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## Elecraft AX1 antenna review

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ISSN 0141-0857



### Display until

10th October 2019

We are pleased to be involved in the launch of the new Elecraft K4 transceiver. For years Elecraft have led the market in performance HF radios. Now joining the K3 series is the K4 series that promises a performance level that will become the industry standard. In addition to its performance will be its versatility with full diversity reception option and a selectable superhet front end, add to that the VHF and UHF options, plus an ATU that can handle up to 10:1 and you have a world class radio. And remember that we offer a 24 month warranty.

Peter Waters G3OJV



## Elecraft K4 Demo

Elecraft Visits UK - see below



- HF - 6m SSB CW AM FM Data
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- Panoramic displays inc. Waterfall
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Above Eric Swartz & Phil Jeffery (W&S)

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Eric Swartz WA6HHQ, will visit the UK, bringing with him the K4 transceiver for the first UK demonstration. This will be hosted by Waters & Stanton Ltd, one of the oldest established dealers in the UK, and the exclusive distributors of Elecraft in the UK. The K4 promises to be the new leader in SDR design and offers greater flexibility and portability than any other model. Stand by to be amazed at what it has to offer.

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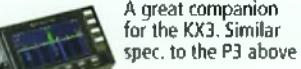
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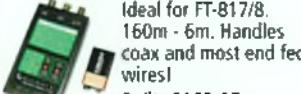


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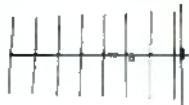
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# Keylines



Don revisits the subject of radio clubs, recommends a PW subscription and selects his favourites from this issue.

**A**s I write this we are two weeks in our new (200-year old!) house, still unpacking boxes, building flat-pack furniture and generally trying to get a sense of organisation to the place. My thanks to those readers who have written to wish us well. I've already had a tentative invitation to speak at one of the local radio clubs.

## Radio Clubs

And while on the subject of radio clubs, one of the reader e-mails I received started along the lines of, "I look with envy at the amateur radio clubs in the Home Counties. The range of activities, lectures and so on. I am in a kind of no man's land here, miles from anywhere, from what I would call an active club. It is a facet of the hobby I miss most, face to face interaction with other like-minded individuals. I searched on qrz.com for my postcode, findings tens of licensees. But never hear them on the air, never see an antenna".

It's a challenge. I commented in my Keylines a few years ago about some of the clubs I have visited as a speaker – few in numbers, elderly, almost indifferent to the visiting speaker. Certainly not welcoming to younger, newly-licensed amateurs. I was fortunate when in the Reading area to belong to a club that was thriving, had an active training programme and twice (quite deservedly) won the RSGB's Club of the Year award.

There are alternative models, of course, perhaps more suited to the present day and age. There are 'virtual'

clubs that exist primarily in the 'cloud' although this fails to address that basic human wish for personal interactions with fellow enthusiasts. Then there are clubs like the very successful CambHams (URL below for more information), who are very much an informal but successful group, often seen at rallies and events with their mobile shack.

[www.camb-hams.com](http://www.camb-hams.com)

I am reminded of my early days in the hobby, in Northampton, when a new Radio Social Club was started, meeting in pubs (usually those with a private room) for a sandwich supper, often an informal talk, a few pints and the chance to interact, maybe plan a Field Day operation, or whatever. It's not a bad model.

My correspondent also said, "Why do so few wear a callsign badge at club meetings and rallies? Some clubs have member regalia, with callsigns printed on. I am puzzled to know why some prefer to remain anonymous, other than to their tight-knit circle of personal friends?"

We are a unique hobby in that we identify each other by callsigns rather than names so why not make a feature of them? It's also notable that at events like the Newark Hamfest some clubs (Norfolk, Wythall, to name but two that come immediately to mind) are notable for their members attending the event clad proudly in club shirts.

The simple fact is that it often just needs one or two folk to start the ball rolling but it's also true that many of working age, perhaps with a growing family, understandably don't have a lot of time nowadays to become heavily enmeshed in

club activities.

There's no simple answer but, if you share any of the frustrations I've mentioned above, don't just wait for others to do something about it!

## This Month's PW

It's another busy issue and, as always, I hope that you enjoy the magazine. Maybe it's your first experience of PW. Perhaps you will be considering taking out a subscription on seeing the magazine at Newark. I sometimes get feedback at such events along the lines of *"I looked at the magazine in Smiths but there was nothing that appealed to me"*. And that may well be true! We cannot cover all aspects of this rich and varied hobby in every issue but, hopefully, over the course of maybe a year, we can manage to give most topics at least a modest airing. And our new owners, Warners, are doing their best to encourage you to subscribe with some tempting offers!

My own favourites from this issue are Roger G3LDI's story of getting to grips with an SDR-based station despite being in his 80s. Tony G7ETW's Operating 101 follows on from his widely-acclaimed series about the new licence syllabus (with more to come on that in future issues). And Martin G0PJO's Practical Way feature will no doubt go down well – he tells me he continues to get a steady stream of requests for his RBNSpyBox PCB.



Don Field  
G3XTT

## Practical Wireless

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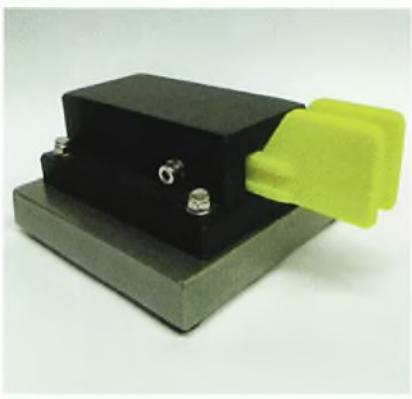
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We regret that due to Editorial timescales, replies to technical queries cannot be given over the telephone. Any technical queries are unlikely to receive immediate attention so, if you require help with problems relating to topics covered in PW, please either contact the author of the article directly or write or send an email to the Editor and we'll do our best to reply as soon as we can.



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## CW Morse Keys

Another new product line has been added to the ML&S product portfolio. **Martin** and his team are now stockists of the CW Morse range of Morse keys from the USA.

From only £19.95, there are over 35 different keys to choose from, including Camel Back, Straight Keys, Micro Keys, Lightweight Keys, Heavy Duty Keys, Paddle Keys, Navy Keys and even Bullseye Keys. With such a huge and colourful range to choose from there's bound to be a model (or two!) to suit CW enthusiasts worldwide.

For more information see:  
[www.HamRadio.co.uk/CWMorse](http://www.HamRadio.co.uk/CWMorse)

## Cricket World Cup Marathon

**Nick G4FAL** reports that both the Cricket World Cup Final and the Radio Marathon have exceeded the organisers' wildest expectations.

The Marathon QSO total is well in excess of 360,000. Nick comments, "The bands are quieter now the GB19 callsigns are silent but we have left a great impression of amateur radio in the UK". He thanks to everyone who has operated or hosted a station for the event.

## BRARS AGM

The British Railways Amateur Radio Society is holding its AGM on Tuesday October 22nd. The Committee will be there from noon to meet, greet, chat and eat. The AGM will commence at 1.30pm.

All members of BRARS are welcome to attend. The more the merrier! For more information please contact the Secretary, **Ian Brothwell G4EAN** (OTH, [AGM@BRARS.info](mailto:AGM@BRARS.info)). Members are welcome to turn up on the day (though booking places in advance will help preparations for the AGM). Latest news about the AGM will be found on the NEWS page at:  
[www.BRARS.info](http://www.BRARS.info)



## New Battery Charger Analyser

Nevada have announced the new Powerex C-980 Intelligent charger/analyser. The C-980 will charge from one to eight AA/AAA NiMH batteries with independent charging circuits for each battery. It also includes a 'one touch' battery health analyser with capacity readout to provide accurate data. The C-980 has a Turbo-charge mode for rapid recharging of batteries (approximately one hour for

20000mAh). A built-in thermal management system ensures the batteries are kept cool during charge and a deep battery conditioning system enables old batteries to be revitalised. The unit has a large LCD display that allows easy monitoring of the processes.

The C-980 sells for £59.95 and is available from Nevada:  
[www.nevadaradio.co.uk](http://www.nevadaradio.co.uk)



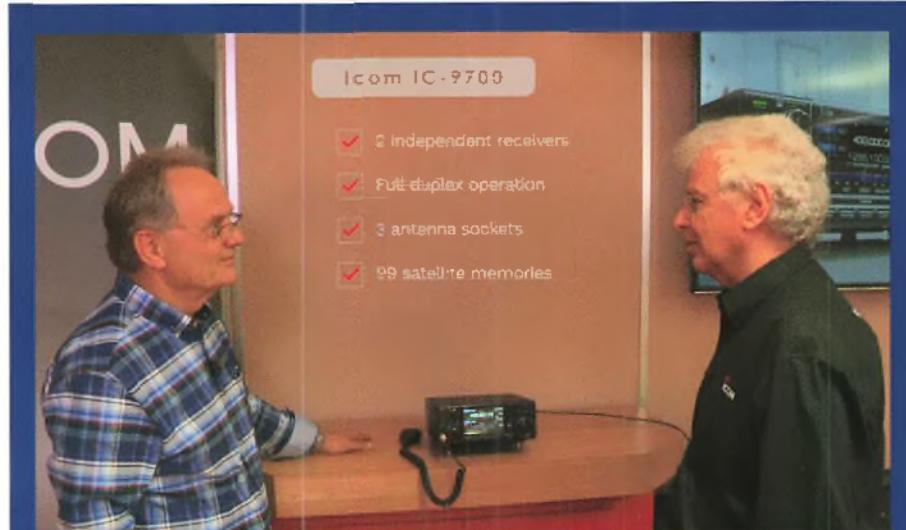
## Five Summit Challenge

**Dennis G7AGZ/M3DJS** reports that his Cornish SOTA five summit challenge for Cornwall Hospice Care was completed in six days between July 8th and 13th. The weather was very good and lots of contacts were made from each location. GB8BW was activated from Brown Willy on Bodmin Moor. Dennis says he is pleased that the total amount raised from this year's project was £2461.13 and now takes his overall total to £20,000 in 30 years using amateur radio. Well done!



## GB1NHS from NRC

The GB1NHS callsign was activated from the National Radio Centre at Bletchley Park by Paul Devlin G1SMP from the NHS Improvements Team, supported by Pete Sipple M0PSX and the RSGB's Martyn Baker G0GMB. During the event, two satellite contacts using SO-50 were made to promote the NHS's tie-in with amateur radio, and two visitors to the National Radio Centre, Derek from South Carolina and Martin from Switzerland, had the chance to get on air to promote the NHS.



## New IC-9700 Video

Icom UK report that following their initial *Introduction to the IC-9700 VHF/UHF/1200MHz Base Station SDR Transceiver* video, they have put together a more in-depth video called *Overview of the Icom IC-9700 SDR VHF/UHF Transceiver*.

With the help from **Bob McCreadie G0FGX** of TX Films, this video features **Chris Ridley G8GKC** who goes through the range of features of the IC-9700.

To view this film, click on:  
<https://tinyurl.com/y5n8se38>

## InnovAntennas

Justin Johnson G0KSC of InnovAntennas reports that their XR7 7-Band compact 'full-sized' Yagi was raised for the first time in South Africa (at the QTH of Hugh ZS6WMT). The XR7 covers all bands from 20m to 4m inclusive with a single feedpoint.  
[www.innovantennas.com](http://www.innovantennas.com)

## Anytone D578UV111PRO

Chris Taylor of Moonraker reports that they shortly expecting their first delivery of the Anytone D578UV111PRO. This ground-breaking mobile radio is the first mobile radio to offer true Bluetooth hands-free operation as well as dual-band VHF/UHF analogue and DMR. Features include APRS and Digital APRS. The radio will also include the Moonraker codeplug. PW plans a review in the near future and we will have photos and pricing once available.  
[www.moonraker.eu](http://www.moonraker.eu)



## Apollo 11

The 50th anniversary of the Apollo 11 lunar landing was commemorated by two days of activity by Essex Ham members. GB5AML (Apollo Moon Landing) was active on HF, and also on 2m in support of the Essex 2m Activity Day. Other activities over the weekend included transmission of SSTV images of the moon, tracking of two balloons launched from a school in Kent (aptly named **Neil** and **Buzz**), and helping with greetings messages for a Scout group in Ockendon.

The star attraction was **Andrew**

**MOONH**'s homebrew satellite tracker. This ingenious ensemble made use of an old pan-and-tilt CCTV camera mount, sensors, a Raspberry Pi and 3D-printed parts for the 2m/70cm antenna and rotator mounting. Several good contacts were made over the weekend, including the special event station running at Goonhilly Earth Satellite Station in Cornwall.

At the Goonhilly site, the callsign GB50AML was activated on July 20th, by the Poldhu ARC. They contacted around 770 other stations as far afield as the United States and Japan with poor band conditions, though most of the contacts were within

Europe. GB50AML was part of much bigger events on the site, which attracted some 3000+ people. The main event hosted two popular bands (Public Service Broadcasting and Orbital) but GB50AML attracted many members of the public who wondered what they were doing. Many stopped to have a long chat about how the signals get around the World. The whole event was very well received, with invited speakers, people from the Space industry, laser displays and numerous other activities. The large dish at Goonhilly, Aerial 1, was used to receive satellite signals which were re-transmitted via microwave links to the BBC.

## Bittern DX Club Contest

Members of the Bittern DX Club participated in the RSGB 2m/70cm low power contest from a field on the coast at Trimingham, Norfolk, on August 3rd/4th. Some of their Leicestershire members travelled down to Norfolk with gear for the weekend to take part in the contest.

Club Secretary Linda G0AJJ takes up the story: "We had a good weekend. The weather was warm, although it turned very cold in the evening. We did an hour apiece on 2m finishing up with 40-something contacts. We were reasonably pleased with the results considering the conditions were flat and we only had 25W and a small 144/432MHz combined antenna. It was certainly nice to go home and sleep in a warm bed! Phil stayed on site overnight and we started again at 9am on Sunday for 70cm and finished at 1pm. Managed 25 contacts on 70cm".

## Happisburgh Lighthouse Celebrations

Norfolk Amateur Radio Club (NARC) made around 350 contacts while operating from Happisburgh Lighthouse on August 17/18th using the callsign G80HL as part of this year's International Lighthouse and Lightship Weekend.

The event coincided with the International Lighthouse Heritage Weekend when many lighthouses across the world are open to the public. Happisburgh Lighthouse was extremely busy on Sunday with many visitors climbing up to the light, enjoying the location and views. They were also intrigued by the radio operations and a lot of questions were asked.

For the radio event a 132ft antenna wire was suspended from the top of the light to the ground. This proved to be very effective on the 40, 30, 20 and 17m bands. A 2m/70cm dual-band collinear was also placed at the top of the lighthouse.

The team made 321 contacts around Europe and even Canada on HF using phone and CW, reflecting the traditions and history of maritime communications. A further 34 were made on VHF, around the UK, the Netherlands and Belgium.

Many other lighthouse stations were also contacted within the UK and Europe, including North Foreland, Dungeness, Blackhead, and Muckle Flugga in the Shetland Islands.

## The Right Decision under Difficult Circumstances

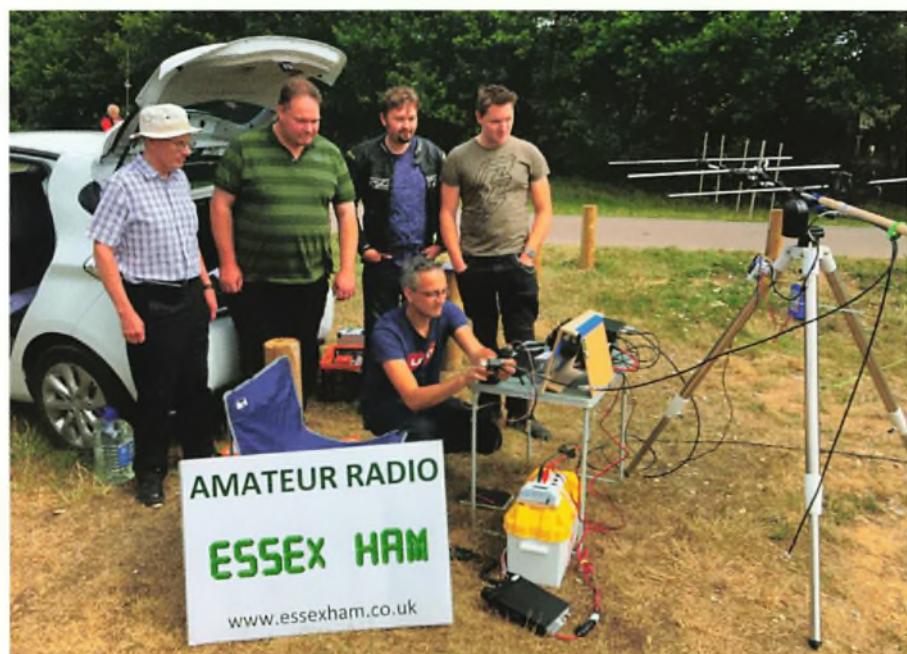
The bad weather made national news on August 10th. In Essex there were gusts of up to 48mph, making it touch and go whether to risk going ahead with GB1EWT, a special event station held at the Essex Wildlife Trust's Thameside Nature Park situated on high ground overlooking the River Thames. The difficult decision fell to the event organiser, Eddie



## Long Distance Visitor at Nevada

Nevada were delighted recently to be visited by Mario VP8EME from the Falkland Islands. Mario came to purchase an Icom IC-9700 but he also said that he will be

looking for UK stations this autumn on 80 and 160m, having installed verticals for both bands. The photo shows Mario (Left) with Nevada's Tim Johnson G0WBR (Right).



G0BKL, who assessed it was safe to erect three antennas – albeit at a slightly lower than ideal height.

Considering most people were taking down their antennas around the country, they had a remarkably successful event. 21 contacts on 2m using a temporary collinear antenna on the roof, 17 contacts on FT8 from a vertical antenna tied to a fence post; and a G5RV antenna hanging from the third storey.

The ferocious weather deterred some visitors but those who made it were presented with live radio and an intriguing

display promoting the hobby, including a life-size model in size and weight of a cubesat (amateur radio satellite).

[www.taarc.co.uk](http://www.taarc.co.uk)

## Essex CW Bootcamp

Places for the Bootcamp and Convention to be held in Witham, Essex on October 19th are filling up. If you have an interest in attending this year's event and to avoid disappointment, contact Andy G0IBN at [g0ibn1@yahoo.com](mailto:g0ibn1@yahoo.com)

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**T**his is a review of the Elecraft AX1 base loaded vertical whip, Fig. 2. And in case you're busy and can't wait to read the full report, I can tell you now that it works! It assembles in a couple of minutes and gets you on the air immediately. Highlight? Breaking into a pile-up on 20m with it! What follows is a longer look at the theory and practical use of this little antenna. As well as using it every day during the test, I also did experiments with different ways of mounting it, tested it with the antenna analyser and tried various (additional) counterpoise wires. I contacted other operators who are also very enthusiastic about its performance, and, together with a Canadian operator, made simulations using EZNEC. After reading this, I hope you will be able to agree with me that the AX1 can only be described as a little marvel!

### Back to the Start

But let me start at the beginning. The photos, Figs. 1 and 4, show what comes out of the box: a 1.1m whip, a base loading coil, a 3.3m counterpoise and a pair of mounting brackets (sold separately). It's designed for 20, 17 and 15m (with an ATU) and maximum power handling 30W. Wayne N6KR from Elecraft sent an e-mail to a list that was discussing the antenna (more on this later). He said, "suspend disbelief and just try it". So that's what I did. I mounted it firstly on my picnic table in the garden, Fig. 3, and then on a tripod, Fig. 5. For my money, the tripod seems more secure but you can differ with me on this if you like. I stretch the supplied counterpoise wire out, facing south, reaching the ground about a metre from the tripod (you'll understand the placement later). Then I plug it into my KX3 to see what happens. A push of the TUNE button gives 1.0:1 on 14.250MHz and I see several QSOs in progress on the PX3 screen. I tune to 14.255MHz, where Enrico IZ3WUW is calling CQ from near Venice. There is much QSB but we swap 57 reports. Next up is SA0AQT, who is 59 with me but only gives me a 43; OJ0C gives me a 59 and so does Alan 9A1RBZ who is using 100W and is 59+ with me. I'm running 10W. Beginners luck?

Just for a quick check, I tried the RBN and got just two reports - EA5WV was only 4dB but CT7ANO reported my signal at 20dB. It's not as though propagation had suddenly jumped to solar maximum levels but that 20dB is encouraging. The following day I repeated the RBN testing, to directly

# Elecraft AX1

**Joe Chester MW1MWD takes a look at the compact portable AX1 antenna from Elecraft.**



compare the AX1 with the full-sized dipole in the attic. I got nine spots with the dipole and four with the AX1, again using 10W. OL7M reported the dipole at 23dB and the AX1 at 13dB, about three S-points lower. Of course, the dipole is up much higher, at about 5m, compared with the AX1. Draw your own conclusion but don't discount the previous day's QSOs. Which brings me to the point of the AX1. It's not really designed to challenge the fine antenna farm at your QTH. It is designed for /P work (note: not /M work!) - a simple, quick-to-assemble antenna for opportunistic operations out and about. This being what it's for, I decided to try it out portable.

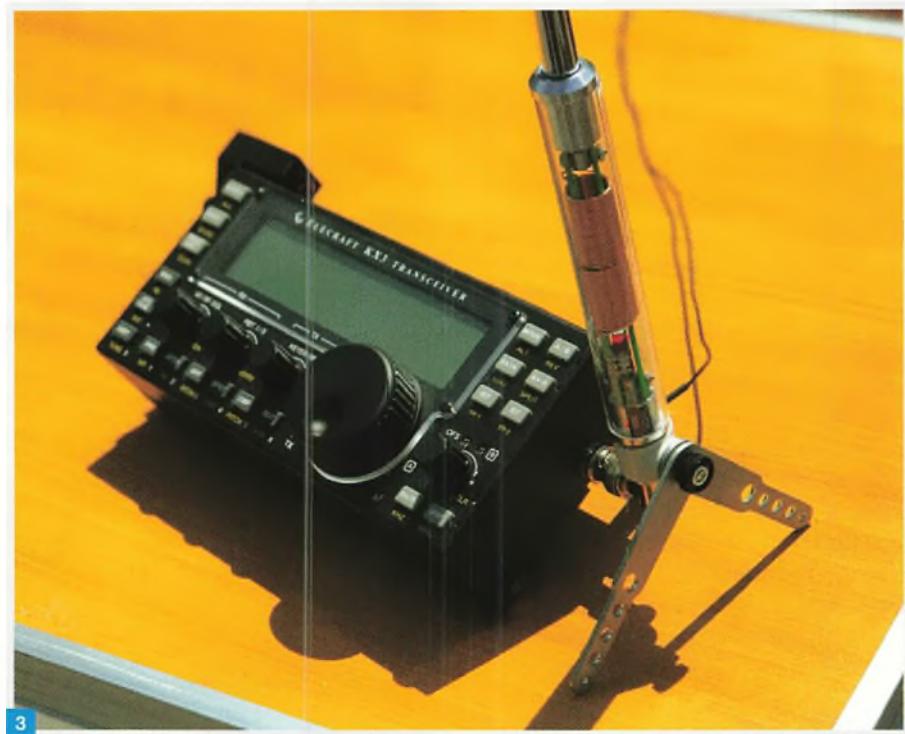
### Off to the Beach

Fortunately, the weather was kind as I set up in the local beach car park. Unlike most of my /P operations, this one felt like a decidedly Micro-DXpedition - just the KX3, a battery and the AX1 on a lightweight camera tripod. There's none of the usual site work about this setup - no tall mast or large tripod, or guys ropes covered in bunting. Just the tripod beside the car, the counterpoise wire stretched out along the ground

and the KX3 on the dashboard. It's sunspot minimum, so I'm not expecting it to start raining QSOs. I push TUNE on 14.250MHz and get a 1.1:1 match. I get Joachim GM/DH5JBR/P on 14.260MHz immediately, first call.

