal Navy or Army intercept officers either. One of my friends, ex RAF, could easily decode Morse at 35 to 40wpm, including Russian barred letters. Another friend can follow Chinese Morse at speed. I have met ex-RN operators who could do similar and carry on a conversation at the same time. These operators were worldwide, as were those in the Diplomatic Wireless Service with as good Morse and signalling skills.

What knowledge was gained using this most sneaky approach to the geopolitical gifting of the machines can only be guessed. More so the gifting of the majority of the Geheimeschrieber and Lorenz machines to the rising Soviet Russia. They would have used them while totally unaware that Colossus would make it possible to receive decent intelligence routinely. However, to make use of this most unlikely and unexpected gift the recipient country's governments would also need more wireless equipment.

Peter and I used to write for *EyeSpy!* a now defunct magazine whose content needs no explanation. We were often contacted for our views of different aspects of espionage, particularly SIGINT and technical means and such like. My passion is number station transmissions. Interestingly many schedules have closed since the Ukraine/Russian war. Peter ably demonstrated the use of code books and one-time pads on the *One Show*, where I was the advisor, the interviews done by the most able **Ruth Goodman**.

Although Peter never mentioned wireless particularly; he did say other technological equipment, including use of an acronym, long forgotten by me, used in connection with this practice. It is more than likely with working wireless equipment being seized the eventual disposal was via unfriendly governments to help with the use of the useful encryption machinery innocently gifted them.

Military secrets? Diplomatic messages? Railway timetables? Who knows? Only those intercepting the resultant coded messages I suspect.

Paul Beaumont G7VAK
London

Repurposing Power Supplies

Dear Don,

I have one reservation and one warning about the power supply in Fig. 3 (May, p.15). Op amp U4.1 appears to operate as an open-loop comparator so the gain will be enormous and the output will jump from (as close as it can get) one power rail to the other. **Samuel EI9FZB** clearly believes it works, but I question if it's actually oscillating at a high frequency that he hasn't (yet) noticed. I'd expect proportional control by a (probably differential) error amplifier. Compare U4.3, also a comparator, that correctly only needs two states – normal function or overcurrent shutoff. Even this has appropriate feedback R16 to provide suitable hysteresis. I admit I might have missed something due to the tiny print of the diagram, despite magnification. Would be interested to compare notes with Samuel.

Let me also warn about connecting PSUs in series (Fig. 11). The circuit shows a true earth symbol connecting to the negative supply rail, but I think (hope) local zero-volts is intended. Otherwise, the leftmost PSU in Fig. 11 has its output shorted to earth. Assuming all's well in the illustrated case, the 'End note' (P17) also mentions putting two supply 'Bricks' in series. This omits the necessary check to ensure that the output terminals are floating and not connected to chassis/mains earth.

Godfrey Manning G4GLM

Latest News

FREE ONLINE UK AMATEUR RADIO FOUNDATION LICENCE COMMENCING MAY 2024:

Do you, or someone you know, want to get your UK Amateur Radio Foundation Licence? If so, this free online course from South Bristol Amateur Radio Club is for you, or them.

Amateur Radio licensing went through a substantial change in February 2024 and there was a degree of uncertainty about how this would feed into the examination and training system. We now know that the new Licence Conditions will become examinable at all levels of the Amateur Radio Licence from 1 September 2024. We believe that we can fit in an online Foundation Licence course between now and the change-over date.

What we will do:

Ahead of the Training Evening we will send you a set of training notes in PDF format by email to allow you to prepare for the on-line lesson.

On a weekday evening (Monday – Friday other than Thursday), based on majority preference, we will host an online lesson using the Open Source Jitsi Meet platform where one of our trainers will present the lesson topic or part of the lesson topic. We expect these lessons to take about an hour and be held weekly. At the end of each lesson send copies of the presentation slides in PDF format by email to each participant.

At the end of each module (there are 8 modules) we will provide a set of revision questions to be undertaken as 'homework' to allow you to assess your understanding of the points discussed.

At the end of the formal training sessions hold one or more 'mock exams' in an interactive virtual classroom format.

After the exams are complete, or largely complete, hold an on-line 'conversion course' to explain the new Licence Conditions.