Then I hear a pile-up in operation on 14.200MHz. He's running split, transmitting 5kHz up. It only takes a minute to reconfigure the KX3, with the receive frequency on A and the transmit on B. I listen for a few minutes to check the callsign - it's 1A0C, which is the The Order of Malta's Italian Relief Corps amateur radio station in Rome. The listening frequency is jammed in the usual way, operators calling over each other, and repeating their calls time and time again every time he calls CQ. I think to myself that I have no chance with my 10W and the AX1. But suddenly, I hear him call CQ and then immediately call CQ again. I push the button to change to B and make my call. When I switch back, there he is, repeating my call, 59 too. I give him a "59+, thank you, 73", and that's it! Forgive the repetition, but I broke into a pile-up on 20m with 10W using what is supposed to be a compromised short base-loaded vertical.

**Fig. 1: Out of the box – the various parts.**  
**Fig. 2: The Elecraft AX1.**  
**Fig. 4: On the picnic table with the KX3.**  
**Fig. 3: The coil close up.**



3

within five minutes of setting up. I hope you're suitable impressed; I am. This may not be your idea of DX but this is a pair of callsigns I would have missed without the AX1. To put this into some kind of context, the following day **David G0FVH** on the WAB list said, "Another poor day on the HF bands here yesterday, nothing heard on SSB all day".

And in case you think this is just me, and that luck played its part, I had an e-mail from a Canadian operator recently. **Pierre VE2PID** told me that he made 13 QSOs in an hour, in the WPX CW contest, including **Classe SM3GSK** on 20m, using 10W with the AX1. It was this report that sparked my interest in the AX1. Pierre's e-mail started an avalanche of reports from other operators. A bit of an ad hoc contest developed to see who had the DX record with the AX1. **Thaire W2APF** said, "In January, when I received my AX1 I set it up on the deck (on a tripod and with the one radial) and promptly worked LZ and YO on 20m from New Hampshire. I was using my KX3 at 15W". And here's a longer report from **John W7SAG**. "I worked France and Germany during the recent ARRL CW contest from Utah. What makes it even better is I was indoors at my kitchen table using my KX3 running 10W with the counterpoise wire on the kitchen floor. I have also worked Hawaii, Mexico, the Caribbean and all over the US on 20m on CW from the same location because I was too lazy to set up an outdoor antenna during very cold Utah winter



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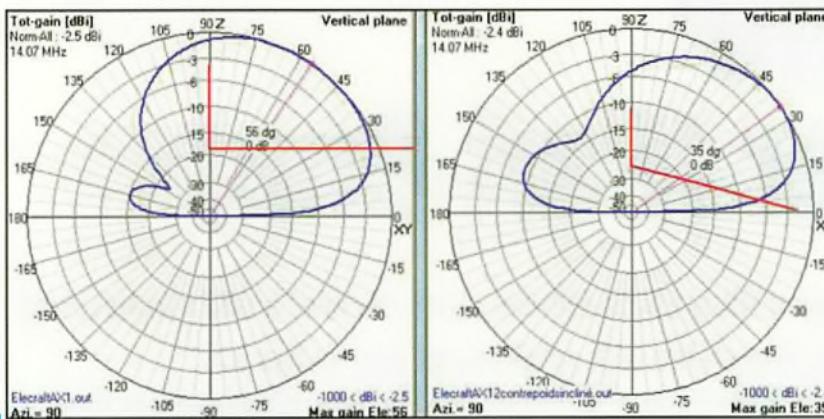
weather. My first contact after receiving the antenna and attaching it to my radio was XE2X in Mexico, CW from my kitchen table running 5W". **Steve KJ5T** got Hawaii from Texas with 5W SSB and **Ed** worked Bonaire from California, 10W SSB. And several operators, including **Dan N7CQR**, used it for SOTA, with excellent results up at 4500m, where the weight saving was one of its advantages. Enough? By the way, I agree that these are all North American operators – I did put out an e-mail request for UK or EU operators to contact me but none did.

### Home Again

Back in the garden, I tested the AX1 with the antenna analyser. This showed an SWR of 1.89:1 on 14.250MHz, 57Ω, -30j (zero capacitance and a small inductance). The SWR was quite low across the



5



6

entire 20m band. This is better than the manufacturer's notes predicted. Other operators got different results. I also used a variable length of my own wire as a counterpoise, both elevated and dropped to the ground, and did measurements to see the effect of these changes. As you would expect, longer wires lowered the resonant frequency and shorter ones did the opposite. You should not be surprised when I tell you that the supplied length was just about perfect! Wayne also says that for such a high-Q loaded whip, the SWR can wander all over the place because of the position of the counterpoise relative to surrounding structures. Hence the need

for an ATU to match the transmitter to the feedline impedance. Which is one of the strengths of the KX3 – an ATU that could match a clothesline! But we did find something interesting about the exact placement of the counterpoise.

I lit up cocoaNEC and tried modelling the AX1. It's not as easy as it sounds. I contacted Pierre again and asked him whether he had tried modelling it in NEC simulations. Back came his results (I can give you the exact 3D coordinates for the models for anyone who may be interested). In one sense, there is nothing strange about these elevation diagrams, **Fig. 6**. They clearly show that the AX1 favours

**Fig. 5:** in use on a tripod. **Fig. 6:** Two plots of NEC modelling, horizontal counterpoise and sloping counterpoise (by Pierre VE2PID, see text).

the direction of the counterpoise. This is a general conclusion about the use of a counterpoise to reduce ground losses with any short vertical. The interesting thing is that the maximum gain drops from 56° to 35° (second plot) when the counterpoise is lowered to the ground a metre or so from the AX1. The gain changes slightly (from -2.5dB to -2.4dB) but the lower take-off angle is the really significant result. I think the idea of dropping the counterpoise to the ground may be making some of it behave as part of the radiator. **Dave AB7E** thinks that in some circumstances, the whip may become a 'loaded counterpoise' for the trailing wire. Weird, but to go any further with this analysis would probably require a field test meter and an antenna range.

### In Conclusion

A couple of points to finish. I didn't do much testing of the AX1 on 17 or 15m. I only tuned it up and listened on those bands. There was little or no activity on those bands during the week I was testing. You might also like to know that Elecraft are currently testing a 40m 'extender' for the AX1. Basically, this will be an additional base coil, to fit between the existing coil and the whip, to give 40 and 30m capability. Back in May, Wayne said this would be available 'late summer'. This would make the AX1 'system', if I can coin that phrase, a very useful piece of kit.

Is it possible, then, to reach a conclusion from all this work? Let's start right back at the beginning. Does it work? Yes. How well does it work? I broke into a pile-up with it using 10W – what more do you need? It probably won't out-perform your monoband beam. But if your portable operations do not include the physical resources to erect large, possibly full-sized antennas, then this could be for you. It's not designed for DX hunting but it might surprise you one day. I think my testing and that of other operators, together with the theoretical evaluation we did, all show that for its small size, the AX1 is a surprising performer. I'm off now to have a chat with my Accountant!

I'm extremely grateful to **Peter** and **Phil** at Waters and Stanton for agreeing to loan me the antenna for testing. The AX1 is available for £109.95 from W&S, website below. The desk top support is £32.95 while the tripod mount sells for £29.95.

<https://hamradiostore.co.uk>



# The QCX QRP Transceiver (Part One)

**R**eaders will recall my recent articles on building a uBitx QRP transceiver into a 'go-box' for portable and occasional use. During the summer this has also proved to be useful to take out onto the patio on warm mornings with a pot of coffee and linking it up to a 40m end-fed half-wave antenna I leave erected just for this purpose.

The uBitx was a lot of fun to put together but the reality is that it wasn't much of a real challenge to build. The PCB came ready populated with all the components and my involvement was really in the wiring up of the various sockets and switches. The biggest challenge was the design and printing of the case and the alignment of the rig. It's also quite a reasonable size and while it is fine for taking somewhere in the car, it's too big to back-pack or throw on my bicycle.

Additionally, I have re-learnt CW and

**Daimon Tilley G4USI follows up his build of a uBitx transceiver by taking on the QCX single-band transceiver kit.**

have really started to enjoy that mode. So, I decided I wanted a project that built on the enjoyment I had building the uBitx but was much, much smaller and capable of being carried in a small corner of a rucksack, on my bike and similar.

## Making a Choice

An internet search of QRP kits revealed quite a significant range of suitable products to choose from. There are still many crystal, single frequency models available. Timeless classics such as the Rockmite and Foxx can still be bought as kits and will fit in a small mint tin or tobacco tin. These were attractive for their size but seemed a little pricey, at around £30, considering their relatively

diminutive size and component count. Additionally, I was put off by their relative lack of frequency agility. Most can be tuned a few Hertz either side of the crystal but at busy times that could be quite limiting, along with their typical power output of less than 1W.

The I came across a company called QRP Labs, run by Hans Summers G0UPL. Hans now lives in and operates from Turkey and has built a company providing high quality kits, including the WSPR kits, GPS receivers, dummy loads, power amplifiers and APRS trackers. What caught my attention, however, is his QCX transceiver.

## The QCX

The QCX is a single-band 5W CW trans-

**Fig. 1: The arrival of the QCX.**

**Fig. 2: Component packs.**

**Fig. 3: The winding and installation of T1.**

**Fig. 4: Populated board without display.**

**Fig. 5: Populated board with display fitted.**

ceiver with a choice of the 80, 60, 40, 30, 20 or 17m bands. It provides digital tuning of the entire band chosen, 200Hz CW filter, twin VFOs, a built-in iambic keyer, WSPR and CW beacon capability and built-in alignment and test equipment. The PCB is 10 x 8cm, which is just a little too large to fit in an old-fashioned tobacco tin. Nice and small, and very capable. The PCB comes as a bare board with just two SMD ICs pre-soldered. The remaining components are provided as through-hole components for the builder to populate and solder on the board. You also have to wind and solder four toroids.

This is a very impressive CW rig, which gets even more impressive when you consider the price – £37.18 plus £5.31 postage – a total of £42.49. That's a lot of rig, for just a fraction more cost than something much less capable.

The QCX was designed by Hans and introduced at the Youth on the Air (YOTA) Summer Camp in 2017. At the time of writing, Hans has sold over 7,100 kits! Yes, over 7,000 kits in less than two years – that gives you some indication of the quality and popularity of this kit.

### Order and Arrival

I was hooked and placed my order on March 17th. Orders are posted by Turkish post and you are provided with a tracking number. Postal times to the UK vary and average delivery times are shown on the website. The average seemed to be around 12-14 days but mine took nearly 30. I should stress that this delay was not any fault of QRP Labs, who dispatched the kit quickly, or Turkish mail, but seemed to be the result of long delays in UK Customs. Very frustrating and perhaps a sign of things to come post-Brexit – let's hope not.

Before the rig arrived I downloaded the most comprehensive builders manual I have ever seen – over 120 pages of incredibly clear instructions, diagrams and photos, guiding every step of the build and alignment. While it was daunting to see a manual of this size at first, it was simplicity itself to follow.

On arrival, the kit was well packaged in a cardboard box, **Fig. 1**, and the components were in a selection of plastic bags, **Fig. 2**. My first task was to check that all components were present and correct and I then



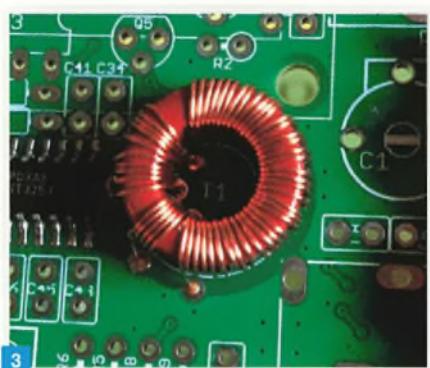
ordered them by component type and value, ready for the build. This actually took quite a long time but saved time when it came to the actual construction. As with my uBitx build, I opted for tea-tray construction.

### The Build Process

The suggested first build step is the winding and fitting of the most complicated and fiddly part of the build, the receiver input transformer, toroid T1. This has a total of four separate windings and for 40m, my band of choice, this consists of 38, 5, 5 and 5 turns on a small T50-2 core. It wasn't difficult but it was fiddly with such a small core and reasonably large fingers. However, I managed to do quite a neat job, **Fig. 3**.

After T1 was installed, and following the instructions, the order of build was easy to follow, and followed a small to large methodology. I found a pair of magnifying glasses really helpful here to read the screen printing on the PCB and to check the quality of the soldered joints. I did find that it was difficult to read some of the component numbers on the board, which were not printed clearly, but reference to the manual shows exactly where on the board each numbered component goes in relation to others previously installed, so it was never a problem.

The only other fiddly part of the build was the installation of the test point header pins, of which there are a number. Header pins where three or four pins were part of a whole were straightforward enough but installing a number of single pins was really quite tricky, and my normal ploy of superglue to secure the part to the board before



**Fig. 6: The finished rig, next to the FT-881. Note the microphone for scale.**

**Fig. 7: The log from the first 35 minutes of operation.**

soldering didn't work on these.

I estimate the process of sorting components and completing the build took about two days of work in total but the end result looks very nice and compact. The photos, **Figs. 4 and 5**, show the completed board without and with the LCD display.

### The Smoke Test

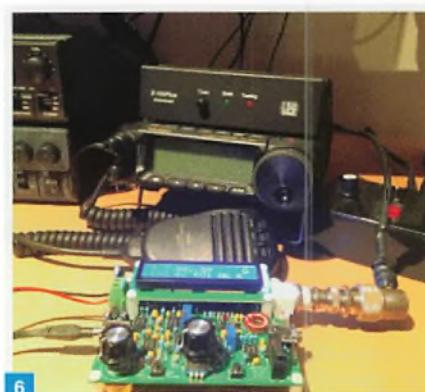
It was time to apply power and hope the QCX came to life. The rig accepts a wide voltage input, from about 7 to 16V, so I hooked it up to my 13.8V PSU. There is no on/off switch and it sprang straight into life with no smoke – so far, so good! The next job was to tweak the contrast potentiometer to get a nice clear display and then follow the alignment process using the built-in test equipment. In essence, this consists of adjusting a variable capacitor, which acts as a bandpass filter, and three potentiometers to adjust I-Q amplitude balance and audio phase shift. If it sounds complicated (it did to me!), I can assure you that it isn't. There is some to-and-fro between adjustments but alignment is as simple as turning a screw while looking to either maximise or minimise the bargraph displayed on the screen. It is suggested that these adjustments are made while connected to a dummy load so this led nicely into keying-up the transceiver.

The QCX comes with a small microswitch attached to the board as a built-in key, as well as the option to plug in an external key or paddle. For test purposes I used the microswitch and fed the rig into my power meter and dummy load. While I cannot vouch for the accuracy of my meter, at 13.8V it indicated a healthy 4.5W of RF output. All good so far.

The photo, **Fig. 6**, shows the QCX on my shack table and gives an idea of its size.

### On the Air

By now, it was mid-evening on a Friday so I connected to my LDG auto-ATU and G5RV and tuned for 7020kHz. Tuning around the band I could hear lots of stations operating in a contest. There were lots of CQs to choose from. Not knowing how well the rig was going to 'reach', I tentatively replied to one and got an immediate response. Of course, the bog standard 599 contest response was not too helpful to evaluate this little rig but, suffice to say, after just my first 35 minutes, I had 13 contest contacts (all



599, of course) in Romania, Hungary, Spain, Switzerland, Poland, Malta and Russia. **Fig. 7** I was a happy man.

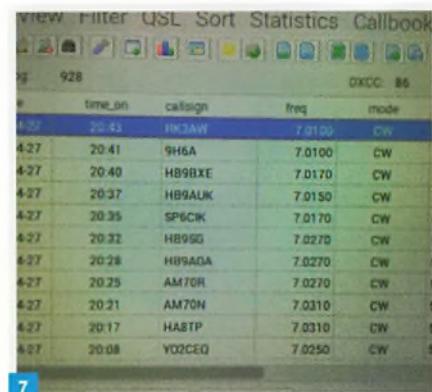
A little more tuning around confirmed how nice a receiver this rig has, and the ability to change tuning steps allowed some precise tuning.

Over the next few days, more contacts were added to the log and I was really enjoying this little rig. I have to say I find it much more fun to use than the uBitx. I think that this is mainly down to the greater self-satisfaction I had from building the kit. It wasn't just a case of wiring up a pre-populated board but of populating the board itself. I could actually feel myself grinning with satisfaction as I operated.

### The Second Smoke Test – this Time with Real Smoke!

Soon I began to consider how to power the rig for portable use. I had recently dismantled a couple of laptops and had used some of the Li-Ion batteries for the uBitx. With four remaining I decided to use them in series for the QCX, giving a maximum initial voltage of 16.8V and a nominal voltage of 14.8V.

Connecting four of them in series with an initial battery voltage of 16.4V gave me an RF power output reading of 6.5W. One of the nice features of the QCX is that part of the test equipment feature is a digital voltmeter. By programming the menu with the initial battery voltage and placing a jumper across two header pins, the display can show the state of battery charge. Not having any suitable jumper plugs and the pins being fiddly to access, I decided to jumper the pins on the reverse side of the board, where the soldered connections are. I needed to jumper the two outside pins of a three-pin header so I cut a suitable length of insulated wire and jumped the pads, lying the wire flat. Subsequent switch-on was fine and the battery indicator worked nicely. I decided to answer a CQ by battery power and as soon as I keyed the micro-switch –



disaster! There was a loud crack and real smoke from underneath! I immediately pulled the plug and quickly identified that, when lying my insulated jumper flat, it had been punctured by another solder joint, causing a short-circuit.

Removing the jumper again and re-powering the rig showed, thankfully, that not all was lost. The receiver and display still worked well but there was no RF output when keying at any point of the PA stage. Further inspection revealed an intact but lifted PCB track connecting the header pin to a pin of the main processor IC.

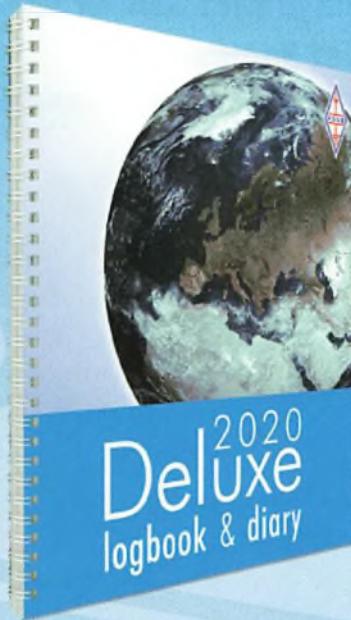
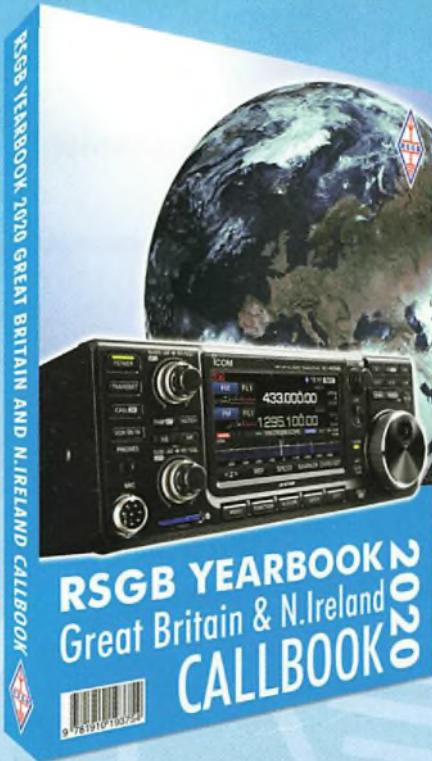
Beside myself with disappointment, I emailed the creator, Hans, with my problem. His advice was that he felt I had put the full 16V straight onto a pin of the processor, which would have damaged it. He suspected that damage might just be limited to the processor and not other components so I ordered another processor, complete with the relevant firmware, for £6. Now I have to wait for another period for it to arrive and I hope HM Customs are a little swifter this time!

Hans also suggested I check for continuity between the relevant header pin and the centre pin of the microswitch key. There was none, so even closer examination was required with my magnifier. By following the PCB layout diagram carefully, between the header pin and the microswitch, I was able to detect another section of lifted track, this time with continuity broken, hidden just underneath the volume control. Bridging that gap with hook-up wire restored continuity but, sadly, not transmit. I guess I will just have to wait for that processor to arrive and hope nothing else is damaged. I also ordered some spare PA transistors just in case.

In the next part, I will report on repairs, explore some of the menu options, the testing of the WSPR and CW beacon facilities, and how I intend to enclose the rig to protect it for portable use.

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# CW Bootcamp at 70!

**Realising that Morse has an advantage over SSB for low power operation, Joe Chester MW1MWD signs up for the rigours of Bootcamp.**

**Y**ou're right, it's just odd. Licensed for nearly 40 years, but never used CW or even owned a Morse key. I'd seen the reports in PW of successful one day Morse courses. You see – can't even get the term correct. It's BOOTCAMPS now, rather than 'courses', like what we ran in the old days! I spotted one and took the plunge. My Accountant (!) refused permission for the huge expenditure (a whole £10!). So, I had to promise a posh hotel to get agreement!

I arrived a bit sheepishly to a very warm welcome from the organiser, **Rich G4FAD**. He had asked me online while booking whether I wanted to join the 10, 10-20 or over 20WPM group? My CW skills are minimal but not non-existent. I had passed the Morse test way back when that was a requirement so I assumed that I would remember most of it after some practice. But there was another factor I didn't take into account – my soggy memory banks! I decided that the starter group was probably the right answer but immediately regretted it. I imagined 10-year olds in that group, future Scout leaders adding to their badge count. **Felix**, my Grandson is learning Morse in his Beaver group, so I would be shamed if I came back less than proficient – me, a radio operator for nearly 40 years, out-keyed by a 6-year old. Ouch!

We were asked to bring a Morse key, headphones and a name badge. I thought of just sticking a paper sticker on but instead asked Timpsons to make me a pin badge. I also bought a cheap MFJ key.

I need not have worried about joining a group of eager youngsters, for everyone in the room was nearly up to, and some well over bus pass age! A cup of tea, hand over the £10 borrowed from the Accountant, and we're off, starting with the obligatory safety briefing. Wouldn't want anyone to fall off their Morse key and injure themselves! The day is highly structured, with practice sessions broken up by informal discussion. There will also be a demonstration of various type of keys.



Fig. 1: Andy presenting to the group.

## Frustration!

I'm not sure how to describe the next hour. Tedious would be wrong but so would enjoyable. Frustrating is probably the nearest. A distant memory of trying to recall the multiplication tables back in junior school briefly comes to mind. Tiring it certainly was. I hadn't realised how foggy my 70-year old brain was either. I felt as though I should have gone into some kind of mental gym for the past six months to sharpen up my memory banks. But there is no escape now.

Our instructor **Andy G0IBN** immediately started sending slow Morse. He apologised for finding 5WPM a bit difficult. He is a member of FISTS and FOC, and is used to sending at much higher speeds. He hands us a piece of text and tells us to follow along and when he stops, take over, one of us at a time. Well, he got a surprise very quickly. It's easy to count the characters sent, without any attempt at decoding. So, it was easy to know where we were. However, when I was asked to take over, by sending a letter F, my brain froze. di-dah, no daaaahhh – gone! But Andy is very patient and says "di-di-dah-dit", which I send. The next letter is an A,

di-dah. Easy, but I send dah-dit, mixing up me 'a' and me 'n'. The session continues in this vein, until it's someone else's turn to take over. Some of the others did a bit better than me but not by that much. And while they may not exactly agree, they were probably too kind to tell me that I was almost certainly one of the worst at the table!

In fairness to Andy, he did ask at the start if anyone present knew no Morse. We all looked at each other, reluctant to be the first to admit how little some of us knew. But I would advise anyone thinking of joining a future Bootcamp that they should at least do a bit of practice beforehand. I didn't and but for Andy's perseverance, it would have been a complete disaster. The coffee break put us out of our misery. Time to relax, have a chat, and grab a coffee. I think the guys I was with all agreed that our brains just weren't as quick as they used to be. Of course, there were many very proficient operators at the other tables, who were practising at 20WPM or more. However, I didn't realise beforehand that trying to recall the Morse I learned but had not used for nearly 40 years was a recipe for trouble.

## Morse Revival

Why is Morse code experiencing a revival of sorts? For me it's quite simple. I went on a mini-DXpedition recently and my CW skills just weren't up to it. But others are also reporting an upsurge in CW QSOs. You can see this any day on the DX Cluster ([dxmaps.com](http://dxmaps.com), for example), by turning reported CW QSOs on and off. Many days, it overwhelms SSB and even FT8!

Couple this with the increasing interest in QRP operation, in turn driven by SOTA and POTA activities, and you have another possible reason. FISTS and FOC have been promoting CW for years. But there are newer groups, such as the True Blue Club and many others, setting up to support CW operation, some as a reaction to the increasing use of FT8. As with QRP versus QRO, the CW/SSB debate has a long history, joined these days by the anti-FT8 arguments, all with no end in sight!

Finally, there is the state of propagation currently. At the trough in the 11-year solar cycle, it's increasing difficult to work DX on SSB. Instead, operators are turning to CW because it's more efficient – it uses less bandwidth than SSB or digital modes and has a better signal-to-noise (S/N) ratio (some say as much as 20dB – over three S-points). There is a well-known saying that CW can get through when all other modes fail. However, FT8 proponents probably claim this as well, but they need a computer to do so.

Of course, it could just be that too many of us watched the movie *Independence Day* where, when the aliens disrupted satellite communications, causing the internet to fail, they suddenly discovered that Morse code signals worked. And who isn't afraid of an alien invasion!

I suspect it's all in the mind. Operators use CW because they want to. It's as simple as that. And, I'm told, it can be addictive although I've seen no evidence of this yet! But I must get back to the course.

## Types of Key

Andy is giving a talk about the different types of Morse keys. **Fig. 1**, which starts off a discussion about the 'right' or 'best' key. There are no answers to these questions. He also shows us a cutting-edge Morse key, **Fig. 2**. And we wouldn't be radio amateurs if we couldn't find an excuse to take out the tools to make some adjustments to some of the keys, **Fig. 3**. He also shows us videos of several operators going full blast. Amazing! It was while watching these that a thought occurred.



Fig. 2: A 'cutting edge' key – literally.



Fig. 3: Making adjustments.

Many of those promoting the use of Morse code today appear to come from professional Signals backgrounds, military, naval and similar. While understandable, it also highlights something else. If those of us today fail to master the skills to become Morse code operators, then in the future CW may die. This is not an exaggeration. CW is not the irrelevant mode some believe it is. Its 'mode of last resort' tag is well-known. But it cannot live up to this accolade unless more of us become at least somewhat competent. It's a challenge but I'm sure it can be done.

This, I think, is what the bootcamps are all about. One attendee told me that there was no one in his club willing to train new CW operators, so the bootcamp was the only way for him to get some training. Yes, there are practice sessions but mostly it's about encouragement and the reinforcement that others are struggling just like you. With the added bonus of learning from experienced CW operators. Very few of us will ever reach the standard of the professional operators from the past. But this isn't necessary to make CW QSOs.

## Practice Time

I was very happy to see the others in my group struggling as I was. We all know that we have to practice more to develop the skills. One of the main things I learned from Andy was how to send a dah. It seems it's not in the fingers, as I had learned, but in the movement of the wrist. Apparently, when you rotate at the wrist to send a dah, the timing, the relation between the length of the dit and the dah is correct. If you dah with your fingers, it's

just too short. Brilliant. And another trick. After sending a word, take your hand off the key before you start the next word. This gets the length of the inter-word space correct. No one ever told me things like this – my training was just a mad two day rush to achieve enough familiarity to pass the Morse test to get the licence.

## QSO Demo

As lunchtime approaches, Andy decides he wants to demonstrate a CW QSO. He picks me as his correspondent (or victim, my brain said!). But it was really good. Prompted where needed, I have a simulated QSO with him, three or four 'overs', something I've never even attempted before but you can be sure I will be doing on the air very soon. Unfortunately, my credit card (!) phoned as I was relaxing after the morning session, reminding me that we had another appointment that evening and that it's a long drive back. So, with great regret I had to leave my new friends.

Was it worth it? Would I recommend it to others? Will I continue to revive my nearly expired Morse skills? I can't say thank you enough to Rich, the organiser, and to Andy, and to the guys with whom I practised. And I apologise again for not practising beforehand. On the long drive home, my Accountant asked if her £10 note was well spent. The answer to all these questions is a resounding YES! I was tired, but slightly exhilarated. It felt as if a weight had been lifted, something I should have seen to a long time ago. I decided not to check the bags in the car boot to see how much she had spent while on the loose with the credit card!

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### Mobile Antenna Mounts

<b>TRIMAG-S</b> Triple magnetic mount with S0239 antenna fitting with 4m RG58 and PL259 fitted - ideal for these larger antennas	£39.95
<b>TURBO-S</b> Single 170mm magnetic mount with S0239 antenna fitting with 4m RG58 and PL259 fitted - will suit most antennas up to 5ft	£19.95
<b>HK17W-S</b> Heavy duty hatch back mount with S0239 antenna fitting with 4m RG58 and PL259 fitted	£32.95
<b>HK17M-S</b> Mini hatch back mount with S0239 antenna fitting with 4m RG58 and PL259 fitted	£32.95



### Multiband Mobile

Why buy loads of different antennas when Moonraker has one to cover all! SPX series has a unique fly lead and socket for quick band changing

**SPK-100** 9 Band plug n' go portable, 6/10/12/15/17/20/30/40/80cm, Length 185cm retracted, just 0.5m, Power 50W complete with 3dB PL259 or BNC fitting to suit all applications, mobile portable or base - brilliant!

£44.95

**SPK-200S** 6 Band plug n' go mobile, 6/10/15/20/40/80cm, Length 130cm, Power 120W, PL259 fitting

£44.95

**SPK-300S** 9 Band plug n' go mobile, 6/10/12/15/17/20/30/40/80cm, Length 185cm, High Power 200W, PL259 fitting

£59.95

### VHF/UHF Mobiles

**GF151** Glass Mount 2/70cm, Gain 2.9/4.3dBd, Length 78cm complete with 4m cable and PL259

£29.95

**MRM-100** MICRO MAG 2/70cm, Gain 0.5/3.0dBi, Length 55cm, 1" magnetic base with 4m cable and BNC

£19.95

**MR700** 2/70cm, Gain 0.3/0.6dBd, Length 60cm, 3/8 fitting

£9.95

**MR77** 2/70cm, Gain 2.8/4.8dBd, Length 180cm, 3/8 fitting

£19.95

**MRQ525** 2/70cm, Gain 0.5/3.2dBd, Length 43cm, PL259 fitting (high quality)

£19.95

**MRQ500** 2/70cm, Gain 3.2/5.8dBd, Length 95cm, PL259 fitting (high quality)

£26.95

**MRQ750** 2/70cm, Gain 5.5/8.0dBd, Length 150cm, PL259 fitting (high quality)

£36.95

**MRQ800** 6/2/70cm Gain 3.0dB/5.0dB/8dBd, Length 150cm, PL259 fitting (high quality)

£39.95

**MRQ273** 2/70/23cm Gain 3.5/5.5/7.5dBdBd, Length 85cm, PL259 fitting (high quality)

£49.95

**MRQ900** 10/6/2/70cm Gain 1.0m (2.15dB) 6m (2.5dB) 2m (2.8dB) 70cm (5.5dB) Length: 125cm PL259 fitting

£49.95

## ALPHA ANTENNA

### Base

**PROMASTER** complete 10-80m tuner free base antenna

£329.95

Built for the harshest military and civilian environments, the Alpha ProMaster is a 43 foot tuner free 10-80 meter 500 Watt base & transportable antenna. Perfect for all HF modes including but not limited to: CW, SSB (USB/LSB), AM, etc.

**PROMASTER SR** complete 10-160 antenna tuner free base antenna

£399.95

The Alpha ProMaster SR operates on 10-160 meters. This durable permanent base and transportable outdoor antenna brings you multi-band system base performance into an extremely small footprint.

### Wire

**J-POLE SR 6-160M** 60ft wire antenna

£199.99

The Alpha J-Pole SR Antenna is only 60 feet in length. The unique design characteristics of this 6-160 Meter HF J-Pole antenna enables it to approach resonance on the major HF bands (10/12/15/17/20/40/80 Meters), all of which presents an SWR that is low enough for external tuners to achieve a perfect match, including 6 & 160 meters.

**J-POLE JR 6-160M** 34ft wire antenna

£179.99

The Alpha J-Pole Jr Antenna is only 34 feet in length. The unique design characteristics of this 6-160 Meter HF J-Pole antenna enables it to approach resonance on the major HF bands

### Portable

**MILITARY 2.0 10-80M** Multiband directional tuner free portable antenna

£389.95

Unlike ANY other antenna, the multiband Military 2.0 is from the Multiband tuner free line of systems and fits in an included 16 inch Field Bag. When deployed, the Military 2.0 is a 10-80 meter directional antenna system, which can be configured to launch your signal at your target that has a maximum PEP SSB rating of 500 watts.

### Mobile

**MOTO-SS 6-40M** Multiband HF mobile

£199.99

The Alpha MOTO-SS (Stainless Steel) provides you with the most Rugged and Compact HF mobile antenna system available that is rated 2:1 PEP9K. It requires: -No extra whips -No adjustments required for band changes. -No moving parts -No power required -No control interface boxes. Simply the Alpha MOTO-SS puts you on the air making contacts for an economical price! Placing the core components in the 316 Stainless Steel housing enables: -100% RF rejection -Critical protection in a non-magnetic metal housing -The highest level of corrosion protection -Full RF bonding

Full Alpha Antenna range see [www.moonraker.eu/alphaantenna](http://www.moonraker.eu/alphaantenna)



### GRP Fibreglass

### Base Antennas

### Diamond quality - Moonraker pricing

These high gain antennas have been pre-tuned for your convenience, easy to use, easy to install, and a choice of connection ... look no further

**SQBM100P** 2/70cm 3.0/6.0/10dBd, RX 25-2000MHz, Length 100cm S0239

£49.95 SPECIAL OFFER £39.95

**SQBM200P** 2/70cm, Gain 4.5/7.5dBd, RX 25-2000MHz, Length 155cm, S0239

£54.95 SPECIAL OFFER £44.95

**SQBM50P** 2/70cm, Gain 6.8/9.2dBd, RX 25-2000MHz, Length 250cm, S0239

£64.95 SPECIAL OFFER £59.95

**SQBM100P** 6/2/70cm, Gain 3.0/6.2/8.4dBd, RX 25-2000MHz, Length 250cm, S0239

£84.95

**SQBM223N** 2/70/23cm, Gain 4.5/7.5/12.5dBd, RX 25-2000MHz, Length 155cm, N-Type

£79.95

**SQBM300GN** Triband 2/70/23cm, Gain 4.5/8.3/10.7dBd, Length 155cm

£119.99



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WATTS

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£49.95 SPECIAL OFFER £39.95

**SQBM200P** 2/70cm, Gain 4.5/7.5/12.5dBd, RX 25-2000MHz, Length 155cm, S0239

£54.95 SPECIAL OFFER £44.95

**SQBM50P** 2/70cm, Gain 6.8/9.2/12.5dBd, RX 25-2000MHz, Length 250cm, S0239

£64.95 SPECIAL OFFER £59.95

**SQBM100P** 6/2/70cm, Gain 3.0/6.2/8.4dBd, RX 25-2000MHz, Length 250cm, S0239

£84.95

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£79.95

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£79.95

**SQBM300GN** Triband 2/70/23cm, Gain 4.5/8.3/10.7dBd, Length 155cm

£119.99

### HF Wire Antennas

### Diamond quality - Moonraker pricing

Our HF wire antennas are made with complete waterproof potted baluns and high quality "original" flexiwave antenna wires.

**MDHF-80** 3.5MHz balun matched mono dipole, length 40m

£59.95

**MDHF-40** 7.0MHz balun matched mono dipole, length 20m

£44.95

**MDHF-20** 14MHz balun matched mono dipole, length 10m

£39.95

**OSHF-80** 3.5-30MHz balun matched off set dipole, length 40m

£59.95

**OSHF-40** 7.0-30MHz balun matched off set dipole, length 22m

£44.95

**OSHF-20** 14-30MHz balun matched off set dipole, length 11m

£39.95

**LWHF-160** 1.8-50MHz unun match end fed antenna, length 42m

£49.95

**LWHF-80** 3.5-50MHz unun match end fed antenna, length 20m

£44.95

**LWHF-40** 7.0-50MHz unun match end fed antenna, length 10m

£39.95

### Yagi Antennas

All Yagis have high quality gamma match fittings with stainless steel fixings!

**Y627-35** Dual band 3/5 element 3.5/12.5dBd gain with one feed

£79.95

**Y627-55** Dual band 5/10 element 5/10dBd gain with one feed

£149.95

### Base

### Mobile



### Amplifiers

The **BLA 600** is a wideband compact linear amplifier for the HF bands and 6m. from 1.8 to 54 MHz. Using Freescale MRFF6VPS600.



£1999.95

**BLA350 (New Version)** 1.5-30MHz 300W mains powered solid state amplifier

£899.95

**HLA305Y** 1.8-30MHz 250W professional amplifier with LCD

£649.95

**HLA300V+** 1.8-30MHz 300W all mode amplifier with fans

£499.95

**HLA150V+** 1.8-30MHz 150W all mode amplifier with fans

£399.95

**LA250Y** 140-150MHz 200W professional amplifier with LCD

£549.95

**HLA100** 420-440MHz 100W compact linear for 70cm

£449.95



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### Tuners

**LDG Z-817** 1.8-54MHz ideal for the Yaesu FT-817

£129.95

**LDG Z-100 Plus** 1.8-54MHz the most popular LDG tuner

£159.95

**LDG IT-100** 1.8-54MHz ideal for IC-7000

£159.95

**LDG Z-11 Pro** 1.8-54MHz great portable tuner

£179.95

**LDG KT-100** 1.8-54MHz ideal for most Kenwood radios

£199.95

**LDG AT-100 Pro II** 1.8-54MHz

£239.95

**LDG AT-200 Pro II** 1.8-54MHz

£269.95

**LDG AT-1000 Pro II** 1.8-54MHz continuously

£519.95

**LDG AT-600 Pro II** 1.8-54MHz with up to 600W SSB

£384.95

**LDG YT-1200** 1.8-54MHz 100W for FT-4800, FT-8120 & FT-DX3000

£244.95

**LDG YT-100** ideal for Yaesu FT-8570

£199.95

**LDG RT-600** 1.8-54MHz 600W external ATU

£439.95

**LDG R8A-1** Balun 1:1 high quality

£34.99

**LDG R8A-4** Balun 4:1 high quality

£34.99



**PS23SW1 25A compact switch mode power supply**

£69.95

Output Voltage: 13.8VDC, Output Current: 23A constant 25A Max, Fan cool 10- full speed, High RFI immunity, Binding post and cigar socket DC output, Overload and short circuit protection



**QJPS30H** 30A switch mode power supply

£79.95

Input Voltage: 220VAC

Output Voltage: 9-15V adjustable

Output Voltage regulation: less than 2%, Output current: 30A, Meter: Displays the supply voltage and current, Cigarette plug terminal: 10A (max)

£129.95

**QJPS50II 50A switch mode power supply**

£129.95
£119.95

Input Voltage: 220VAC, Output Voltage: 9-15V adjustable, Output Voltage regulation: less than 2%, Output current: 50A, Meter: Displays the supply voltage and current, Cigarette plug terminal: 10A (max)



## Join the best loyalty programme and start earning **WATTS** now!

All registered retail customers can now earn and redeem free product credits known as **WATTS**. It's simple the more you spend the more **WATTS** you receive. You will also receive bonus **WATTS** when you refer a 'New Customer', 'Write a Product Review', 'Share a product' or 'Refer a Friend'

Don't miss out - Register now and start enjoying free **WATTS**



### AVAIR SWR Meters

Quality meters at affordable prices - from HF to UHF

<b>AV-20</b> 1.8-200 MHz 30/150W	£49.99
<b>AV-40</b> 144-470 MHz 30/150W	£49.99
<b>AV-201</b> 1.8-160 MHz 5/20/200/400/1000W	£59.99
<b>AV-400</b> 140-525 MHz 5/20/200/400/1000W	£59.99
<b>AV-601</b> 1.8-160/140-525 MHz 5/20/200/400/1000W	£79.99
<b>AV-1000</b> 1.8-160/430-450/800-930/1240-1300MHz up to 400W	£89.99

£199.95



### Bhi Noise Cancelling Products

Bhi design and manufacture a range of DSP noise cancelling products that remove unwanted background noise and interference from noisy voice and radio communication channels to leave clear speech.

**DESKTOP** 10 watt DSP noise canceling base station speaker will work with most radios, transceivers, receivers, and SDR radios, giving a new listening experience. The now rotary controls make it very easy to use and set up to your own operating conditions

**DSPMR** 200W OH OFFER £118.99

This noise cancelling speaker incorporates unique DSP technology to remove unwanted background noise and interference from speech

**DUAL IN-LINE** £199.99

The Dual In-Line DSP noise eliminating module provides two channel/stereo noise cancellation, and is suitable for use on all radios and receivers including SDR, especially those with stereo or two channel output options.

**COMPACT IN-LINE** £179.99

This small compact battery operated handheld unit is ideal for portable use, and includes the latest bhi's latest dual Channel DSP Noise Cancelling technology and Bluetooth technology. The parametric equaliser allows any specific part of the frequency range to be selected and adjusted in strength enabling the user to shape the audio to suit their ears!

**PARAPRO EQ20B** £199.99

The EQ20 product range features a 20W modular audio power amplifier with a parametric equaliser plus the option of having bhi's latest dual Channel DSP Noise Cancelling technology and Bluetooth technology. The parametric equaliser allows any specific part of the frequency range to be selected and adjusted in strength enabling the user to shape the audio to suit their ears!

**HP-1 Wired Stereo Headphones** JUST £19.95

The HP-1 stereo headphones are suitable for general purpose use and can be used for radio communications as well as listening to music.

### Coax Cable Drums

Save money buying in bulk - 50m as well as 100m drums at discounted prices

<b>RG58-DRUM-50</b> standard RG58 6mm 50m reel	£19.99
<b>RG58-DRUM-100</b> standard RG58 6mm 100m reel	£28.99
<b>RG58M-DRUM-50</b> military spec RG58 6mm 50m reel	£24.99
<b>RG58M-DRUM-100</b> military spec RG58 6mm 100m reel	£44.99
<b>MINI8-DRUM-50</b> military spec MINI-8 7mm 50m reel	£34.99
<b>MINI8-DRUM-100</b> military spec MINI-8 7mm 100m reel	£64.99
<b>RG213-DRUM-50</b> military spec RG213 9mm 50m reel	£64.99
<b>RG213-DRUM-100</b> military spec RG213 9mm 100m reel	£119.99
<b>WESTFLEX-DRUM-100</b> military spec Westflex 103 10mm 100m reel	£159.99
<b>RG174-DRUM-100</b> military spec RG174 2.8mm 100m reel	£59.99



### Masts - Push Up

Lightweight medium and heavy duty swaged masts sets from 1.25-2" diameter 5ft sections to create a lovely 20ft mast - choose the correct size needed for the antenna installation. Masts have a lovely push fit for easy of use and to give a strong connection



<b>MSP-125</b> 20ft Medium Duty (set of 4 poles) 32mm dia 1.6mm gauge	£44.99
<b>MSP-150</b> 20ft Medium Duty (set of 4 poles) 38mm dia 1.6mm gauge	£49.99
<b>MSP-175</b> 20ft Medium Duty (set of 4 poles) 44mm dia 1.6mm gauge	£59.99
<b>MSP-200</b> 20ft Medium Duty (set of 4 poles) 51mm dia 1.6mm gauge	£69.99
<b>MSPX-150</b> 20ft Heavy Duty (set of 4 poles) 38mm dia 2.25mm gauge	£69.99
<b>MSPX-200</b> 20ft Heavy Duty (set of 4 poles) 51mm dia 2.25mm gauge	£89.99

### Masts

#### GRP Fibreglass

Ideal heavy duty fibreglass masts for those antennas that need to be insulated from metal hardware or pole - convenient 2m lengths in a light grey



<b>GRP-150</b> 2m 37mm OD	£29.95
<b>GRP-200</b> 2m 51.7mm OD	£29.95

### Masts

#### Telescopic

We offer both aluminium and GRP fibreglass push up masts ranging from 20-50ft to suit your needs. The aluminium versions are for portable/occasional use and the fibreglass versions can also be used for fixed installation



<b>LMA-M</b> 20ft open 5.8ft closed 50-25mm aluminium mast	£109.99
<b>LMA-L</b> 33ft open 7.2ft closed 50-25mm aluminium mast	£119.99
<b>TMF-1</b> 20ft open 5.6ft closed 50-30mm high quality GRP mast	£199.99
<b>TMF-1.5</b> 30ft open 7.5ft closed 57-30mm high quality GRP mast	£299.99
<b>TMF-2</b> 40ft open 9ft closed 57-30mm high quality GRP mast	£349.99
<b>TMF-3</b> 50ft open 9ft closed 65-23mm high quality GRP mast	£399.99

### Hardware

We offer all type of mounting hardware to help get you rigged up at home - if you can't see it listed chances are we have it. Check www.moonraker.eu or just give us a call

<b>TRIPOD-HDA</b> heavy duty collapsible tripod to suit base mats up to 67mm	£149.99
<b>TK-24</b> wall bracket offers 18" clearance	£29.95
<b>TK-12</b> wall bracket offers 12" clearance	£19.95
<b>BB2</b> mast base plate to suit up to 2" masts/pole	£22.99
<b>JOHN-200</b> clamp 2" poles back to back	£17.95
<b>PTP-20</b> 2" to 2" mast clamp	£5.95

### Make Your Own?

#### Wire, insulators & bits

Have fun but making your own antenna system and see how it works against the commercial designs



<b>SCW-50</b> Enamelled copper wire, 1.6mm, 50m length	£24.95
<b>HGW-50</b> Hard drawn copper wire, 1.6mm, 50m length	£29.95
<b>FWPVC-50</b> high quality flexiwave with PVC coating 4mm, 50m	£44.95
<b>300-20</b> Ribbon feeder 300 ohm high quality slotted, 20m	£17.95
<b>450-20</b> Ribbon feeder 450 ohm high quality slotted, 20m	£19.95
<b>DPC-W</b> Wire dipole centre with securing clamps	£5.95
<b>DPC-S</b> Wire dipole centre with 50/239 socket for PL259	£6.95
<b>DPC-38</b> Dipole centre for 2 x 3/8th whips antennas to make dipole	£6.95
<b>DOGBONE-S</b> small plastic insulator	£1.00

## COME AND MEET US AT THE BIGGEST STAND

National Hamfest  
27 & 28th September



National Hamfest

# MFJ MFJ MFJ MFJ

UK Distributer – All MFJ 1500+ product lines available from stock or pre-order

## Automatic Tuners

MFJ-926B	remote Mobile ATU 1.6-30MHz 200W	£349.95
MFJ-929	Compact with Random Wire Option 1.8-30MHz 200W	£269.95
MFJ-991B	1.8-30MHz 150W SSB/100W CW ATU	£269.95
MFJ-993B	1.8-30MHz 300W SSB/150W CW ATU	£299.95
MFJ-994B	1.8-30MHz 1600W SSB/300W CW ATU	£399.95
MFJ-998	1.8-30MHz 1.5kW	£799.95