What you should do:

If you are interested; send an email to **training@sbarc.co.uk** including:

- your name, email address, postal address, date of birth and which weekday evenings (Monday – Friday excluding Thursday) and times you are available.
- Save and/or print and file the PDF lesson notes we send; and read/review these ahead of the on-line lesson.
- Attend the on-line lessons.
- Complete the homework.
- Attend the interactive 'mock exams'.
- Book and pay for your own on-line examination through the RSGB Exam Booking System, selecting a date before 1 September 2024. Exams for dates after 1 May 2024 will cost £35.50 per sitting.
- Let us know your result and callsign.

We estimate 11 – 12 sessions to cover all of the syllabus plus allow time for the recap homework and mock exams. To allow time for you to book and sit your exam before 1 September 2024 we would need to start this course during week commencing 20 May 2024.

In order to participate in the on-line sessions you will need:

A working desktop or laptop computer with a modern web browser, microphone and webcam or an Android tablet/iPad. Note: although it is possible to run the Jitsi Meet client on an Android or iOS mobile phone we do not recommend this as the screen is usually too small to efficiently watch the slide show presentations that are used during the on-line lessons.

A stable connection to the internet.

A PDF Reader such as Adobe Acrobat, MuPDF or GNU gv.

An operational printer if you want to create hard copies of anything sent to you.

https://www.sbarc.co.uk

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19 May
DARTMOOR SPRING RADIO RALLY: Yelverton War memorial Hall, Meavy Lane, Yelverton, Devon, PL20 6AL. Doors open 10am, Admission £2.50, Free Parking. Contact Roger:
Tel: 07854 088882
Email: 2e0rph@gmail.com

2 June
SPALDING AND DISTRICT ARC ANNUAL RALLY: (NEW VENUE) Spalding Rugby and Football Club, Centenary Park, Drain Bank North, Spalding, Lincs, PE12 6AF. what3words ///jumpy.either.pipe General Admission £3.00 per person. Free On-Site Car Park. Inside and Outside Traders. Onsite catering and bar. RSGB Book Stall
www.sdars.org.uk/spaldingrally

9 June
MENDIPS RALLY: Farrington Gurney Memorial Hall, Church Lane, Farrington Gurney, BS39 6UA, 9am - 1pm, Admission £2, Free car parking, Hot & Cold refreshments, Inside tables £8 each, Field Pitches £5, Traders from 7.30am, Contact: Luke 2E0VHV, 07870168197 or email mendipsrally@hotmail.com (CBS, CR, FP, TS)

JUNCTION 28 RADIO RALLY: Alfreton Sports Centre DE55 7BD, 1 mile from M1 J28. Open 10.15am. Bookings open for Tables at £12 in advance. Visitor Admission on the day £4. Cash Only. Everything is indoors with bar/refreshments. Large and small suppliers, including Canny Components, providing new and used equipment. As usual RSGB, local and national/specialist groups. See website for map/routes and trader booking form or contact j28rally@snadarc.com. (BB, CR, LB, RSGB, SIG)
www.snadarc.com

15 June
ROCHDALE & DISTRICT AMATEUR RADIO SUMMER RALLY: St Vincent de Paul's Hall, Norden, Rochdale, OL12 7QR. Doors open at 10am with entry still at only £3. Usual Traders and caterers. Plenty of free parking. Please note that all proceeds from this rally will be given to a local charity. Last year we were able to donate £4000 from Rally sales and Silent Key donations to the Rochdale Springhill Hospice. (CR FP TS)
Email: dave@cardens.me.uk,
Tel: 01706 633400, Mbl: 0781 367 1296

Rallies & Events

All information published here reflects the situation up to and including **22nd April 2024**. Readers are advised to always check with the organisers of any rally or event before setting out for a visit. To get your event on this list, email the full details, as early as possible, to: **practicalwireless@warnersgroup.co.uk**