## Manual Tuner

We stock all the popular tuners to suit your needs and budget

MFJ-902B	3.5-30MHz 150W mini travel tuner	£129.95
MFJ-901B	1.8-30MHz 200W Versa tuner	£114.95
MFJ-945E	1.8-51MHz 300W tuner with meter	£159.95
MFJ-941E	1.8-30MHz 300W Versa tuner 2	£169.95
MFJ-949E	1.8-30MHz 300W deluxe Versa tuner with DL	£199.95
MFJ-9341	1.8-30MHz 300W tuner complete with artificial GND	£219.95
MFJ-974B	3.6-54MHz 300W tuner with X-needle SWR/WATT	£239.95
MFJ-969	1.8-54MHz 300W all band tuner	£249.95
MFJ-976	1.8-30MHz 1500W balanced line tuner with X-Needle SWR/WATT	£589.95

## Analysers

MFJ offer the best range of analysers: the most popular being the MFJ-259C		
MFJ-207 HF 10-160M 1.6-30MHz in 5 bands	£124.95	
MFJ-208 VHF 138-156MHz + external jack for frequency counter	£119.95	
MFJ-223 HF/M 1.6-60MHz with colour graphic display	£239.95	
MFJ-225 HF/VHF 1.8-170MHz, two ports, with graphic display	£349.95	
MFJ-226 HF/VHF/UHF 1-230MHz expect times analyser with graphic display	£449.95	
MFJ-227 VHF/UHF 88-226-330-500MHz graphics VNA analyser	£379.95	
MFJ-249C HF/VHF/UHF 530kHz-230MHz with analogue meter	£299.95	
MFJ-250C HF/VHF/UHF 530kHz-230MHz with analogue and LCD screen	£249.95	
MFJ-269C HF/VHF/UHF 530kHz-230/415-470MHz with analogue and LCD screen	£429.95	
MFJ-269C PRO HF/VHF/UHF 530kHz-230/430-520MHz with analogue and LCD screen	£449.95	

## SWR Meters

MFJ-869 HF 1.8-60MHz 20/200/2000W with massive 6.5" screen and fully automatic	£259.95	
MFJ-868 HF 4m 1.8-54MHz 20/200/2000W with massive 6.5" screen	£169.95	
MFJ-867 VHF/UHF 144/220/440MHz 20/200/400W with large screen	£179.95	
MFJ-868 HF 1.8-54MHz 1500W digital SWR/Wattmeter with built in frequency counter	£209.95	
MFJ-828 HF 1.8-60MHz 1500W digital SWR/Wattmeter with 3" cross needle screen	£259.95	
MFJ-864 Compact cross needle HF/VHF/UHF 1.8-60/144/430MHz 30/300W	£114.95	
MFJ-862 Compact cross needle VHF/UHF 144/220/430MHz 30/300W	£84.95	
MFJ-860 Compact cross needle HF 1.8-60MHz 30/300W	£69.95	
MFJ-849 Digital HF/VHF 1.5-525MHz 200W with large 3.5" LCD display	£199.95	

## Antenna Switches

MFJ Rhino antenna switches are tough and durable with gold plated flanges and connector contacts that provide low VSWR and low insertion loss. A rock-solid, sturdy, die-cast design gives up to an excellent 70 dB isolation		
These switches are built like a rhino, tough inside and out! A superior internal design lets them work for you for a long lifespan		
MFJ-2702 S0239 2-Way U-1000MHz 2kW	£37.95	
MFJ-2702N N-Type 2-Way 0-1000MHz 2kW	£54.95	
MFJ-2703 S0239 3-Way 0-800MHz 2kW	£74.95	
MFJ-2703N N-Type 3-Way 0-1.5GHz 2kW	£84.95	
MFJ-2704 S0239 4-Way 0-900MHz 2kW	£109.95	
MFJ-2704N N-Type 4-Way 0-1.5GHz 2kW	£119.95	

## Dummy Loads

Choose between dry and oil filled dummy loads between 15-2500W

MFJ-261 15W (100W peak) DC-500MHz with PL259	£32.95
MFJ-261N 15W (100W peak) DC-500MHz with N-Type	£47.95
MFJ-262B 35W (200W peak) DC-1000MHz with PL259	£69.95
MFJ-262BN 35W (200W peak) DC-1000MHz with N-Type	£79.95
MFJ-260C 25W (300W peak) 30-650MHz with PL259	£49.95
MFJ-260CN 25W (300W peak) 30-650MHz with N-Type	£49.95
MFJ-250X 1kW (2kW peak) DC-400MHz with S0239 (need transformer oil)	£59.95
MFJ-251 1kW (2kW peak) DC-400MHz with S0239 (includes transformer oil)	£89.95
MFJ-264 100W (1.5kW peak) DC-650MHz with S0239	£84.95
MFJ-264N 100W (1.5kW peak) DC-650MHz with N-Type	£94.95
MFJ-251 25W (300W peak) DC-60MHz 16.6/25/50/100/150 Ohm selectable	£169.95



## DC Multi Outlet Strips

These strips have 5-way binding posts for your transceivers and accessories to keep your power connected neat and tidy and organized.

MFJ-111B Deluxe Multiple DC Power outlet lets you power two HF and/or VHF transceivers and six or more accessories from your transceivers main 12 VDC supply	£99.95
MFJ-1117 Multiple DC Power outlet lets you power four HF/VHF radios -- two at 35 Amps each and two at 35 Amps combined -- from your transceivers main 12 VDC supply	£79.95
MFJ-1116 Multiple DC Power outlet handles 15 Amps total. It has eight pairs of heavy duty, RF bypassed 5-way binding posts that lets you power your accessories. They are protected by a master fuse and have an ON/OFF switch with "ON" LED indicator	£69.95
MFJ-1112 15 Amp Multiple DC Power outlet lets you power up to six devices from your transceivers main 12 VDC supply	£54.95



## Morse

Morse keys, readers and tutors starting from just £19.95.

MFJ-350 Budget practice key for beginners	£19.95
MFJ-553 Deluxe wood telegraph straight key	£37.95
MFJ-557 Deluxe code practice oscillator with volume adjust	£48.95
MFJ-566M Micro CW keyer black with metal base	£33.95
MFJ-566P Micro CW keyer black with plastic base	£26.95
MFJ-564 Deluxe Lambic paddle with heavy base in chrome	£109.95
MFJ-5640 Deluxe Lambic paddle with heavy base in black	£109.95
MFJ-461 Pocket size Morse code reader	£109.95
MFJ-418 Pocket size Morse code tutor	£109.95



## Headphones

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In the early 80's DATONG Electronics Ltd started selling the D70 Morse Tutor. It was described as: "The revolutionary new way to practice Morse Code reception. An unlimited supply of precision Morse at the turn of a switch, plus built-in oscillator for sending practice.". At that time most Morse teaching aids were either 'on-air' or record/cassette based so the D70 really was a big step forward. Oddly, the D70 was never formally reviewed in PW but was mentioned in an article titled *The key to MORSE* by Tony Smith G4FAI in October 1981. Tony described it as "One of the new random Morse generators for self-tuition".

I bought one myself and found it a very useful teaching aid. I listened to it on my way to and from work. When learning Morse, you really must submerge yourself in it and having access to such a portable device is perfect.

Almost 40 years later the D70 is still talked about and can be regularly seen for sale on the popular auction sites. With that in mind I thought it would be interesting to rebuild the D70 using technology of the day but with one extra feature. Over the years I've heard many people criticise the D70 for not having a display to show the characters as they are sent. Instead of a display I thought it would be interesting to Bluetooth-enable the D70

# The D70BOX

Martin Waller GOPJO returns, this time with a reworking of the DATONG D70 Morse tutor but using modern devices.

so that the characters being sent could be displayed on a phone, tablet or PC yet still maintaining the original look and feel, **Fig. 1**.

Before embarking on this project, I ran the idea past Dr David Tong, who designed the original D70, and he was delighted that the concept would have a new lease of life.

So, out with the PROM and 4000 series CMOS chips and in with the Arduino Pro Micro.

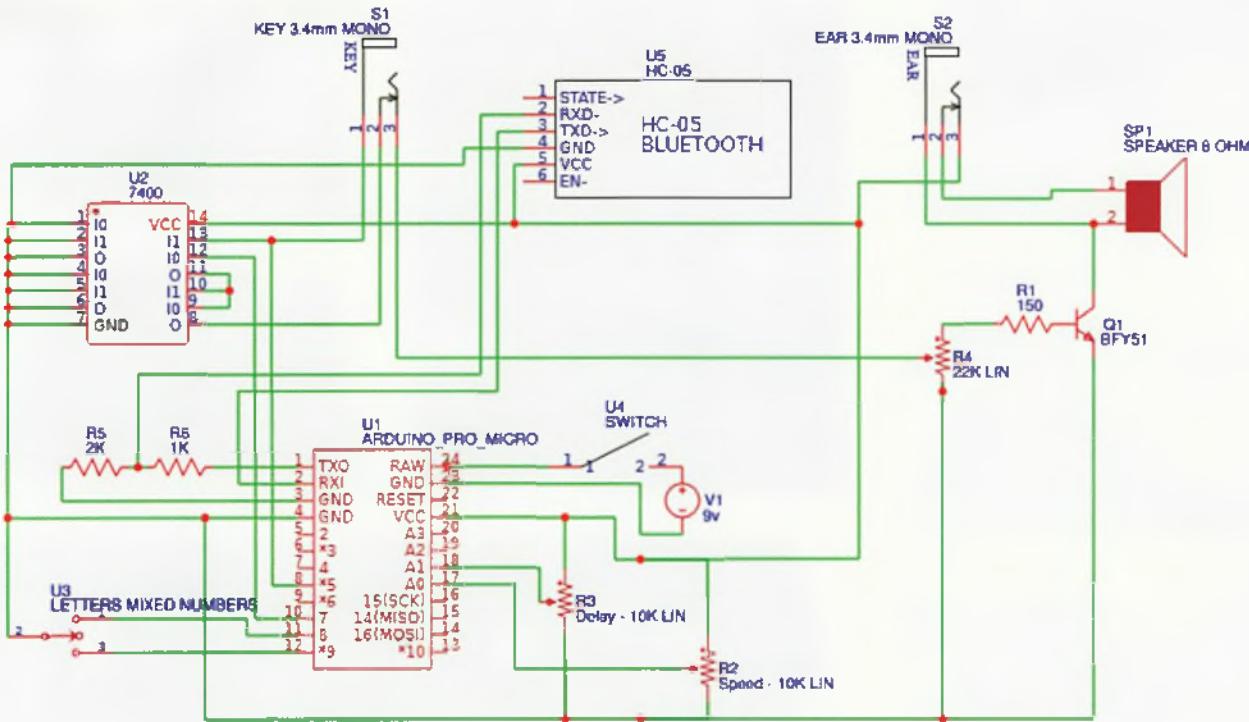
## The Circuit

The circuit, **Fig. 2**, is quite simple. On the input side we have two linear potentiometers used to control the delay and the speed, and a switch to control the characters generated – letters, numbers, or mixed. On the output side we use the Arduino to generate a constant 700Hz tone, which goes to the key socket and

an AND gate built from the 7400. With no key plugged in this signal is ANDed with the 'Tone On' signal from the Arduino that switches the tone through to the volume potentiometer and from there on to drive the transistor and hence the speaker. The 'Tone On' signal is raised as and when dots and dashes are generated. With a key plugged in the tone signal flows through the key to the volume control and the path from the output of the AND gate is cut off. The Bluetooth module is controlled by serial data being sent via the Arduino serial port.

## Software

The software and all building/installation instructions can be found on GitHub – see the reference at the end. Again, the software is quite simple with lots of comments so it should be very readable. It's probably worth noting that it uses



2

the PARIS method for calculating the Dit length in milliseconds and then the Dahs and associated spacings are calculated from that. See the source code for further details.

## Bluetooth

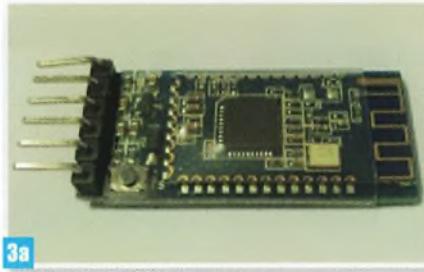
Bluetooth support is provided by a Bluetooth module. They are cheap and driven via a simple serial interface – perfectly suited to the Arduino world. There are lots of very similar devices on the market, the one used in here is described as 'HM-10 BLE Bluetooth 4.0 CC2540 CC2541 Serial Wireless Module' as seen in Fig. 3.

When the D70BOX is turned on the software will ensure that the Bluetooth module gets named D70BOX. It has been tested against a PC running Windows 10, an Android telephone using an App called Serial Bluetooth Terminal 1.24, and an iPhone using an App called BLE Terminal. Note that on the iPhone the D70BOX display can only be seen within the BLE Terminal App and not in the usual Bluetooth settings.

The output can be seen in Fig. 4.

If you don't want Bluetooth support, then simply leave out the Bluetooth module and when you download the software to the Arduino ensure that you comment out the line:

```
#define BUILD_WITH_BLUETOOTH 1
```



3a



3b

Fig. 1: Two D70 boxes with an ad for the original D70.

Fig. 2: Circuit diagram.

Fig. 3a: Top of the Bluetooth module.

Fig. 3b: Bottom of the Bluetooth module.

shapes you want and where on the page in XML. With a little patience and the help of some scripting it's possible to create something rather authentic, Figs. 6 and 7.

The SVG files can be found on GitHub (see references).

The decals were printed on a laser printer and glued to the aluminium panels provided with the box. I've not added any coating to waterproof the decal but it may be worth considering. Take care when printing the decals. Ensure that the image is scaled to 100%, otherwise they will come out smaller than expected!

The delay and speed controls presented an interesting problem: How could I be sure that the delays and speed setting in the software matched that of the D70? After some thought I decided

## PCB

The circuit could easily be constructed on Veroboard but I decided it was time to design my second PCB! Again, I used the free edition of Eagle and it allowed me to position mounting holes and a cut out to match the KL-11.5 as required. The design was sent off to a cheap prototype PCB manufacturer in China and was delivered in a couple of weeks. The EAGLE file can be found on GitHub (see the references). The PCB can be seen in Fig. 5.

## Boxing Up

If you're going to build a D70, then the box must be right. It turns out that the original case is still available from a company called TEKO Enclosures, Model KL-11.5. To make it look authentic the decal must also be right. Not being a graphic artist, I chose to replicate the original using Scalable Vector Graphics – viewable in any modern internet browser. Using this method, you basically declare what

the easiest way would be to record the values returned by the associated Arduino analogue inputs at all the settings on each dial and then fit a curve to these points. This gave me two polynomials, one for the delay and one for the speed, that would map the read analogue value to the correct delay and speed respectively. See the software for how these are used.

The inside of the box is organised as shown in Fig. 8.

Take care fitting the two switched mono sockets on the rear panel because they must be insulated from it. The sockets come with a small collar and holes are drilled to fit this. The fixing nut is then insulated from the paper-coated aluminium panel by a small nylon washer.

### Knobs

Looking around the internet I failed to find any potentiometer knobs like the original. In the end I chose a similar looking knob from Thingiverse. Once printed, I painted them with acrylic paint and I'm happy with the result. If I was a skilled 3D designer, then I'd have an attempt at making something closer to the original.

### Costs

Cost-wise, for a simple replication of the D70 without the TEKO enclosure, you're probably looking at something less than £15 depending on your bit box and whether you choose to implement the Bluetooth connectivity. The TEKO enclosure will add another £10 to that due to postage and so on. I have a few spare PCBs that I'm more than happy to pass on for the cost of the postage. Please contact me if you are interested. Strictly one per person.

### Conclusion

It's been an interesting project. I hope it encourages some readers to take up learning Morse code. You'll never know the satisfaction found in that first Morse QSO until you've tried it!

### References

D70Box Software:

<https://github.com/MartinDavidWaller>

Thingiverse Knob:

[www.thingiverse.com/thing:2978486](http://www.thingiverse.com/thing:2978486)

TEKO Enclosures:

<https://tinyurl.com/y2ugxwx9>

Android Serial Bluetooth:

<https://tinyurl.com/yyj3xzjt>

iPhone BLE Terminal:

<https://tinyurl.com/y2cuw328>

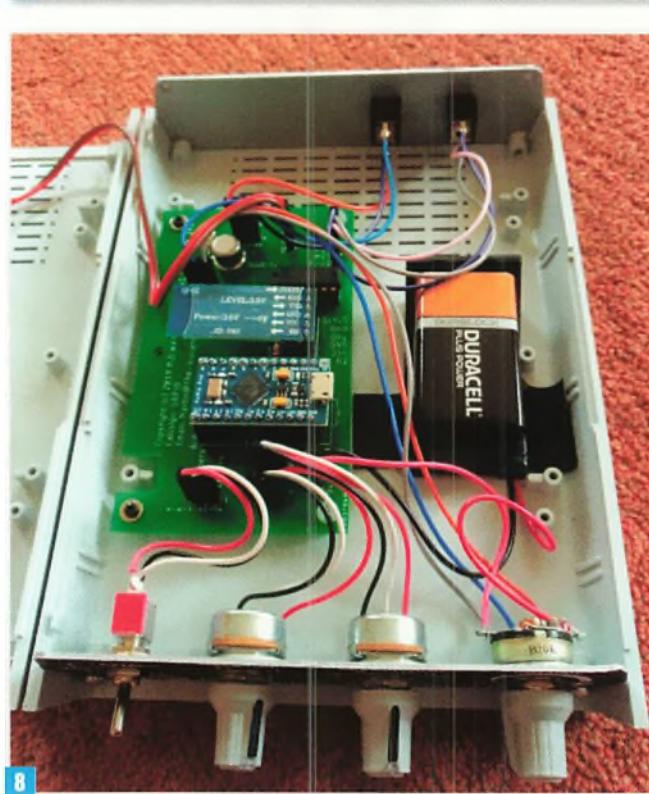
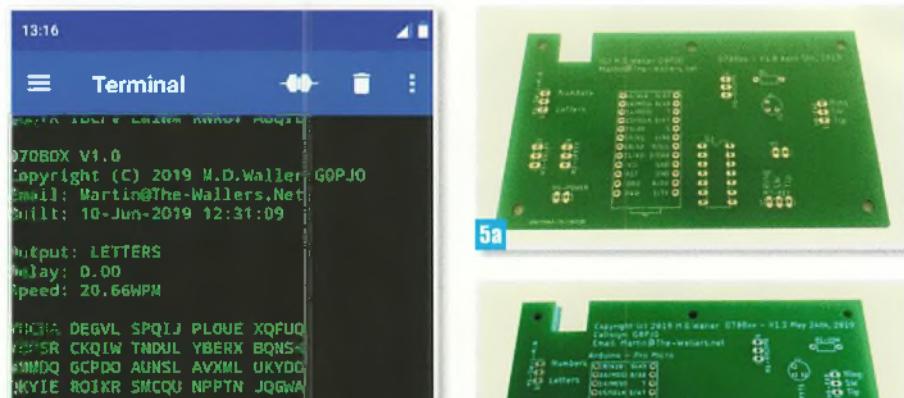


Fig. 4: Screenshot of output from the Arduino.

Fig. 5a & 5b: The PCB as fabricated in China.

Fig. 6: Front graphic.

Fig. 7: Rear graphic.

Fig. 8: Internal view.



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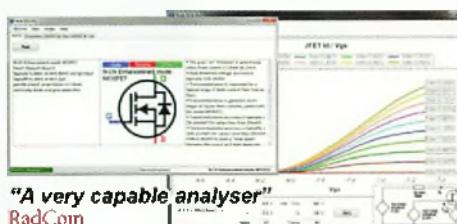
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# A Race against Time and a Goldmine of a Book

Lee Aldridge wraps up his Starting Over exploits and starts making some QSOs!

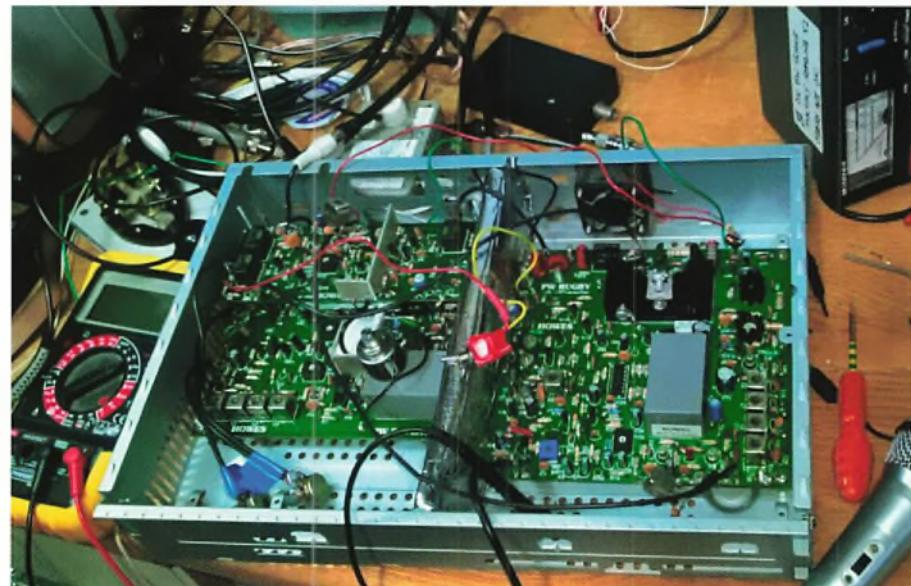
**T**he Howes 40m SSB/CW transceiver was all bolted into an old metal Sky box, as shown in the photo. I knew I might be inviting trouble but I didn't know what.

The receiver seemed to work well with the A5 linking module mounted above the receiver board, the VFO buffer functioned well even though I'd forgotten about the frequency response of my oscilloscope, I checked the output with my RF probe and set it for 220mV (well it was a token gesture for the 1mW stated). The transmitter board proved to be exacting. I'd had to refurbish a fair bit of the board, scratching around for parts but I got there. I couldn't control the carrier level for CW. The transistors were getting a tad warm, power output could be seen on my power meter but not much else. Re-reading the instructions did help, connections were corrected but still there were problems.

## An Ideal Reference Book

Remember I said I might be inviting trouble? Sometimes you stumble across the right information just when you need it. Well, the W1FB *Design Notebook* came into my possession and I have to say, it's one of the great reads in one book I've come across. The insights into simple circuit design are written in a way that even I can understand. No wonder **George Dobbs G3RJV** (among many others) held **Doug DeMaw W1FB** in such high regard. And that reminded me of when I used to read QST hand-me downs and my old *ARRL Handbook* that finished up damaged in a road accident. Never carry a box of eggs with one of your prized books.

Anyway, I'd been reading up on oscillator design and some sensible precautions with oscillator energy. By putting my Rugby transmitter in the same box as the Daventry receiver and linking module, I could now grasp some of the issues that Doug had written about, how **Chris Howes** had over-



The Howes 40m transceiver in an old Sky box

come some of the issues as he designed the Rugby to be housed in a separate enclosure and how I'd brought the whole lot together. The 10.7MHz oscillator on the receiver was running when I first tested the transmitter. Guess where it found its way into? It was mixing with the VFO to provide its own carrier. No wonder I couldn't control the CW power output or null the carrier on SSB! Solder up the inhibit for the receiver local oscillator on transmit.

## On with the Debugging

It became even more involved. My cheap DVM decided to no longer work. So, armed with one DVM, my old 'scope and cheap frequency counter, I spent many a happy hour thrashing around and eventually taming some of the issues that I had added. Screening was added to help stabilise the VFO and contain some RF, the VFO buffer amplifier was given a little screening, 10.7MHz traps were added to the buffer strip and the VFO input on the transmitter.

Now where's the SSB modulation? Why's that driver transistor getting so hot? The

'many a happy hour' was losing its charm. I can tell when this effect kicks in. I'm usually looking at the equipment adverts in the magazines or online. G3CWI's fleamarket always gets a look:

<https://tinyurl.com/y4k2yp4y>

Back for another go or three. I was yet again reminded to keep to the script – that is, start with the original value component before condemning other components. An example of that error was the lack of modulation. You see, I hadn't got the specified  $270\Omega$  potentiometer for the incorrect  $22k\Omega$  potentiometer that had been fitted to the board, I'd only got a  $200\Omega$  one. When I fitted a  $47\Omega$  resistor in series with the potentiometer, I had modulation. When I decided to 'tidy up' the board, I thought, that shouldn't matter in the emitter of the microphone amplifier. Well, after one exasperating evening ending with some side-cutters, I can assure you it did.

Anyway, with calm reinstated in the shed, a proper alteration was made to add a  $68\Omega$  resistor in series underneath the board. Did it work? Yes. Did I then decide to fit an electret

microphone to the radio because the moving coil microphone seemed to be a little low? Yes. Now the modulation was making the power meter jump about! Did I check if it might be bouncing about too much? No.

I couldn't easily resolve the RF driver getting a little warm when not transmitting even though I did slightly alter the bias on the device to reduce the standby current. I modified the supply switching to the first two driver stages. That was a success.

### Time to go Live

Time to give this radio a go. I'd listened to the transmitter on my 40m DC receiver and thought it sounded acceptable enough considering how easy it was to overload the 'open built' DC receiver.

Now to wire the radio up as a transceiver. I paid attention to the original instructions. Take care to connect the receiver correctly to the transmitter board. I hadn't gone through all this fun just to finish up with that potential catastrophe.

First evening, full of intrepid optimism, I tried calling a couple of stations. Nothing. They must be running high power. Too many others calling. A bit of patience required.

Second day, still hoping it would all work out, I checked the frequency alignment of the receiver and transmitter. I thought I'd

got it right. No. I could tell I was getting tired when I could no longer tell which frequency was higher.

Let's have a look at that modulation on the 'scope. Why didn't I look at it before? It was distorting on peaks. The electret microphone was probably a bit too much for the old circuit. Just don't shout into the microphone for now!

Still no one wants to talk to me. Was it me off frequency according to a Danish station? Surely not. Yes, it was. Flipping heck (edited), how can that be?

The real lesson of all this has been, until you really get to the real issue, the messing about just doesn't count. I hadn't really aligned the receiver local oscillator on frequency! Good grief, the receive audio has far more bass. Further adjustment of the transmitter local oscillator frequency with my counter, DC receiver and my ad hoc signal generator/FET dip oscillator followed.

A few test calls. Nothing. Retire from shed, before lighting touch paper. Well, no I didn't.

### And Success

One final go. A G station calling CQ on 40 – he's answered. Fantastic. My thanks to **Steve M5SCT** for my first phone contact on 40m. He gave me an honest report, my

audio warbled but he could understand me. SSB almost sorted but as you can see from the photo, there's plenty of room for improvement. One thing I'll say is, the Chris Howes design, kit and instructions have been proven through the test of time and the rebuild of a 20+ years radio.

Why the race against time? Because by the time you have read my article, we thought we would have moved home. All the gear had been packed away ready along with most of our house contents only to find our buyers backed out. I'm sure a few of you have been through the trials and tribulations. But the dancing Father Christmas did get sorted for the grandchildren. I now plan on improving all of the projects I'd hurriedly built and build a few more.

Finally, may I thank you for reading this series of articles over the months. The support and encouragement I have received has been greatly appreciated. More than anything, the friendship and incredible generosity of the amateur radio community has shone through. I can only hope I've encouraged someone to carry on in the practical way!

*(Editor's note: Don't worry, we haven't lost Lee. He will be back following in the footsteps of the late George Dobbs G3RJV, revisiting some of those classic Practical Way designs but with a slant of his own)*

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**T**he Nevada Radio 50th anniversary seemed like a good time to look at this, our longest-established amateur radio dealer.

I've been a regular visitor over the years because owner Mike Devereux G3SED was kind enough to store our Five Star DXpedition equipment in his warehouse from our first trip to the Spratly Islands back in 1998. However, this was my first visit since he refocused the company on amateur radio and considerably extended the showroom.

### Early Days

The story of the company that started as Telecomms and is now Nevada Radio has many fascinating twists and turns. Indeed, to read it you would think that its success is more by accident than design. To an extent that's true but the story also reflects a sharp business brain, taking opportunities as they came along but having the good sense to move out of particular markets before the bubble burst.

I'll try not to duplicate what has already appeared in our sister magazine *RadioUser* but it is worth going back to the beginning where Mike was living in a rented bungalow in Portsmouth, was told that it was cheaper to rent an empty shop, and realised that he was then sitting on an opportunity to set up a modest radio and electronics business, selling components, government surplus radios (many of us recall those days when every surplus shop had a heap of 19 sets on sale!) and, in due course, early Kenwood and other rigs on a sale-or-return basis. And, at the back of the shop, doing repairs of equipment brought in by locals who had figured that this modest store next to the local Co-op had something to do with electronics. So along came TVs, amplifiers, record decks and the like, to be brought back to life.

And thus it was that the call came on Sunday morning to help out at the local town hall where a **Max Bygraves** concert was scheduled for the evening but the PA system had packed up. It turned out to be a burned-out transformer and Mike was able to save the day by calling in some favours from people whose hi-fi equipment he had repaired. Max Bygraves' manager was so impressed with the quality of the sound compared with the crude systems typically found in concert venues in those days that he asked Mike to work with him for the rest of the tour and so a life as a roadie began while still keeping the shop

# In Focus: Nevada Radio

**Don G3XTT pays a visit to Nevada Radio on the occasion of their 50th anniversary.**



# nevada®

going and attending radio rallies as and when the opportunity arose. The roadie life took in **Bruce Forsyth** (who, at times, travelled with a 48-piece orchestra, all of whom had to be 'mixed up'), **Morecambe and Wise** and other well-known acts of the day before they made the transition to the big-time on TV.

(Photo 1) Mike G3SED & Roger Kennedy G3YRQ at the mixing desk. (Photo 2) A Telecomms ad from the Feb 1970 issue of *Short Wave Magazine*. (Photo 3) *Radio Active* magazine before its sale to PW Publishing. (Photo 4) Mike in front of the Flex display with his favourite reading matter! (Photo 5) Part of the workshop area. (Photo 6) Just some of the MFJ products in stock.

### Nevada Music

Out of this, some of the acts wanted a source for guitars and other instruments and so what would eventually become Nevada Music was born. And would-be musicians also wanted to cut demo tapes, which led Mike (by now in larger premises) to set up a professional recording studio.

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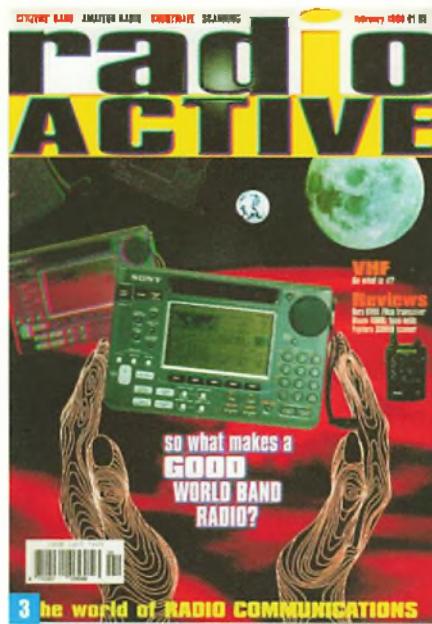
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3 The world of RADIO COMMUNICATIONS

Apropos of which, this was at pretty much the same time as a certain **Richard Branson** was doing very much the same thing. The difference was that Branson had the good fortune to stumble across **Mike Oldfield** and the rest is history although it has to be said that Mike had at least one client who made it to the big time, albeit in the US.

The Nevada name came about in 1974 because when Post Office Telecommunications became British Telecom the Telecoms name led to confusion, such as members of the public coming in to pay their phone bills! Mike had been a regular attendee at the Consumer Electronics Show in Las Vegas and Nevada seemed like a good name!

### Further Development

Anyway, the Telecomms/Nevada business continued to morph, setting up its own music publishing arm in conjunction with Warner Brothers of the US and stumbling into the early days of the CB boom when potential customers started coming into the shop seeking help in setting up their newly-acquired CB sets. And, again as fate would have it, the CB boom benefited from advertising in *CB Magazine* and when that magazine started to suffer and perhaps be closed, Mike bought it and became a magazine publisher, later transforming it into *Radio Active*, eventually sold to PW Publishing who merged it with *Short Wave Magazine* to become, yes, *RadioUser*. It's a small world!

Throughout much of this business development, Mike had become a wholesaler as well as a retailer, perhaps the best example being his relationship

with Midland, a major manufacturer of CB and PMR sets, with whom he has had a close working relationship for 40 years. For a time, Mike was also a huge importer of DAB radios and other consumer electronics, feeding into the likes of John Lewis, Maplin, Dixons and others. Sadly, as we know, many of those names have disappeared from the High Street so that business too has seen better days. Meanwhile, it eventually became obvious to Mike that the music business was very much a young person's game and in 2016 he sold Nevada Music to a national chain. The business still operates from the same premises, directly opposite Nevada Radio, but is no longer his.

### Full Circle

So, we come full circle. Nevada Radio is now back to being where it started, primarily an amateur radio vendor, albeit with some remaining CB and PMR446 sales along with related products. While there has always been an amateur radio side to the business, reflecting Mike's never-diminished passion for the hobby, it has been a minor aspect for a lot of the time but the focus is now back on amateur radio, with Waters and Stanton also operating out of the shared premises since their move from Hockley. Thus, there are dedicated demo areas for the major vendors, including Yaesu, Icom, Kenwood, Elecraft and Flex, with a MyAntennas end-fed half-wave on the roof for demo purposes. The site, as it happens, is electrically quieter than might be expected for a location on a business park and there is now a steady stream of would-be customers, as I noted during my visit.

As well as the showroom and extensive



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5



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warehouse, there is also a busy service department on site. Their role is first and foremost to take care of Nevada customers. They also build up the Elecraft gear, which comes into the UK in kit form but which many customers prefer to buy ready-assembled.

Many of Mike's staff have been with him for much of the journey, Phil, for example, having been there for around 40 years. There's a real sense of family. The company has, along the way, also won a number of awards for business achievement. I was, of course, also delighted to see that the packing department were assiduously putting PW flyers into each consignment!

Nevada is now the longest serving amateur radio retail emporium in the UK and will celebrate with a special dinner for staff and a few guests in September. As we said in our August News item, the company will also be celebrating its 50th with some special offers. I feel sure PW will want to recognise their Centenary in another 50 years too!





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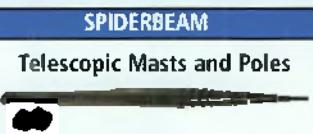
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**T**ake a car of 1919 and compare it, a century later, with one of today and you will discover that it is still essentially

**the same thing.** Yes, the modern one has all the bells and whistles, improved technology in many areas, perhaps with a little more speed and comfort but still only something that moves you from A to B.

But look at the subject of electronics and in the same century of progress you will see that we are light-years ahead. The semiconductor has changed everything. It has made possible the miniaturisation of electronics and the manufacture of increasingly powerful digital computing technology that in turn has enhanced our ability to design, develop and manufacture just about every product that we buy.

So it is with the oscilloscope, an analogue device that allows us to see the shape of oscillating electrical waveforms and, depending upon its sophistication, measure the frequency and many other parameters. However, over the last few years it has been undergoing a radical change as, along with us all, it has moved into the digital age. The hardware has shrunk, the cathode ray tube has gone, and the screen has grown in size so that the digital oscilloscope can now display in colour with multiple traces and gather data, all of which can be recorded and stored.

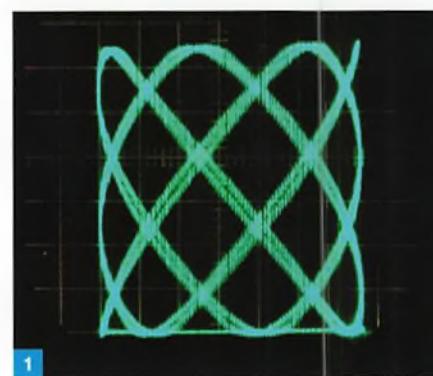
### Early Days

The oscilloscope initially came of age during the 1930s in parallel with the early development of television, perhaps because they both used the cathode-ray tube, but it was during the post-war period that it was improved to become a sophisticated laboratory tool. The cathode-ray tube, which was in essence a late-19th century invention, was the central component but it had limitations. The screen size was constrained because the electron beam had to be deflected by electrostatic means if high frequency pulses were to be displayed, and this needed high voltages. Television screens used coils wrapped around the neck of the tube to produce greater deflection of the electron beams by means of a magnetic field but this would not work for the oscilloscope's higher frequency displays.

I first saw an oscilloscope when I was a toddler. A cathode ray tube demonstrates

# The Cossor 1052

**Duncan James MOOTG asks what we can learn from a Cossor 1052 Double-Beam Oscilloscope.**



what happens when invisible electrons in a vacuum impact the screen's phosphorescent coating, which is a kind of magic if you don't know the physics and hopefully, still is when you do. The 'scope I saw had a tiny screen and was displaying beautiful sinuous Lissajous figures in luminous green, and to a child this was captivating [ref. 1], Fig. 1.

### An Acquisition

So, how could I resist when I had the chance, many years later, to acquire my first oscilloscope, a venerable vintage Cossor Double-Beam Oscilloscope, Model 1052 [ref 2], made in the early 1950s? It was green and rather smart, as if someone had actually designed the exterior, quite unlike the majority of laboratory oscilloscopes that seem to be overwhelmingly practical and, these days, white, as if they are trying to blend in with the white coats of the lab technicians. I was assured that the Cossor still worked and, somewhat out of character for a radio amateur, I readily parted with my cash, Fig. 2.

The Cossor 1052 is described as a portable model and it has a handle on the top just to give you a clue, but it is built like a battleship and is not something you would care to move more than a few yards. It is, as the instruction handbook states, 'a direct descendant of the famous Cossor Model 339, the first cathode ray oscilloscope to be widely used outside the laboratory', Fig. 3. The Cossor 339 was much more in the style of the 1940s with



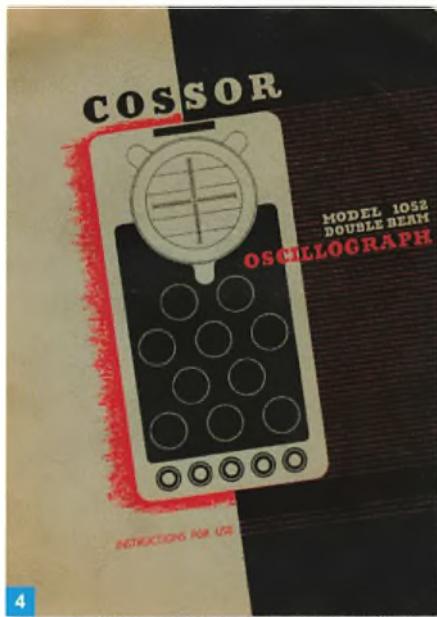
Fig. 1: A typical Lissajous figure showing a 3:4 ratio between X and Y plate inputs.

Fig. 2: The Cossor 1052 Oscilloscope.

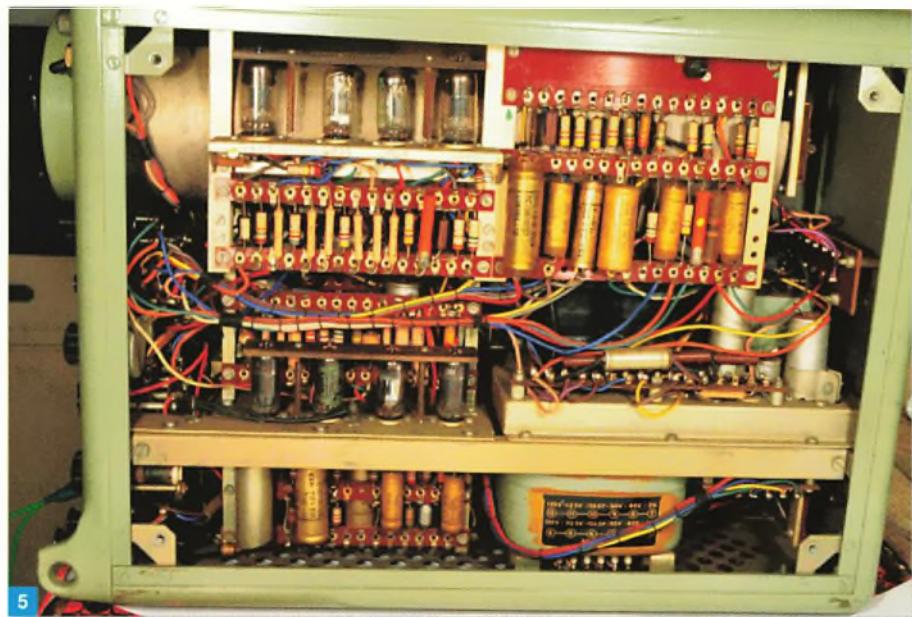
Fig. 3: The Cossor 339 Oscilloscope.

Fig. 4: The stylish front cover of the Cossor 1052 instruction booklet.

Fig. 5: The accessible layout of components in the Cossor 1052.



4



5

a utilitarian case. This made me wonder why the 1052, by contrast, was such a stylish-looking piece of equipment.

I think the date is the clue. It was made in the early 1950s, shortly after the 1951 Festival of Britain, which undoubtedly influenced many manufacturers to think more carefully about design. Cossor advertised in the Festival's Exhibition Guide with the following proud boast, *"In this twentieth century, Britain has made many brilliant advances in the field of Electronics. From its foundation the Cossor organisation has been closely linked with this branch of science and over the past 50 years has played a vital part – notably in the production of the first British X-Ray Tubes ... the earliest Cathode Ray Tubes ... and in the development of the Thermionic Valve. The first Radar receiver in the world was built by Cossor and today this pioneer organisation and its associate companies serve the nation in the air, on the sea, in homes, hospitals and factories. Radio and Television ... Oscilloscopes and other electronic equipment..."* [ref. 3]

The sense of design that is evident in the casing of the 1052 can be seen also in the cover of the *Instructions for Use*, which presents an abstract image of the oscilloscope in a smart design that is relatively unusual to find gracing the front of an instruction booklet, Fig. 4. This made me wonder whether an early version, perhaps a prototype, of the oscilloscope had been on display in the '51 Exhibition. There is the possibility that it was brought to market in a hurry because inside the cover of the

instructions booklet there is a printed amendments sheet (2nd issue!) with about two dozen changes listed [ref. 4].

### Internal Design

However, the good design was not limited to the exterior of the oscilloscope because the layout inside the casing is also arranged in a convenient fashion. There is a main, girder-like frame within which the components are fixed and access for maintenance and repair is made easy because side, top and back panels are all removable, Fig. 5. The cathode ray tube is horizontal within the upper part of the case.

As noted above, this is a double-beam cathode ray tube although there are not two separate electron guns but just one that feeds a beam of electrons towards an anode, after which the beam passes on each side of a horizontal splitter plate creating two beams. Above the splitter plate is the Y-axis deflection plate for one beam and below it the Y-axis deflection plate for the other one. This means that the lower beam traces an image of the waveform that is inverted in respect to the one above.

The majority of the resistors and smaller capacitors are mounted on five tiers of tag strips on one side and three tiers on the other, a practice that seems crude when we know how neat printed-board circuitry can be, Fig. 6. But here the resistors are comparatively large because they will be dissipating a certain amount of heat, so having them laid out in this way is probably advantageous and it would also be convenient to identify

and replace a faulty component. The capacitors on these strips are also large because most of them will be rated at a high voltage. This illustrates one of the important advantages of semiconductors – they use much lower voltages and apart from applications such as power amplifiers, they also operate with lower current flows. This means there is less need to dissipate heat and capacitors can be made with a lower voltage specification – all of which leads to miniaturisation. The rows of valves are held in place by springs securing a cap of Paxolin sheet (synthetic resin bonded paper), a material that is also used for the tag strips.

The wiring is gathered into looms and as an indication that stray capacitance can be a problem the instruction manual states that, *"If any new connection is made to replace an accidentally damaged wire, the replacement wire must be of the same kind as its predecessor and it must follow the same physical path. Failure to do this may result in deterioration of the performance of the Oscillograph at high frequencies and high timebase speeds."*

The Y-axis inputs are fed into three-stage amplifiers (3 x 6AM6 pentodes) on each side of the chassis, their outputs connected to the Y-axis deflection plates and also feeding the trigger/sync amplifier. Above these near the top another row of four valves forms the timebase and trigger circuits. The timebase is described in the instruction manual as a *"circuit based on the well-known phantastron or Miller-transistor."* For those who are not aware of the improbably named but allegedly well known 'phantastron', it is a circuit

that was developed in about 1942 for use in radar where there was a particular need for a sawtooth generator that could produce a waveform that would give fast flyback.

As oscilloscopes go, this Cossor is relatively simple and yet it must have posed a challenge to the manufacturer of the mains transformer. It has a 'C' type of core and is immersed in oil in a sealed container. On the input side there are multiple tapping points to allow the equipment to be used on a range of input voltages and frequencies from 80V at 1500Hz (used at the time in aircraft), 180V at 500Hz (used in association with radar equipment) and, of course, 110V for the USA and 244V for the UK – both at the standard 50Hz. This has led to complicated switching at the input side as can be seen from the circuit diagram, Fig. 7.

On the output side there are four separate low-tension windings supplying the heaters in the 15 valves and the cathode ray tube. The centre-tapped high-tension winding has double-diode valve rectifiers with capacitor and choke smoothing to eliminate the chance of ripples passing to the timebase and trigger circuits. A separate feed, stabilised using a 6AB8 triode/pentode, is made to the pentodes that are first in the Y-plate amplifier chains.

The extra high tension (EHT) of about 1,000V for the cathode ray tube anode is drawn from an additional winding to one side of the HT supply and taken through a separate rectifier.

### Trying It Out

I had been assured that the oscilloscope worked and sure enough, it did. Both beams came up on the screen each one tracing a horizontal line, but did the two Y-axis amplifiers still function? I fed a 50kHz sinewave signal into both channels and with a little adjustment of the trigger and timebase had a satisfactory display of both inputs – one being inverted although this simply made it appear to be 180° out of phase, Fig. 8. Then I cranked up the frequency of the signal generator and as I swept past 1MHz the images began to distort and it was clear that I had reached the useful limits of the oscilloscope.

However, bearing in mind that no components appeared to have been replaced it is remarkable that it could still be a useful, though limited, working piece of test equipment in the amateur radio workshop. Not only that, it also makes a

handsome addition to the shack, standing at the end of the bench reminding me of the advances that have been made in electronics in the last 70 years.

And those advances became even more sharply defined when I connected my laptop computer to a modern Hantek PC-Oscilloscope and there on the screen was the sinewave that I had just been viewing on the Cossor Oscilloscope,

Fig. 9. It was not perfectly smooth because the number of sampling points was relatively low but the larger display made it easy to spot the fact that the sinewave lacked symmetry, which is no surprise since it was coming from a signal generator that was about 45 years old.

In the Hantek hardware the analogue sinewave from the signal generator was digitised and the data sent to the laptop. On the screen I had the two sinewaves presented in different colours and on a panel alongside there was data concerning a wide range of parameters. Arguably there is more brainpower involved in writing the software than designing and constructing the hardware, which is the direction in which so much of amateur radio and of electronics generally is going these days and probably no bad thing.

Although this was all very impressive I did wonder, in a world that is now dominated by screens both large and small and each feeding us a blizzard of images, whether my digital oscilloscope would be able to draw those Lissajous figures that had once held me spellbound so many years ago.