23 June
NEWBURY RADIO RALLY: Newbury Showground, next to junction 13 of M4 motorway in Berkshire, RG18 9QZ. This is the 35th year of The Newbury Radio Rally and is the ideal event for anyone interested in radio communications, computing and electronics. There will be a display area with an amateur radio station, exhibits, special interest groups, clubs and societies. Open to sellers at 08.00hr and visitors at 09.00hr. Massive Free parking. On-site catering. Disabled facilities. Entry is £3 visitor, £15 sellers pitch. Advance bookings (with discount) via:
www.nadars.org.uk/rally.asp
Email: NewburyRally@nadars.org.uk

30 June
DUNSTABLE DOWNS ANNUAL CAR BOOT SALE: The Dunstable Downs Radio Club are holding their Annual National Amateur Radio Car Boot Sale at the usual venue, Stockwood Park in Luton on Sunday 30 June. This is the 39th year without a break (bar COVID) that this event has been run. For this year only our event has been forced to make way for the Radio 1 big weekend at Stockwood Park in May. All the usual facilities will be there, further details on:
www.ddrcbootsale.org

7 July
BARFORD NORFOLK RADIO RALLY: The venue is Barford Village Hall and Green, Barford, Norwich, NR9 4AB and doors open at 9am for visitors. The event features trade stands, car boot sales, bring and buy, charity raffle, repeater groups, catering and free car parking. Entry £2.50 per person - under 16s free of charge. Traders only may arrive from 0800 - Outside pitches £8 no need to prebook / Inside hall tables £10 must be prebooked.
David G7URP radio@dcpmicro.com
www.norfolkamateurradio.org

14 July
MCMICHAEL RADIO & ELECTRONICS RALLY AND CAR BOOT SALE: Reading Rugby Club, Holme Park, Sonning Lane, Reading, Berkshire, RG4 6ST. 09:00 entry (08:00 for Trader Set-up). Entrance Fees: Visitors - £4 per person, Traders - £10 per Table (includes entry for two people). Berkshire Lowland Search and Rescue will be providing a First Response service. No Dogs other than Assistance Dogs are allowed on the events field. (CBS, CR, CS, D, FM, FP, LB, TS)
Email: rally@radarc.org, Traders: traders@radarc.org
Telephone: Colin Ashley 07706 512505
Facebook: McMichaelRadioRally/
Instagram: @mcmichael_radio_rally X: @McMichaelRally

LINCOLN SHORT WAVE CLUB, SUMMER RADIO RALLY: The Festival Hall, Caistor Road, Market Rasen, LN8 3HT. Doors open at 10.00am, Indoor Event Admission £3, Hot refreshments including our bacon butties. Ample free car parking, Tables £10 . (BB, CR, FP)
Steve M5ZZZ: 07777 699069, m5zzz@outlook.com

CAMBRIDGESHIRE REPEATER GROUP RALLY: Unfortunately, the April event had to be cancelled due to the wet weather. It is hoped to hold the rally on 14 July, subject to final confirmation from the venue (Foxton Village Hall). Please check the website for updates:
https://cambridgerepeaters.net

28 July
WILTSHIRE RADIO SUMMER RALLY : Kington Langley Village Hall, Kington Langley, SN15 5NJ, just off Junction 17 of the M4. Opens 09:00 close 13:00. Admission £3.00. Indoor tables £10.00. Car Boot Car size Pitch £10.00 Van Size Pitch £15.00. Hot and Cold refreshments available on site. (CR, CBS)
Email: Chairman@Chippenhamradio.club

BA Buildathon, **BB** Bring-and-Buy, **CBS** Car Boot Sale, **CR** Catering /Refreshments, **CS** Club Stalls, **D** Disabled visitors, **FM** Flea Market, **FP** Free Parking, **L** Talks, Lectures and Demos, **LB** Licensed Bar, **MS** Meeting Spaces, **RF** Raffle, **RSGB** (RSGB) Book Stall, **PW** PW in attendance, **SIG** Special-Interest Groups, **TI** Talk-In (Channel), **TS** Trade Stalls, **Wi-Fi** (Free) Wi-Fi

Next Month

in the UK's best & only independent amateur radio magazine...