### References

1. A valuable explanation and demonstration can be found at: <https://tinyurl.com/y6gdyk1c>
2. The precursor of the oscilloscope was the oscillograph, a device that did not use a cathode ray tube but produced, by various mechanical means, a drawing of the waveform. The Cossor 1052 was designed to be used with a specially developed camera (model 1432) that could capture the screen image, thus justifying the oscilloscope name.
3. The South Bank Exhibition: A Guide to the Story it Tells. (1951) HMSO, xix.
4. The Science Museum, London, has a Cossor 1042a, (collection number Y1986.59.3), which appears to be an earlier and more specialised version of the 1052. It can be seen here: <https://tinyurl.com/y3xxodkt>

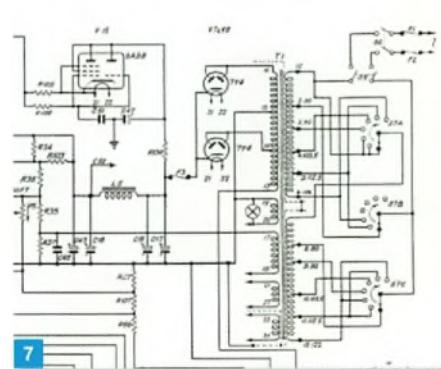


Fig. 6: Resistors mounted on tags in the Cossor 1052. Fig. 7: The power supply circuitry in the Cossor 1052.

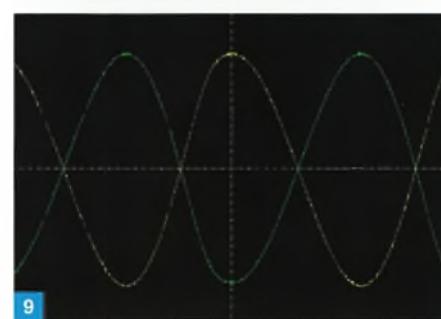


Fig. 8: The Cossor double beam analogue display of 1kHz signals. Fig. 9: The same 1kHz signals as in Fig. 8 but displayed using a Hantek PC Digital Oscilloscope.



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# Drawing the Curtains

If you omit to fit curtains to your bedroom windows, or fail to draw them correctly, I doubt if you will get much sympathy from the police if you complain about peeping toms. That however is what the police and various authorities have been doing over many years.

The fuss about security, and Huawei a few months ago, was rather late. I joined the radio trade in 1952 and since then I have seen many glaring cases of 'open curtains' and lack of planning for security. When I was 15 I built my first VHF radio from details in a *VHF Manual*. This was hardly 'cutting edge' technology because it only used one valve but it would tune to all sorts of stations that, as I later found out, I was not supposed to listen to. Well the book did not warn me, or that due to it being of the 'Super Regenerative' type it would cause TVI throughout the village, if I tuned it to the TV sound channel!

Even by the 1970s the Police still seemed blissfully unaware of the 'gaps in their curtains', and that their stations had fan clubs ranging from the Mafia to lonely elderly people. One lady told me "It's better than the Archers", and yet I once had to almost snatch a constable's radio out of his hand, when he started giving confidential details of our security systems back to base over the air.

## Father Confessor

Many people who were passing through Blackburn called in the shop. They knew that I hadn't a clue who they were so they felt quite safe in passing on tales of things they had heard, and we often discussed the lack of security of many modern devices.

The authorities seemed to think that because a paragraph in various radio and TV licences stated that you must not listen to stations you were not licensed to receive, or even mention their existence, that this somehow made radio transmissions secure, and that the newspaper reporters who mysteriously turned up at crime scenes were there just by chance. The regulation actually made radio transmissions less secure because it gave a false sense of security to users, and meant it was difficult to legally report problems, as the following shows!

A spurious output from a Police repeater

**Harry Leeming G3LLL wonders whether the powers-that-be (and others) will ever really learn about the need for secure communications.**



Photo 1. Avoid that gap in the curtains! Photo 2. A simple but effective way to add value to second-hand rigs.

popped up in the middle of the 2m band so one of my customers thought that he had better report it. He went into his local Police station to do them what he thought would be a good turn but got a most hostile reception. He was told that it was none of his business and that if he mentioned it again, he would be prosecuted for listening, so the spurious output remained. Eventually he mentioned it to a member of a radio club, who was able to contact a friend who worked for the police radio service, and the fault was cured.

## Early Wireless Baby Alarms and Intercoms

Early wireless baby alarms and intercoms passed on modulated RF via the mains supply, in the same way as some modern computer network range extenders do. I was told of some teenage girls who suddenly got very keen on babysitting for an aunt. It transpired that they had discovered that the next-door neighbour left their baby alarm on in the bedroom 24/7, and that they could pick up its signal using their aunt's identical alarm. The girls had been spending entertaining evenings listening to the

young couple next door, who were making valiant attempts to increase their family. I just hope the latest video baby alarms are more secure.

## Early Cordless Phones

Early cordless phones were totally unsecure and used an assortment of unauthorised frequencies, some in amateur bands. As they could sometimes be heard over a range of a few hundred yards the dangers were considerable. If you parked near to a travel agent equipped with one, for instance, you could find out who was rich enough to have an exotic holiday, and when they were going to be away from home, but how could anyone legally warn the travel agent? Even Prince Charles was caught out and got his rather embarrassing conversations recorded and published in a newspaper. I once had to tune away quickly to spare my blushes, when I inadvertently heard a neighbour consulting her doctor about intimate problems, on her phone, right in the middle of the 40m amateur band.

A visitor to the shop told me that he sometimes listened to these phones and

decided, just as an experiment, to set himself up as a blackmailer, and started to record conversations. He noticed that a married lady always had a call from her boyfriend, who was in a phone box, on Thursday evenings when the husband was out, and that they had a plan to make her husband seem to be the guilty party in a divorce. They were going to buy a house together, and one evening the boyfriend read out the whole text of a letter he had received from an estate agent. This included his own full name and address. At this point my informant decided that he had proved his point, that things were getting too hot for him, and he deleted all the recordings.

### Modern Digital Cordless Phones

Modern digital cordless phones are fairly secure and are proof against most nosy neighbours. If, however, your business is very private, you can't beat a hard-wired phone, provided that the recipient of the call is also secure.

### Early Analogue Mobile Phones

The first generation of mobile phones were analogue and broadcast your conversations from the hilltops, and the tales customers told me about these, and those other readers have heard, would fill PW, but perhaps publishing these stories would be rather frowned on.

### Unwanted Customers

I did have callers in the shop who wanted equipment to "listen to the security services, to help their business". One even told me he dealt in 'Black Gold'. I managed to fob these off.

Whenever new equipment was introduced, novelty and convenience seems to have been the main consideration, and often security was only tagged on when problems arose. This was the case with early computer networks, some of which still use default passwords.

During WW2 we were told "Be careful what you say, as even the walls have ears". Now, as some 'security cameras' are connected to unsecure networks, they may have eyes as well. PW readers at least should be sure to 'Draw the Curtains'.

### Guarantees?

In the 1970s catalogue sales were quite a big thing. Mrs Jones signed up with a catalogue agency, started to sell curtains and furnishings to her neighbours for so much a week, sent the money to the agency, and got some pocket money as commission. All



went well until the agencies tried to branch out into goods that sometimes needed servicing, such as tape recorders.

When the equipment was still under guarantee the agency would send the customer to us, instruct us to carry out the repair and send them the bill. We soon learned that chasing them for the money was hard work so we only accepted these repairs on a cash-when-collected basis, and advised the customer that they would have to chase the agency for any payment.

Over the years other people's 'guarantees' caused quite a bit of upset. Some suppliers offered an extended warranty, and people would come in waving a bit of paper with two-year old equipment that they had purchased elsewhere with a three-year guarantee, expecting it to be repaired free of charge. Quite often the company that had given the guarantee had gone out of business so the person concerned had to learn the Golden Rule, which is "A lifetime or an extended guarantee only lasts as long as the life of the company who gives the guarantee". This of, course, applies to many items you may purchase such as double glazing, or even amateur radio equipment. Unless the company concerned is very well established, or the guarantee is backed by

a third party such as an insurance company, you would do well to treat any such guarantees with caution.

### Looking at the Problem from the Other End

Anyone in business should be very careful about offering extended guarantees. In the 1950s TV manufacturers gave a 12-month guarantee but the small print stated that valves were only covered for three months, the CRT for six, and that they didn't cover labour costs at all. In fact, they guaranteed very little! I remember a small radio and TV retailer that was doing well until they obtained an 'exclusive agency'. To celebrate this they started giving a full one-year guarantee with their TVs but the new range proved unreliable and the cost of carrying out free repairs put the shop out of business.

### To Buy or Repair?

While I am now retired, I was in the retail electronic business one way or another all my working life and hence tend to look at things from a profit and loss perspective. If you want to obtain, say, a transceiver or a car, for your own use, I can therefore see several possible approaches:

- You can purchase a brand spanking new one. This will be the most expensive approach but it should come with a full guarantee, will no doubt serve you well but will start to depreciate from the moment you take delivery.
- You can purchase second-hand from a retailer, which may or may not include a worthwhile guarantee, but at least it should hold most of its value for a while.
- You can purchase privately a unit that you know to be in poor condition at a low price, and then, if you and your friends have the necessary skills, service it. It will probably then be worth more than you paid for it.

Which you choose depends on your ability, and certainly when buying goods for resale my favourite was always number three because this gave me an opportunity, as they say on the TV programme *Homes Under The Hammer*, to 'add value'. It was marvellous how much value could be added by giving equipment a good clean and polish. Think of this before trying to trade in your rig. Retailers love to buy scruffy neglected looking equipment because this tells them that they can offer a low price.

That's all for now but do remember to draw the curtains, and don't put anything in an e-mail that you would not write on a postcard.



**T**his is written for Foundation licensees. You've got your callsign and your first priority is to get on the local repeater. (Whose wasn't?) That may be trickier than it sounds because a Foundation course doesn't cover repeater operating.

Let me make good that shortfall. Follow my advice and you'll fit right in, soon receiving 'congratulations on the callsign', invitations to clubs and offers of help. I'll use my callsign and some made-up ones and my local repeater and give some real-world examples.

### Making an Initial Call

Repeaters have quiet periods so it's important to know how to make an initial call.

*'This is G7ETW calling through GB3HR and listening for any calls.'* This is long enough for someone to hear me. It also identifies the repeater, which helps when there's a 'lift' (enhancement in propagation) going on.

If I'm mobile I can add my approximate location.

*'This is G7ETW mobile in Northwood'.* I could use the optional '/M' suffix but I usually don't.

I might be calling for one person in particular.

*'M7ZZZ M7ZZZ, this is G7ETW for you.'* Giving M7ZZZ's callsign twice gives him (I made M7ZZZ up and he's a man) chance to pick up on his callsign and also tells listeners this is not a general call.

M7ZZZ is listening and hears my call. He replies.

*'G7ETW M7ZZZ, hello Tony.'* M7ZZZ probably wouldn't double-identify because he knows I'm listening.

Note the order of callsigns. I called with M7ZZZ's callsign first, he replied with mine first. The correct order is 'your call, my call'. Without exception.

*'M7ZZZ G7ETW'* begins my reply.

### Faults on Air and Radio Checks

Sometimes repeaters transmit short periods of 'dead air', which repeat in quick succession. This is usually caused by faulty microphones. On hearing this I always try to help.

*'This is G7ETW. Station heard, but no audio'.* The person transmitting knows he or she is accessing the repeater but has an audio problem.

When the audio is weak, sometimes there's just enough voice to recognise the

# Operating 101

**Tony Jones G7ETW explains the basics of repeater operation, often the first operation encountered by new licensees.**



(Photo 1) All you need to get started on repeaters is a cheap handheld, in this case the sub-£30 Baofeng reviewed in our May 2019 issue, and you can immediately start communicating with others over a wide area.

(Photo 2) Repeaters, first introduced in the UK around 50 years ago, make it possible to work over a considerable distances with a handheld or mobile.

one voice is heard because repeater users take turns. There is a system to it, awkward at first but easily learned. Imagine that M7XXX, M7YYY and M7ZZZ are on the repeater in a three-way QSO when I switch on. Being good operators, they leave short (one second is enough) gaps between transmissions. To join, I wait for the gap between M7XXX and M7YYY.

I transmit my callsign, snappily. G7ETW.'

M7YYY hears me. *'M7XXX and the group, M7YYY, G7ETW acknowledged'* is how he starts his over. At the end he clearly brings me in.

*'M7YYY, passing it round to G7ETW. From you it goes to M7ZZZ'.*

It's as simple as that. We only have to identify ourselves, please note. It is perfectly legal for me to use someone's name when passing 'it' round.

I mentioned 'doubling'. This is when two or more amateurs inadvertently transmit at the same time, resulting in a high-pitched buzz with no one audible. Even considerate and experienced amateurs double occasionally but patience and leaving gaps are the key to avoiding this.

When in doubt, de-key and listen for a second. *'I'll just check I'm not doubling'* is what people usually say. If someone else is transmitting, leave them to it. Nothing technical can prevent this on a simple voice repeater.

### Callsigns

Callsigns are important. We are legally required to identify ourselves 'clearly at all times' and 'as frequently as practicable'. Quite aside from that, we become known

person transmitting.

*'This is G7ETW. M7ZZZ heard but very low audio'.* This is even more help.

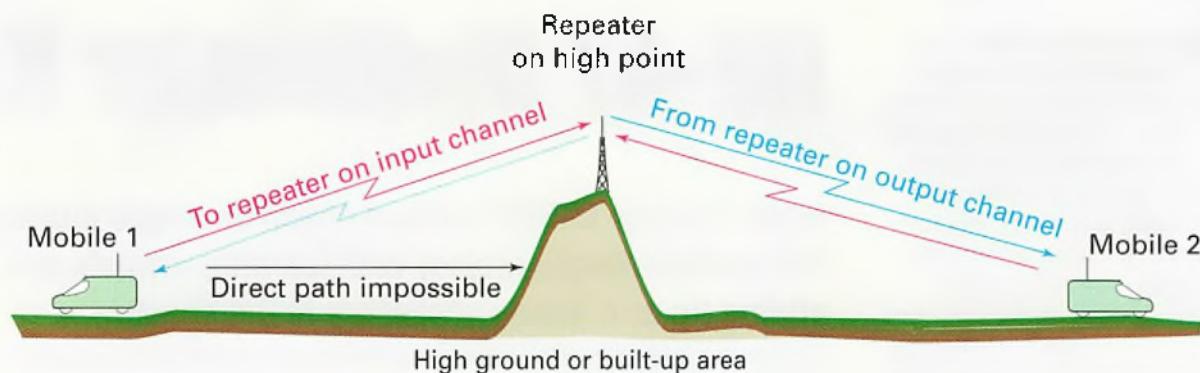
I've had a few faulty microphones myself. After making repairs, I always request a radio check.

*'This is G7ETW calling through GB3HR. I'm testing a microphone. I'd appreciate a report if anyone is listening.'*

That usually gets me a report or two straight away. Sometimes they don't agree but at least I know I'm being heard!

### Joining an Active Repeater

At any one time, 'doubling' aside, only



2

by our callsigns – indeed our whole amateur radio life is based on them. We should treat them as the priceless assets they are.

### Phonetics or Letters?

Most people don't give callsigns phonetically. Why? Because it takes longer and the audio quality through a repeater is usually excellent.

Take my callsign. 'GEE SEVEN EEE TEE DOUBLE-YOU' is clear enough, you would think, but people quite often get it wrong. It's the 'T' that's the problem; the letters 'B', 'C', 'D', 'E', 'G', 'P' and 'V' all sound almost the same. Other letters – 'M' and 'N', and 'F' and 'S' spring to mind – can cause confusion too.

Accents, speaking too quickly, interference and weak or distorted audio are all factors in callsign intelligibility so it's not surprising callsigns aren't always heard correctly. I've always done my initial calls and sign-offs phonetically but I've just persuaded myself that I will use phonetics the whole time from now on.

### How Often?

How often should you identify? 'As frequently as practicable' obviously. Most people give their callsign twice per over, at the beginning and the end. Do I always do this? I do, except when my transmission is just one or two words. If I'm answering a yes/no question or similar I might reply without identifying. But for anything longer, I always give my callsign.

### Signing off

Imagine the repeater has been busy but only M7ZZZ and G7ETW now remain.

'G7ETW M7ZZZ/M Just arriving at work so I'll have to go. Thanks for the QSO. This is M7ZZZ going QRT and listening for your final'.

QRT strictly means 'stopping transmission' but has come to mean 'closing

down'. M7ZZZ is saying he is going off air. Many people just say 'clear' and pull the plug. This is fine – what matters is that you make your intentions clear so there is no confusion for others using the repeater.

'M7ZZZ G7ETW. Yes, thanks for the QSO. This is G7ETW going to standby.' This means I too am stopping transmitting but I am not switching off and I will be listening.

A variant I use is 'going QRT unless called', which invites anyone who was listening to the QSO but didn't want to interrupt to call me quickly before I close down.

Sometimes stations simply vanish mid-word. This happens when people are using handhelds – when the battery is flat, the radio makes the decision for you!

### Repeater Abuse

Sadly, repeater abuse is all too common. Whatever the abuse is, never acknowledge it or engage with an abuser. There are two reasons for this.

Firstly, a response is what an abuser wants, and the more an abuser gets what he or she wants, the more they cause trouble. As a psychologist might say, don't reward bad behaviour.

Secondly, radio amateurs are only licensed to communicate with other radio amateurs. If an abuser is not licensed, to talk to him or her is a breach of licence regulations.

### CB-type Operating

Since the 1980s CB radio has been a popular route into amateur radio. While both hobbies involve radios and transmitting, CB and amateur radio have different operating styles. I mean no offence but if your background is CB please take note of these Dos and Don'ts.

- Never use 'break', 'QSK' or 'on the side' to break into a QSO. We must be clearly

identified at all times, and only a callsign does this.

- Be careful with traffic announcements. 'This is M7ZZZ mobile Eastbound M25. We're all stopped at junction 21.' As part of an over in a QSO, this is a 'remark of a personal nature' and is perfectly fine. But as an initial call the transmission constitutes broadcasting, which is expressly forbidden in our licence.

- Amateur radio voice signal reports are in 'RS' units (Readability and Signal strength), for example 'five and nine'. A weak signal might be 'three and four', not 'back of the box'.

- A radio amateur 'tunes' an antenna, adjusting it for minimum VSWR, using a VSWR meter. CB operators do the same thing but they make 'SWR' into a verb and a noun, pronouncing it 'swahr'. I'm sorry, radio amateurs never talk of VSWR like this.

- Risqué talk and swearing – anything at all 'adult' really – is unwelcome. Even a modest repeater can reach out 30 miles and that's a lot of potential listeners. No radio amateur wants his friends or family to hear embarrassing transmissions – it gives a bad impression of the hobby. It's all too easy to forget that, unlike a mobile phone, amateur radio is an 'open' communications medium – you never know who else might be listening.

### Conclusion

I seem to have left this piece on a negative note, and I need to fix that.

Inexperienced radio amateurs are bound to make mistakes in operating. I certainly did when I first started but local amateurs were kind and helpful and I quickly learned.

My advice is not to worry – be active, have fun, and learn by doing. If this article helps just one new amateur to do that, I'm a happy man.



For some time I have been looking for an analogue-reading test meter, chunky, easy to construct, use and to understand the circuit.

A digital multimeter kit is often just a PCB, chip, display and switch. Very little can be learned from building these. The MF-47 analogue meter is a versatile, multifunction, moving-pointer meter, using discrete components, which is well priced at about £10 and may last for years, while teaching how these meters work. It is an indispensable tool for the workbench.

I ordered one three times, from three different suppliers, which were twice not delivered and I was quickly refunded, the third time I succeeded. The supplier was jiecanhr4, found on eBay and then search this vendor for MF47.

Open the case – do not try to open with a blade or screwdriver, you risk breaking something or stabbing yourself. Open the large battery door and look for two locking tabs on the inside top edge. Gently prise these back while encouraging the case top and bottom to part, using a firm grip. See?

Carefully check the contents – there are several odd values of components. Check these with an accurate digital test meter as each is fitted, and do not lose any! They are probably irreplaceable for the average amateur. The switch wiper is very thin and fragile, see Fig. 1 for where it fits. It is also explained on the side of the box it was packed in.

There are no English instructions, either for building or using the meter. The notes are in Chinese but an English language user manual can be downloaded from the Banggood site at:

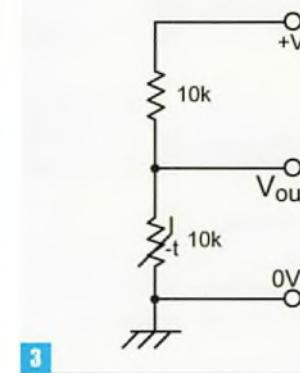
<https://tinyurl.com/y2r8fgrq>

Components are assembled, and soldered, on the beige side of the PCB, except for the meter zeroing pot, transistor tester block and the probe sockets. Assemble these last but don't solder yet. Mount the PCB in its final position and only then solder the sockets. This ensures proper alignment with holes in case. Don't get solder splashes on the rotary switch contacts!

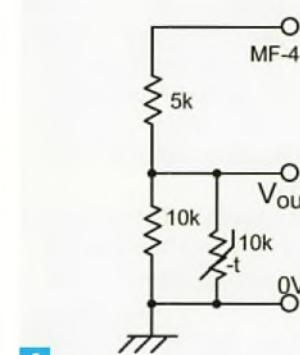
The kit was assembled easily, with no errors detected, in three hours. It didn't work, and I diagnosed a broken fuse. Replacing this, the meter read in reverse. Swapping over the meter leads cured this problem. A dab of Electrolube or similar on the switch contacts will help prevent oxidation and prolong its life. No continuity buzzer was supplied, although one was provided for, so I added a cheap one (£1)

# MF-47 Multimeter Kit

Geoff Theasby G8BML builds a cheap analogue multimeter. Yet another simple project with learning aspects and ending up as a handy accessory in the shack.



3



4

Fig. 1: Location of switch wiper. Fig. 2: Buzzer is located behind meter scale. Fig. 3: Simple series circuit for test purposes, requiring an external voltage. Fig. 4: Alternative, parallel circuit, to Fig. 3, requiring no external supply.

behind the meter scale, Fig. 2. It works on the OFF position, and also functions as a diode test.

Some versions (of at least eight) have a temperature measuring facility. Mine didn't but they are easy to make. I tried a K-type thermocouple, to no avail. A 10kΩ NTC thermistor will work 'as is' using the ohmmeter set to the x1000 range. However, they are very non-linear, but can be improved by adding one or two resistors. The simpler method, Fig. 3, requires an external voltage, the second, Fig. 4, does not. I tested the arrangement in the domestic oven, from 15°C ambient, to 80°C, melting a pair of cheap test leads in the name of science. Readout, using the 10V AC scale

on the meter, is direct in °F. No catering equipment was harmed in the writing of this article.

I tested the MF-47 alongside several meters, setting the variable PSU to 15V DC. The results were as follows:

- MF-47: 15V DC
- Digilek INO 2512: 15V DC
- Heathkit IM-25: 14V DC
- Sparkfun VC 830L DMM: 14.23V DC
- Rapid 180 DMM Analogue: 14.5V DC
- Avo 8: 15V DC

Verdict? A good meter with a useful large scale, using discrete components, ideal for the beginner and accurate. Downside? No assembly instructions. Apart from the switch wiper, all is straightforward.

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- Input overload LED
- Headphone socket
- Supplied with user manual and fused DC power lead





If you were with us last month, you'll have read about the challenge to the primary status of the amateur service on the 2m band. As the story emerges, we'll keep you up to date but in the meantime, what can we do to help the process? Last month I suggested that if you are not currently a member of your national society, you might consider this again. But what else?

Making our use of the band obvious is something we can easily do. I've noticed on Twitter a few pictures and comments from people saying that they have been putting 2m mobile rigs back in their car. That's a great plan. For all sorts of reasons, I've predominantly used 70cm repeaters in recent years but perhaps now is a good time to use any local 2m repeaters you may have. Club nets are a good idea too. Good solid FM signals are hard to miss and will make our presence on the band very obvious.

#### MSK144 Operating Periods?

During the Perseids meteor shower, I was surprised to note some stations using 30 second periods, rather than 15 seconds, which is the default for the mode. Just as I was scrambling to see if I'd remembered it wrongly, an e-mail from Jim Edgar GM4FVM arrived.

Jim wrote, "There seems to be some confusion about whether to use 15 second or 30 second period with MSK144. I would tend to trust Joe Taylor's (K1JT) view, as he is the man who writes the software and manages the WSJT home page. In the WSJT-X user guide (URL below) he puts it like this:

"To configure WSJT-X for MSK144 operation:

- Select **MSK144** from the **Mode** menu.
  - Select **Fast** from the **Decode** menu.
  - Set the audio receiving frequency to **Rx 1500Hz**.
  - Set frequency tolerance to **F Tol 100**.
  - Set the **T/R sequence duration to 15s.**
- <https://tinyurl.com/yyuujlwe4>

"Sure, MSK144 can, of course, be used on other settings but these are the recommended ones.

"I don't understand why this has arisen. To use MSK144 in a 30 second period is self-defeating. You lose half your transmission time (to all the stations using the recommended 15 seconds), you waste half your receiving time, you blank out your neighbours' receivers and spoil their chance to operate, and your QSOs

# Making the most of the 144MHz Band

Following on from the Es season, Tim Kirby G4VXE has a full postbag but starts with a plea for more 2m activity.



may take up to twice as long for no overall advantage.

"Just in case anybody suggests that 15 seconds MSK doesn't work, I have had 374 QSOs where I worked 111 squares in 32 DXCC with a maximum distance of 1982km. 15 seconds MSK144 seems to work for me. Using 30 seconds would have lost me many of these QSOs and offered no benefit at all.

"I would sum this up as follows: why not read and follow the WSJT-X user guide?"

#### Using Zello for VHF/UHF FT8 Talkback

I have been impressed with the way that the microwave community has embraced the idea of using Zello, a voice-based chat program that you can run on smartphones, PCs or network radios to coordinate skeds on the higher bands. I wondered whether

it would be something of use for arranging VHF/UHF contacts, using FT8 or indeed traditional modes. If you are using FT8, then it offers the opportunity to discuss conditions and so on in more detail. Having established the channel and had a few of the regular VHF/UHF FT8 operators join, it's fair to say that some contacts have been made that probably wouldn't have otherwise happened.

Some people are already using the ON4KST chat system to arrange skeds, but I felt that the Zello App, being voice based would have a different emphasis and feel. If the idea interests you, please look for 'VHF/UHF FT8 Chat' on Zello and join us. The 'channel' isn't always busy but we hope that it is something that may develop. If the idea doesn't appeal to you, please just forget about it – I've no

intention of getting into a debate about Network Radio!

### The 6m Band

**John Hemming G0UYT** (Birmingham) runs an IC-706MK2 with 50-80W output to an HB9CV antenna. Previously, John had been using a rectangular loop for the band, which worked well and seemed to be good for contacts up to 3500km or so. John says that the HB9CV has made a difference and finds he's working more distant contacts with it. Some of the highlights from John's log include 5T5PA, 5B4AAB, KA1W, EA8AQV, TA1D/4, W3LPL, T77C, SV9CVY, VO1SO, VE1PZ and best of all, JA9SJI.

**Jef VanRaepenbusch ON8NT** (Aalter) runs 10W to a V2000 tribander. Highlights from his log are: July 1st K2PL (FM26), K7BV (FM04), VE1PZ (FN85), N2QT (FM07) and SV9CVY (KM25). Next day, on CW, Jef worked EA3FZT (JN01), IS0ANT (JN40), IS0GQX (JM49). On July 11th E7TESLA, EA8DBM (IL18), GM0AXY (IO85), MM5AGM (IO85) and EA8AQV (IL28) were all worked on FT8 with GM8EXI/MM (IO66) worked on SSB.

**Kevin Hewitt ZB2GI** operated as ZB2IG19 to commemorate the XVIII International Island Games, which were held in Gibraltar from July 6th to 12th. Gibraltar, incidentally, won an impressive tally of 29 medals! On 6m, the highlights of Kev's FT8 log include KO1DX (FN54), K1TOL (FN44), N5KD (EM12), N1DG (FN42), KB1HY (FN31), K1MS (FN42), WA1EAZ (FN42) and K3OO (FN20) with lots of European stations also worked.

**Robert van der Zaal PA9RZ** (Sassenheim) writes, as ever, an interesting e-mail. On July 21st, running 10W to his 7-element log periodic for 45-73MHz, Robert worked EA6SA (JM19), IT9XTP (JM68), CT1DIZ (IM58) and EA5GPJ (JM08). Robert says that he has treated himself to an Xiegu X5105 and is wondering how it will perform, not only on HF but on 6m. He bought it as an alternative to the KX3 – being cheaper, Robert feels he can relax taking it out portable, leaving the KX3 in the shack.

**Peter Taylor G8BCG** (Liskeard) says that he decided to take part in the UK Six Metre Group's Summer Grid Marathon and between May 4th and August 4th, Peter worked 589 grids (which is an astonishing number!). Peter says the highlight of the month was the CY9C DXpedition and on August 4th, Peter managed EME QSOs with the team on both 6m and 2m within

15 minutes of each other. Peter writes, "Many were, of course, hoping for CY9C on 6m Es and on August 6th I 'had a feeling'. Sure enough, a late night opening to the Caribbean and North America. I copied CY9C via Es on JT65A while they were working EME. They eventually moved to FT8 (briefly) and then SSB! I worked them on a peak – they were into LA, G, GI, GM, EI and I on 50.150MHz SSB".

**Philip Oakley G0BVD** (Great Torrington) was pleased to catch some Es openings in mid-July and made a good number of FT8 contacts with EA, F, SM, OZ, DL and SP. Phil has been having problems with Windows Update changing settings on his machine, affecting WSJT-X as well as computer control of his radio from the PC. Sadly, this is not uncommon. Any Windows update I run, I always wonder what's going to stop working!

### The 4m Band

Jef ON8NT runs 10W from an IC-7300 to a halo antenna on his balcony. He lists the following contacts on 70MHz: July 18th G3YHM (IO90) on FT8 with PA3Y (JO21) and G3XDY (JO02) on CW; July 19th G3YHM (IO90) on FT8; July 20th G4BRK (IO91) also on FT8; July 21st G3YHM (IO90), G0LFF (IO90), EA6SZ (JM19), EA6FB (JM08), EA6XQ (JM19), G3YDY (JO01) and G4VSQ (IO91) all on FT8 with G0VHF/P (JO01) on SSB and G4RFR (IO90) and G3XDY on CW.

**Kim Edwards G8GRL** (Sudbury) has been trying FT8 on 70.154MHz with 10W to a Halo antenna but with no luck so far.

Robert PA9RZ worked G4BWP (JO02) and G4ODA (IO92) during a 70MHz activity contest, IO92 being a new square for him on the band.

**Jim Edgar GM4FVM** (Eyemouth) says there were some good Es openings around. For example, on the morning of July 22nd, there were two separate openings, which gave Jim 22 QSOs by lunchtime, with the best DX being SV2JAO (KN10). Jim says that Cyprus gave 4m to radio amateurs recently and Jim heard 5B4AIE on July 24th. Although 5B4AIE also heard Jim, unfortunately a two-way QSO was not possible.

### The 2m Band

It was great to hear from **Ian Bontoft G4ELW** (Bridgwater) once again. Ian writes, "Around 1830 on July 2nd things really started warming up and QSOs were had with IK6DTB, IK4JOD and finally 9A2Y, all on 2m FT8 although a friend a few miles



Fig. 1: Dave G4FKI operating from GB9BRS at Baldock Radio Station.

Fig. 2: Bernard Nock G4BXD's homebrew antenna for 23cm.

away managed an SSB contact with Italy, albeit using more power and a beam. And then it all went quiet again! I would suggest that your comment 'if you're in the right place at the right time, almost any antenna will probably do' is quite correct. I suspect that we are fortunate here in that while we are only just above sea level, there are not too many obstructions and that once the RF gets going there is not a lot to stop it other than natural attenuation." Ian runs 15W from an FT-991A to a V2000. Great contacts!

John G0UYT caught the tropo opening on June 28th and worked DL9DBF, DF0WD, DF6PW, OZ1CCM, DF7AP, DF5VAE and DL8YHR all on FT8 and DK5DQ, DL3TW, PA2DB, OZ1BEF and OZ2ND on SSB. On July 25th, John worked DO1EJK/P, PE1OPK, PA3BWE, DL6YBF, DF6PW, DG1KDD and PD0WIM on FT8 with PA3MZ and PA3ALW on SSB.

John mentions that he has started a Facebook page called 'European VHF Amateur Radio Group' and says it is a friendly group with members across Europe and the UK with regular posts about conditions and activity.

Jef ON8NT has had a good month and sends the highlights of his log: July 2nd

MDGAV/P (IO93) on SSB with all other contacts on FT8 unless noted; July 3rd G1BHM (IO70), G8EOP (IO93); July 4th DK1FG (JN59); July 6th GW3SRT/P (IO82), GW3ZTT/P (IO82) on SSB; July 8th G0BLB (IO81), July 10th TM5TFV (JO11), G3VWH (IO82), July 15th GW3TKH (IO81), July 21st GW3TKH (IO81); July 23rd DK1FG (JN59), GI6ATZ (IO74), M0VXX (IO82), CN8LI (IM63, via Es!); July 25th EI3KD (IO51), GM4FVM (IO85), EA1SA (JN83); July 27th G0BLB (IO81), G8EEM (IO93); July 30th G0JCC (IO82), M0BEW (IO82). Jef runs an IC-9700 at 25W to a 5-element LPDA.

**Simon Evans G6AHX** (Twynning) took part in the RSGB Low Power contest on August 3rd working three countries and 11 squares. Best DX was F6KCZ/P (IN99). On August 6th, Simon took part in the UK Activity contest running 100W. He worked 31 stations in five countries with the best DX being GI4SNA (IO64).

Kim G8GRL has been running 50W of FT8 into a Halo antenna with the best DX so far being just south of Paris.

**Dave Thorpe G4FKI** wrote to say that he had been involved in running GB9BRS from the famous Baldock Radio Station, **Fig. 1**, as part of the Institute of Engineering and Technology open day and to celebrate the Baldock station having been open for 90 years. The best DX was on 2m FM with GM4PKJ (IO86), which Dave says was a very short contact, so it may have been aircraft scatter. The station was also active on 2m FT8 where I was glad to make a contact.

Jim GM4FVM says that he caught a tropo opening on July 22nd when he worked 38 stations in five countries. The band opened mainly to Belgium and the Netherlands, but Jim also made contacts into Germany and Denmark. The best DX was OZ1CCM in JO55, a distance of 823km. Jim continues, "As for the Perseids, on August 9th I worked ES3RF in KO29 for a new country for me on 2m. The distance was 1632km, and it completes the set as I had previously worked Gena on 4m and 6m. Further away was EU3AI in KO22, at 1755km, on August 4th".

Here at G4VXE, there were the 'usual' enjoyable regular FT8 QSOs on the band. However, I was inspired by G4ELW's reports of stations that he had worked on Es with low power and a vertical on 2m FT8. I resolved that when I heard an opening on 2m, I would be a bit more proactive in terms of trying to make contacts rather than assuming that with

a small station I'd be wasting my time. Fortunately, I didn't have long to wait to try things out. On July 23rd, I caught an opening to the south, and was delighted to work EA7HLB (IM76), CT1HZE (IM57) and CT7ABP (IM58). There was even better to come. On the morning of July 26th, I was monitoring while working and casually noticed SV2JL on my screen. It took me a second or two to realise that I was on 2m not 6m, but fortunately I was quick enough to respond and to my complete surprise, we completed a QSO. I have never worked Greece on 2m before, let alone on a vertical antenna. Talk about being in the right place at the right time!

### The 70cm Band

Jef ON8NT runs 25W to a 5-element LPDA and lists the following contacts: July 6th G5LK/P (JO01), M0HRF/P (JO01) on SSB; July 9th G3XDY (JO02), G4CLA (IO92), M0SAT (IO91), G3MEH (IO91) all on SSB with G3YDY worked on FT8 on July 15th. Jef also mentions the issues that he had getting Terminal Mode and Access Point functionality for D-STAR working on his IC-9700 and acknowledges the support he had from Jerry at Icom UK in getting everything working. Jef has kindly sent me details of what needed to be done. It is quite detailed to reproduce here but if anyone needs the information, please e-mail me and I will be very glad to pass on Jef's findings.

Simon G6AHX took part in the RSGB Low Power contest on August 4th, making 22 contacts in four countries and 16 squares. Simon's best DX was PE1EWR (JO11).

**Derek Brown G8ECI** (Louth) has been trying some WSPR tests over a difficult path to GBELW in Bath on 432.300MHz, so far without success, but the tests continue.

### The 23cm Band

It was good to hear from PW columnist **Bernard Nock G4BXD**, who says that having acquired an SG Labs 23cm transverter, he took part in his first 23cm UK Activity contest during July. Using 2W to a homemade Bi-Quad, **Fig. 2**, on a pole through the attic window, the best contact was G8DVK, some 110km away, with G0LGS/P, G4BRK, G4CLA, M0GHZ and 2E0MDJ/P all worked too. G4JRY at 175km was also heard but not worked as well as several CW stations, including G3OHH.

Jef ON8NT worked G3XDY (JO02)

running his IC-9700 at 10W into his 5-element LPDA for 2m/70cm and says the SWR was fine. I'm looking forward to some more reports from Jef on 23cm.

Newly on the band, Simon G6AHX has been experimenting with some home-made antennas and hopes to be making some contacts from Gloucestershire.

### Satellites

Simon G6AHX monitored a pass of the new Chinese satellite CAS-7B on July 28th. The beacon on 435.715MHz was clearly audible but the FM transponder was only transmitting white noise. Simon tried accessing the satellite but had no luck. By the time you read this, it's likely that the satellite will have re-entered the Earth's atmosphere because its expected lifetime was in the region of a month.

Jef ON8NT heard the ARISS schools contact on July 27th at 1827UTC as well as monitoring the Russian MAI-SSTV event from the ISS on July 29th and 30th on SSTV (PD120 mode).

Kev ZB2GI operating as ZB2IG19 was active on AO-91 and AO-92 working lots of stations, including 7X3WPL (JM13), G0IIQ (IO93), G0ABI (IO80), 2M0SQL (IO87), G7SVF (IO90) and G0PNM (IO70). Kev also took part in the MAI-SSTV event and received a number of good quality images.

**Patrick Stoddard WD9EWK** (Phoenix) writes, "As I write this, the CY9C operation on Saint Paul Island is wrapping up. As in 2016, CY9C worked satellites and EME, along with other bands. They made a bunch of satellite operators on both sides of the Atlantic happy. Others are roving around North America, and AMSAT's W3ZM/x operations continue.

"A couple of weekends ago, I took a day trip to the DM54/DM55 grid boundary in eastern Arizona. Along the old US route 66, and near the Petrified Forest National Park, I operated for about nine hours from there. I worked 89 stations on 18 different passes throughout the day – nine passes on FM satellites and nine other passes on SSB satellites. I try to get out to that spot, along with others around Arizona, at least once a year to make them a little less 'rare' in the logs of other satellite operators. That area is high desert, and temperatures reached 100°F before a thunderstorm rolled through and dropped the temperature down to 80°F before the end of the afternoon."

That's it for this month. Thanks for all your input – see you next time.



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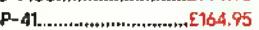
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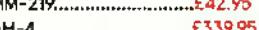
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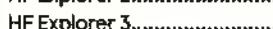
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**W**hen the Airspy team created the HF+ their aim was to provide a top quality, affordable SDR receiver using the best available technology. This was a bold step because it meant moving away from the use of popular TV and radio tuners such as the Mirics, E4000 and R820 ranges and starting again. To develop the new receiver, the Airspy team partnered with ST Microelectronics and Itead Studios. At the heart of the new design was the use of a state-of-the-art tuner chip (ST709) featuring a polyphase harmonic-rejecting passive mixer. This mixer has stunning performance and is an ideal companion for an N-path tracking filter. This is because N-path filters can be tuned by a clock signal at the same frequency as the mixer local oscillator. This greatly simplifies the design of a tracking filter that helps to minimise problems from close-in interference sources. The weakness of the N-path filter is that it provides minimal attenuation of harmonics of the tuned frequency. In the past this has rendered these filters of little use in conventional receivers. However, the use of a harmonic rejection mixer in the HF+ Discovery makes for a near perfect match because this mixer automatically rejects the harmonics up to the 21st.

The first Airspy model to feature the new architecture was the Airspy HF+ and it has proven to be an excellent performer. Once the HF+ had been released, the team continued to develop the receiver firmware to fine-tune the performance. This nicely illustrates one of the many benefits of SDR receivers, which is the ability to improve performance or add new features simply by uploading new firmware. Since its launch, the HF+ has enjoyed several updates that have further improved its performance. Developing these refinements meant working with users and the chip developers at STM. It soon became apparent that, despite the excellent close-in filtering from the tracking filters, the design would benefit from the use of some additional preselection filters. In the early part of the development it was thought that these could be provided as a DIY add-on. That idea was abandoned when it became clear that the new filters would be too difficult to retrofit. The team decided that the best way forward would be to take the learning from the HF+ and produce a new model with auto-switched preselection filters. That model is now being shipped as the Airspy HF+ Discovery. This uses the same receiver architecture as the HF+ but with the additional pre-selection filters and a new physical

# Airspy HF+ Discovery and Spy Server

**Mike Richards G4WNC is enjoying lots of new toys again this month – join him as he explores them all!**

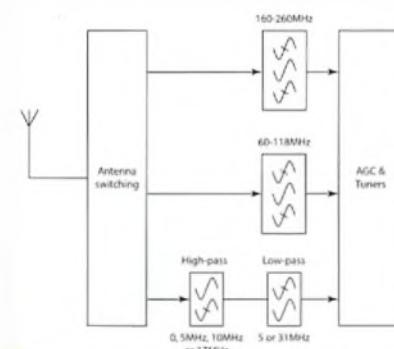
layout. I've shown a block diagram of the Discovery filters in Fig. 1. The new PCB layout enables all the RF components to be shrouded in a metal case that is coated with an EMI absorbing material, Fig. 2. This is supplemented by using a 6-layer PCB with double thickness copper (2oz) for the ground planes. This combination makes the receiver RF tight, so it can be housed in a lightweight case. As you can see from the photos the Discovery is much smaller than the HF+ and uses a single antenna socket, Fig. 3.

## Discovery Preselection Filters

You can see from Fig. 1 that the preselection filter bands have been chosen to help isolate the high-power broadcast bands and prevent them from creating intermodulation products. As you're no doubt aware, the broadcast stations on Medium Wave and around 40m reach very high signal strengths during the night. While the HF+ front-end is fairly bulletproof, the extra filters in the Discovery provide additional protection for extreme cases. I've had a pre-production Discovery for a while and am currently testing a production unit. So far, the performance has been superb. The blocking performance seems to be particularly impressive and I've been applying a test signal at 40dB over S9 and that has had little or no effect on the reception of a weak signal spaced just 3kHz away. I'll have more information in a later column.

## Spy Server and Pi-4B

Spy Server is an under-used application that provides an excellent remote access facility for any of the Airspy receivers as well the RTL-SDR USB dongles. It can be run on a multitude of platforms, including the Raspberry Pi. The Pi is a particularly attrac-



1



2



3



Fig. 1: Block diagram of the Discovery filters. Fig. 2: the latest model is EMI-proof with the key components inside a screened housing (HF+ above Discovery below). Fig. 3: External view of HF+ and Discovery.

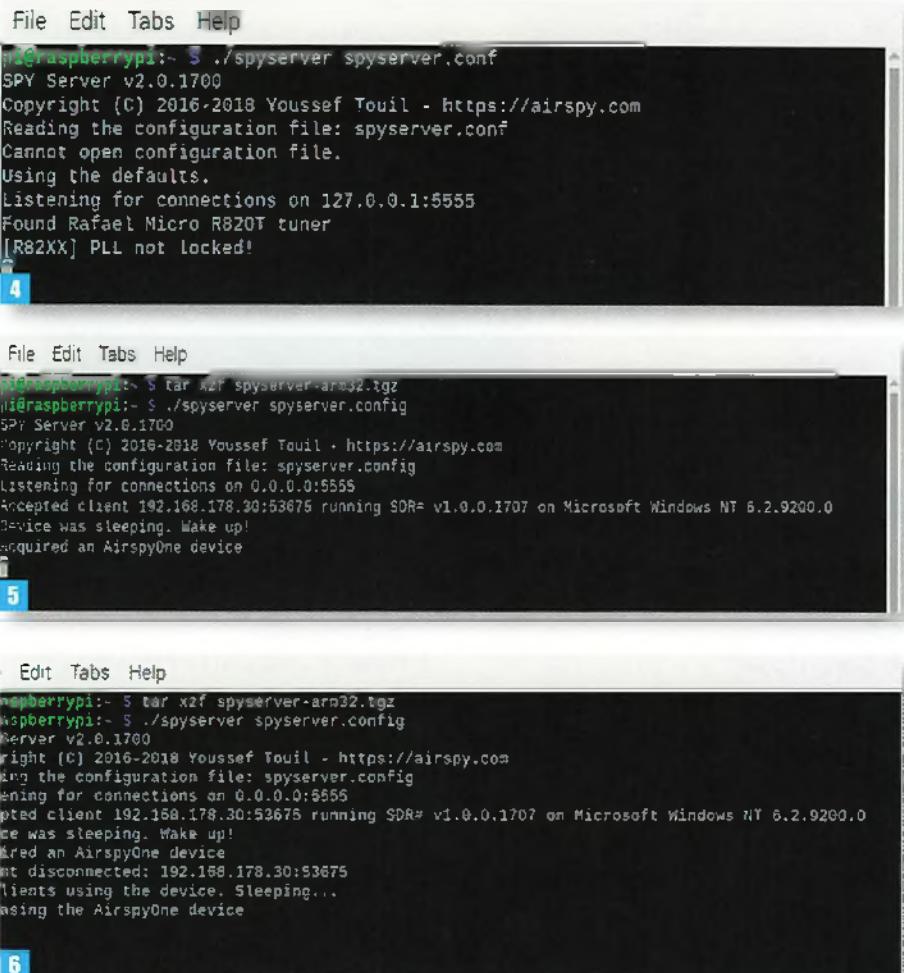
tive platform for the Spy Server because it is the cheapest SBC (Single Board Computer) that can run Spy Server and therefore makes for a very compact, low power consumption, server installation. The server can prove useful in many scenarios and one popular option is to provide access to your receiver from anywhere on your local network. That means you can have the server and receiver connected to your antenna system in the shack and listen in the lounge, back garden or whatever. In addition to use on your local network, Spy Server can make your receiver available from anywhere in the world, providing you have internet access. To facilitate internet sharing, you need to enable port forwarding on your router. This is usually a simple process but you will need to refer to your router's instruction book for the details. Port forwarding is common practice with today's online games, so there is usually plenty of help available if you need it.

Up until the release of the Pi-4B, the Pi was limited to a receiver IQ bandwidth of 2.5MHz of less. This was due to a combination of the, well documented, USB/Ethernet bottleneck and the limited processing power of the Pi. However, the release of the new Pi-4B has changed that, and the new model features Gigabit Ethernet along with full-speed USB-2 and USB-3 ports. In my tests, the Pi-4B has been able to run an Airspy receiver at the full 10MHz sample rate (8MHz receive bandwidth) without issue. In addition to making the receiver available via the network, Spy Server, unlike the RTL-SDR server, allows multiple connections. This means that you can use multiple instances of SDR Sharp or SDR-Console to simultaneously monitor different parts of the 8MHz bandwidth. The server creates lots of opportunities. For example, you could use Spy Server to connect a receiver to your club's antennas. The IP address of the server could then be shared with club members so they can enjoy the club's antennas in their own shack. This antenna sharing could also be useful for VHF or UHF beacon checking.