ALEX LOOP REVIEW: Richard Constantine G3UGF reviews the 'Amazing Alex Loop Hampack'.
VALVE & VINTAGE: Bernard Nock G4BXD introduces readers to a variant of the popular HRO receiver.
PHaRLAP: Nils Schiffhauer DK8OK introduces PHaRLAP – an HF laboratory between heaven and earth.
MY NEW MAGNETIC LOOP APPROACH: Maurice Webb GW0UGQ returns with a new HF loop design.
ANTENNA SWITCHING SOLUTION: Samuel Ritchie EI9FZB starts a project for the remote switching of antennas

There are all your other regular columns too, including HF Highlights, World of VHF, Antennas, Book Reviews, Vintage TV & Radio, the Face Behind the Call and Data Modes as well as your Letters, the latest News and more.

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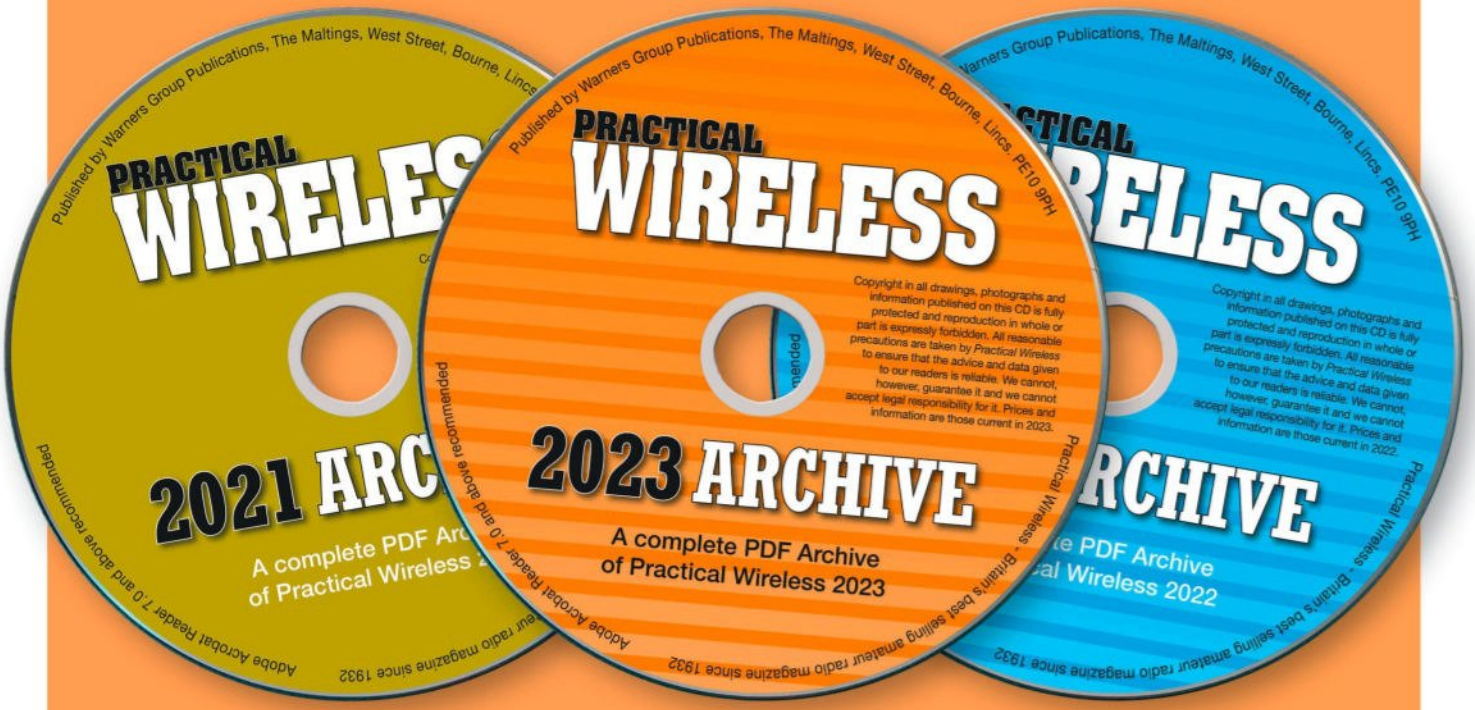

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