### Spy Server Installation and Setup

Let's begin by installing the necessary software. If you want to be able to use the Airspy receiver with its 10MHz sample rate, you will need to use a Pi-4B -1GB, otherwise a Pi-3B+ will do the job. I strongly advise starting with a fresh copy of the Raspbian Buster operating system along with the use of a 16GB SD card, which should ideally be a class 10 device.

The first step is to install some supporting software as follows:



```

File Edit Tabs Help
raspberrypi:~ $ ./spyserver spyserver.conf
SPY Server v2.0.1700
Copyright (C) 2016-2018 Youssef Touil - https://airspy.com
Reading the configuration file: spyserver.conf
Cannot open configuration file.
Using the defaults.
Listening for connections on 127.0.0.1:5555
Found Rafael Micro R820T tuner
[R82XX] PLL not locked!
4

File Edit Tabs Help
raspberrypi:~ $ tar xzf spyserver-arm32.tgz
raspberrypi:~ $ ./spyserver spyserver.config
SPY Server v2.0.1700
Copyright (C) 2016-2018 Youssef Touil - https://airspy.com
Reading the configuration file: spyserver.config
Listening for connections on 0.0.0.0:5555
Accepted client 192.168.178.30:53675 running SDR= v1.0.0.1707 on Microsoft Windows NT 6.2.9200.0
Device was sleeping. Wake up!
Acquired an AirspyOne device
5

Edit Tabs Help
raspberrypi:~ $ ./spyserver spyserver-arm32.tgz
raspberrypi:~ $ ./spyserver spyserver.config
SPY Server v2.0.1700
Copyright (C) 2016-2018 Youssef Touil - https://airspy.com
Reading the configuration file: spyserver.config
Listening for connections on 0.0.0.0:5555
Accepted client 192.168.178.30:53675 running SDR= v1.0.0.1707 on Microsoft Windows NT 6.2.9200.0
Device was sleeping. Wake up!
Acquired an AirspyOne device
Device disconnected: 192.168.178.30:53675
Clients using the device. Sleeping...
using the AirspyOne device
6

```

1. Open a terminal session (Ctl-Alt-t)
2. Enter: sudo apt install -y build-essential
3. Enter: cmake libusb-1.0-0-dev pkg-config

Installing Spy Server on the Pi is a relatively simple task, although it requires using the command line. Here's a step-by-step guide to install the server:

1. Open a terminal session (Ctl-Alt-t)
2. Enter: sudo apt install -y cmake
3. Enter: wget http://airspy.com/downloads/spyserver-arm32.tgz
4. Enter: tar xzf spyserver-arm32.tgz

That completes the server installation but we have some more preparation to do. For each SDR receiver type that you intend to use, you must install the appropriate driver. The receivers supported are: Airspy One, Airspy Mini, Airspy HF+, Airspy HF+ Discovery and RTL-SDR Dongles. In this next section I've shown the installation steps for each receiver type. Do be aware that you only need to install the driver for the receiver you're planning to use.

### Airspy One and Airspy Mini

All the Airspy VHF/UHF SDR receivers use the same driver that can be installed as follows:

1. Open a Terminal session (Ctl-Alt-t)
2. Enter: cd ~
3. Enter: wget https://github.com/airspy/airspyone\_host/archive/master.zip
4. Enter: unzip -o ~/master.zip
5. Enter: cd airspyone\_host-master
6. Enter: mkdir -p build
7. Enter: cd build

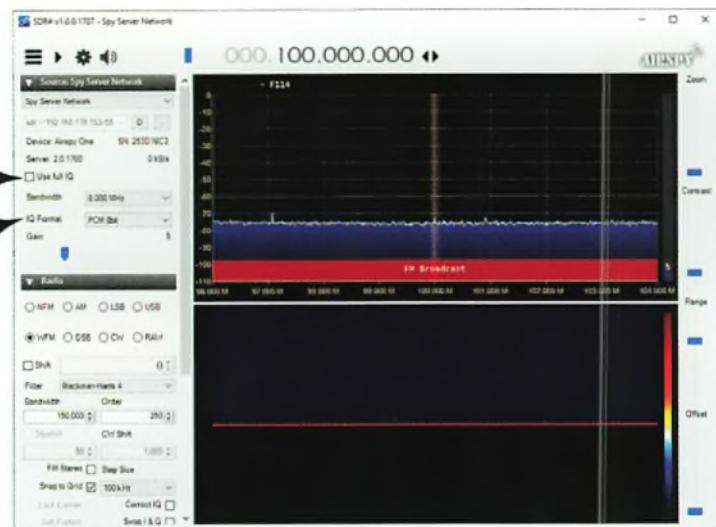
8. Enter: cmake .. -DINSTALL\_UDEV\_RULES=ON
9. Enter: make
10. Enter: sudo make install
11. Enter: sudo ldconfig
12. Enter: sudo rm ~/master.zip

That completes the Airspy One and Mini installation.

### Airspy HF+ and Discovery

The Airspy HF+ and Discovery models require the following driver:

1. Open a terminal session: (Ctl-Alt-t)
2. Enter: cd ~
3. Enter: wget https://github.com/airspy/airshf/archive/master.zip



4. Enter: `unzip -o ~/master.zip`
5. Enter: `cd airspyhf-master`
6. Enter: `mkdir build`
7. Enter: `cd build`
8. Enter: `cmake ./ -DINSTALL_UDEV_RULES=ON`
9. Enter: `make`
10. Enter: `sudo make install`
11. Enter: `sudo ldconfig`
12. Enter: `sudo rm ~/master.zip`

That complete the Airspy HF+ and Discovery installation.

## RTL-SDR Dongles

Although the rtl-sdr driver package is available from the Raspbian repository, please don't use that installation method with Spy Server because it won't work. That is because it reattaches the DVB-T kernel modules, which will result in Spy Server not being able to find your dongle. Manual installation is very easy as follows:

1. Open a terminal session: (Ctrl-Alt-t)
  2. Enter the following sequence of commands:
- ```

git clone git://git.osmocom.org/rtl-sdr.git
cd rtl-sdr
mkdir build
cd build
cmake ./ -DINSTALL_UDEV_RULES=ON
make
sudo make install
sudo cp ./rtl-sdr.rules /etc/udev/rules.d/
sudo ldconfig

```

That completes the RTL-SDR driver installation but we need to create a new file that's used to prevent the default DVB-T kernel modules from loading. We do this by creating a blacklist as follows:

1. Open a terminal session (Ctrl-Alt-t)
2. Create a new file with: `sudo nano /etc/modprobe.d/blacklist-rtl.conf`
3. Enter the following lines in the new file:

```

blacklist dvb_usb_rtl28xxu
blacklist rtl2832
blacklist rtl2830

```

4. Press Ctrl-x followed by Y then Enter to close and save the new file.

## Running Spy Server

Reboot the Pi and connect your SDR receiver to one of the USB-3 ports. Start the server with the following command:

```

./spyserver spyserver.config

```

When the server starts, you should see a message similar to Fig. 4. At this point, Spy Server is waiting for an incoming connection from a compatible SDR software package such as SDR Sharp or SDR Console. When it receives an incoming request, it will search for a connected receiver and automatically begin forwarding IQ data, Fig. 5. If you have more than one receiver connected, it will use the first device it encounters. Here are the steps for connecting to Spy Server from SDR Sharp:

1. Make a note of your Pi IP address
2. Start SDR Sharp on the PC
3. In the Sources box, select Spy Server Network
4. In the configuration box enter the IP details for your Pi as follows:  
`sdr://192.168.0.5/5555` NB: replace 192.168.0.5 with the Pi IP address you collected earlier.
5. Press the Play button at the top left of SDR Sharp.

SDR sharp should burst into life and you can start tuning around. When you stop the SDR software Spy Server will release the device and return to waiting for an incoming request, Fig. 6.

## Starting Spy Server Automatically

Once you're happy that Spy Server is performing as it should, you will probably want

Fig. 7: the 'Use full IQ' box in the 'Sources' panel.

it to start automatically at boot time. This is particularly important if the server is in a remote location. My preferred method is to start the server as a service and I have written an online tutorial that you can see here: <https://tinyurl.com/yyo69lbh>

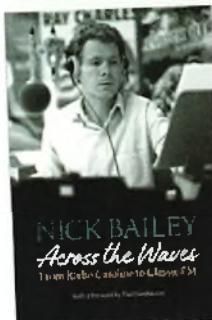
However, a simpler method, that you might prefer, is to start the server once the Desktop is up and running. To use this technique, you need to add two lines to an autostart file. Here are the steps:

1. Open a terminal session (Ctrl-Alt-t)
2. Enter: `sudo nano /etc/xdg/lxsession/LXDE-pi/autostart`
3. In the file that opens, create 2 new lines above the line beginning: `@screensaver`
4. On the first new line enter: `cd ~`
5. On the second new line enter: `./spyserver spyserver.config`
6. Press Ctrl-x followed by y then return to save and close the file.

Reboot the Pi and you should find Spy Server is running. You can test it by using SDR Sharp or SDR-Console from another computer. If you have problems, double-check the amendments you made for typos and restart the Pi.

At this point, you should have a server that auto-starts and is accessible anywhere on your local network. One vital point you need to be aware of is the reduced bandwidth option. This is enabled in SDR Sharp or SDR-Console and provides a dramatic reduction in the data demand over the network. In the Sources panel of SDR Sharp you will see a tick box marked Use full IQ, Fig. 7. This is used to switch between sending the full IQ data over the network or using the reduced bandwidth option. This bandwidth reduction technique is unique to Spy Server and delivers a significant saving. As an example, a VHF/FM signal with full IQ bandwidth requires around 10Mb/s of bandwidth, whereas the same signal with the reduced bandwidth option can be reduced to a mere 320kB/s. It's this bandwidth reduction that makes it possible to access the server over the wider internet. In addition to turning full IQ on/off there is an adjustment for the IQ data format in the same panel. This lets you choose between 8-bit resolution through to 32-bit floating point resolution. Clearly, the higher resolution data requires more bandwidth. In the vast majority of cases, 8-bit is all you will need. The Spy Server configuration file (spyserver.config) contains many well documented refinements that can be made to customise the server's performance but I'll cover these later.

# TOP TITLES



## Book of the Month

### Across the Waves

£17.50 plus p&p

This autobiography gives a detailed account of Nick Bailey's life with Radio Caroline, various other radio stations and finally with Classic FM. Reviewed in September's RadioUser, this is "an extremely entertaining and very readable book... highly recommended to anyone wishing to gain an understanding of what it is like to work as a radio presenter."

### Auntie's War

The BBC is an institution unlike any other, and this is its wartime story. A curated collection of articles gleaned from the BBC archives in this 422 page hardback book. Reviewed as "a good read"

£20.00 plus p&p



### Hear My Voice

Written by former BBC Prague correspondent David Vaughan, this "interesting text on a crucial period of European history, prior to the outbreak of the Second World War cleverly weaves together contemporary radio broadcasts".

£9.99 plus p&p



### The Red Light Zone

For twenty-five years, Jeff Zycinski worked for BBC Radio and became the longest-serving boss of Radio Scotland. An affectionate, humorous account of inside life at the Beeb

£8.99 plus p&p



### Electrified Voices

Tracing the origins of the modern soundscape, showing how sound technology and the rise of a new auditory culture played an essential role in the formation of Japanese modernity. Electrified Voices looks at how radio shaped modern Japan between 1886 and 1945.

£24.00 plus p&p



### Wartime Broadcasting

During the wartime years, the BBC was the sole radio broadcaster in Britain, boosting morale through programmes. Reviewed as "a fascinating read"

£7.99 plus p&p



### World Radio TV Handbook 2019

This book continues to offer the most comprehensive guide to broadcasting. It again provide the most up-to-date information on mediumwave, shortwave and FM broadcasts

£35.00 plus p&p



### The Voices - Spying and Radio Warfare during the Cold War

Based on the series of RedCom articles published in 2000-2001, this book has been edited from those articles and expanded with new pictures.

£9.99 plus p&p



### Broadcast Brothers

A true, autobiographical story about love and loyalties in families and family businesses the world over, risk, luck, laughter, hard work – and what happens when the little guys take on the big guys

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### Radio Listener's Guide 2019

The 31st edition of the annual guide for UK radio listeners is now available. Providing news and information for listeners, with coverage of all the key developments in analogue, digital and internet radio.

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Includes details of an increasing number of "apps" for smartphones specifically for radio data decoding, including programs for digital scanner communications decoding for which a smartphone can be linked to an existing scanner radio to decode.

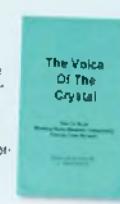
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# Contests, Part 1

**Colin Redwood G6MXL starts an exploration of contests and their terminology, answering the numerous questions asked by newcomers to contesting.**



**L**ike most aspects of amateur radio, contesting (participating in contests) has a whole load of terminology associated

with it. So I thought it might be a good idea to get a better understanding of this terminology and answer some of the numerous questions that are asked about contests by newcomers.

*Why are there contests? What's wrong with just going on the bands and having a chat?*

There is absolutely nothing wrong with going on the bands and having a chat or working some DX. Contests provide opportunities to make contacts with stations in less common DXCC entities (countries) or locators.

Participating in contests can help improve your operating skills. It can also help you learn how to get the most from your station, including improving your antenna system. Some contesters find the thrill of making contacts at a high rate and competing against their peers intoxicating. If you have limited time to operate, a

contest can usually yield a greater number of contacts in a limited time on the air than just calling CQ outside a contest.

In the case of the VHF/UHF/Microwave bands, contests provide an opportunity to keep bands occupied that might otherwise appear to be quite empty, Fig. 1. If the contest coincides with some enhanced propagation, then some really long distance contacts may be made.

### *Who runs contests? In the UK? Internationally?*

In the UK, most contests are run by the HF and VHF Contest Committees of the Radio Society of Great Britain (RSGB). In addition many specialist interest groups such as the UK Six Metre group (UKSMG), the British Amateur Television Club (BATC), the Worked All Britain (WAB) Group, the Microwave Society, the UKEL Contest Club and the G-QRP club also run contests suited to their specialities and members.

Most of the RSGB's international counterparts such as the ARRL (USA), FRC (France) and DARC (Germany) also organise contests. In addition, several amateur radio magazines run contests, including CQ magazine in the USA, well known for their world-wide (WW) and worked prefix (WPX) contests and, of course, our very own PW based here in the UK.

### *Is there an international standard for contests?*

The International Amateur Radio Union (IARU) has rules for its own contests. Apart from these, and some guidance on what constitutes a valid contact, there are no international standards for contests as such. In reality, contest rules tend to follow a common, albeit rather loose, format to provide potential entrants with details of dates, times, sections, eligibility, permitted bands, modes and power, information required to be exchanged (often just signal reports and serial numbers), scoring and submission arrangements for logs. As I'll show next month, there are a couple of common standards for file formats for submitting logs electronically.

### *What is a contest section?*

Many contests have several sections (each can be considered a mini-contest). Typically, these sections are related to things such as the number of operators, the number of transmitters, bands and power. Sometimes these sections are abbreviated as shown in Table 1. Some contests have separate sections for those who wish to

**Fig. 1: G3CKR/P operating in a Practical Wireless 70MHz contest.**

**Fig. 2: A well-equipped contest station (in this case in Kuwait, callsign 9K2HN – PW editor Don G3XTT was one of the operators when the team set the current Asia record for the CQ Worldwide CW Contest in 2014).**

use the assistance of the DXCluster and/or ON4KST Chat and similar techniques. These additional sections are usually suffixed with an (A) (Assisted).

As an example, the Practical Wireless 70MHz contest has two sections – Low Power for stations running up to 10W and High Power for stations running more than 10W. Some contests also have a section for Short Wave Listeners (SWLs) who log what they hear during the contest without transmitting.

### Before the Contest

*What do I have to do to be eligible to enter a contest? Can anybody take part?*

Most contests organiser allow all licensed amateurs to take part in the contests they organise. A small number of contests only allow stations from specific countries or even clubs to participate. Others may allow anyone to enter but limit valid contacts to QSOs with certain countries (so, for example, a contest organised by country X may limit contacts to those with that country or, alternatively, may allow all contacts to count but have bonus points for contacts with country X). If you have any doubts, refer to the contest rules. To submit an entry log, you'll need to declare that you meet the eligibility rules for the contest and section in question. For example, many contests organised by the RSGB require that you are a member of the RSGB or in some cases a member of a RSGB affiliated club. This doesn't, though, prevent you submitting a check log.

### Do I need a big station to do well?

No. Well-equipped stations located in favourable locations tend to do well, **Fig. 2**, but you'll also need a lot of skill and stamina to do well in the major international contests, some of which last for 48 hours! There are also contests specifically aimed at those using low power (QRP) and some with sections for those running less than just 1W, so high power certainly isn't needed in every contest.

Many contests, particularly the major international ones, have lots of sections so that you can compete with stations on a reasonably level playing field. For exam-



ple, I managed to be the leading station in England in the CQ Magazine's 2018 World Wide RTTY WPX Contest in the Tribander/Single element 'low' power (up to 100W) 40m section, **Fig. 3**, and also the second highest placed single operator English station on 40m – the first time I'd actively participated in a RTTY contest.

*I've got a VHF/UHF hand-held FM transceiver. Are there any contests suitable for me?*

Yes, the RSGB VHF Contests Committee runs a series of one-hour FM Activity Contests on various Tuesday evenings throughout the year on 2m or 70cm FM, known as the 144MHz FMAC and 432MHz FMAC contests. These are a great way to have a go at contesting for the first time. I'd suggest trying to operate from some high ground.

### How much does it cost to enter?

There are generally no fees to be paid to contest organisers in order to participate and enter a contest – this is amateur radio after all! However, some contests require entrants to be members of a particular club or society, which may require a membership subscription.

### Are there prizes?

Prizes are not normally given to winners of contests. The closest thing that most contests get to a prize is a certificate and perhaps a cup (which in some cases has to be returned after a year). By the way the winner of the Bermuda contest no longer gets a paid trip to Bermuda as was once the case!

| Abbreviation       | Meaning                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------|
| SOLP               | Single Operator Low Power                                                                           |
| SOHP               | Single Operator High Power                                                                          |
| SOAB               | Single Operator all band                                                                            |
| SOAB(A)            | Single Operator all band assisted                                                                   |
| SOSB               | Single Operator Single Band, often includes the band, e.g. "SOSB/80" for a single-band entry on 80m |
| SO1R               | Single Operator one Radio                                                                           |
| SO2R               | Single Operator two radios                                                                          |
| SOQRP              | Single Operator low power (less than 5W)                                                            |
| MO                 | Multiple operators                                                                                  |
| MS or Multi/Single | Many operators but only a single transmitter                                                        |
| M2 or Multi/Two    | Many operators with two transmitters                                                                |
| MM or Multi/Multi  | Many operators with many transmitters                                                               |

**Table 1: Some common abbreviations for contest categories used mainly in larger contests.**

### Where do I find the rules?

Rules for contests are usually published in the magazines and websites of contest organisers. Regardless of the rules, you must obviously stick to your licence conditions. The contest calendar published by **Bruce Horn WA7BNM** is probably the single most useful source of contest information for the HF bands, **Fig. 4**. It has links to the rules for most HF contests: [www.contestcalendar.com](http://www.contestcalendar.com)

**Table 2** shows where to find rules for some events organised by various UK contest organisers. Note that the RSGB has 'General Rules', which apply to all its VHF/UHF contests, and then rules specific to each contest:

<https://tinyurl.com/yybxc0lw>

### What bands are used?

Contests can be found on almost all ama-

**Fig. 3: You don't need a high-power station to do well in a contest.**

**Fig. 4: A summary of the rules for the CQ Worldwide DX RTTY contest that takes place over the weekend of 28/29th September, as seen on Bruce Horn's WA7BNM contest calendar.**

teur bands from LF to SHF. The most notable exceptions are the so-called WARC bands (12, 17, 30m) and 60m where contests are not organised. If you want to avoid the big contests at a weekend, then the WARC bands can certainly be recommended.

#### What modes are used?

There are contests catering for most modes, including CW, SSB, FM, SSTV, FSTV, RTTY, PSK and FT8. The RSGB HF Contests Committee has recently announced some contests using the new FT4 digital mode, which has been developed specifically with contest operation in mind.

#### How long are contests? Are they always held at weekends?

The duration of contests varies from an hour or two up to 48 hours. While most contests take place at weekends, there are some short duration contests during the week, typically in the evenings. These short duration contests usually focus on one or two bands or modes. Examples include the RSGB's 80m Club Championship Contests, which last just 90 minutes on weekday evenings.

#### Do I need to operate the whole contest period?

No. You can operate for as little or as much time as you wish subject, of course, to the rules of the specific contest. Some contests even have prescribed rest periods, sometimes referred to as 'Off-time'.

#### Can I use the DXCluster, ON4KST's Chat system or talkback during a contest?

You'll need to refer to the contest rules because the use of the DXCluster and ON4KST's chat system is only allowed for certain contests. Some microwave contests permit the use of talkback on other (usually lower frequency) amateur bands such as 2m. In all these cases, where permitted, it is usually limited to setting up a contact but not anything comprising the exchange.

#### Can I use repeaters, satellites or moonbounce during a contest?



With a few exceptions, most contest rules prohibit the use of repeaters, satellites or moonbounce. Likewise, most contests prohibit the use of digital voice modes and echolink.

#### Types of Contest

There are many types of contest – far too many to list. I have listed some of the terms often used to describe contests.

#### What is a Sprint contest?

In a Sprint contest, the station that initiates a QSO by calling "CQ" must change frequency immediately after the QSO without working any other station on the same frequency. The station worked by the station that called CQ can stay on the frequency and call CQ until after they have worked a station, when they must change frequency. Sprint contests tend to be relatively short duration (typically one or two hours).

#### What are Cumulative Contests? How do they differ?

Cumulative contests are a series of contests with the same or very similar rules and (usually short) durations. The results of each of them are combined to produce an overall results table. Stations can participate in as many or few of the contests as they wish but obviously the more you participate in, the higher your overall score.

#### What is a Field Day Contest?

A Field Day contest is one where the entrants are required to operate from a location away from home with equipment not powered by the normal mains electricity supply and all brought to site in the preceding day or so. Field Days can be great social events for a club. They can also provide an opportunity for club members to operate on a variety of bands and perhaps with a better station than they can install at home.

The RSGB organises HF Field Day (CW

| CQ Worldwide DX Contest, RTTY |                                                                                                                                                                                                                |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                        | Worldwide                                                                                                                                                                                                      |
| Geographic Areas              | Worldwide                                                                                                                                                                                                      |
| Participation                 | Worldwide                                                                                                                                                                                                      |
| Awards                        | RTTY                                                                                                                                                                                                           |
| Mode                          | RTTY                                                                                                                                                                                                           |
| Band                          | 80, 40, 20, 15, 10m                                                                                                                                                                                            |
| Chorus                        | Single Op All Band (High/Low/QSO)<br>Single Op Single Band (High/Low/QSO)<br>Single Op Assisted All Band (High/Low/QSO)<br>Single Op Assisted Single Band (High/Low/QSO)<br>Single Op Overlay (Classic/Rookie) |
| Multi-Op                      | Multi-Op                                                                                                                                                                                                       |
| Multi-Team                    | Multi-Team                                                                                                                                                                                                     |
| Max power                     | HF: 1500 watts<br>LF: 1000 watts<br>QSO: 5 watts                                                                                                                                                               |
| Exchange                      | 48 States/Canada: RST + CQ Zone + (state/VE area)<br>All Others: RST + CQ Zone                                                                                                                                 |
| Work stations                 | Once per band                                                                                                                                                                                                  |
| QSO events                    | 1 point per QSO with same country<br>2 points per QSO with same continent<br>3 points per QSO with different continent                                                                                         |
| Multiples                     | Each US state/VE area once per band<br>Each DXCC/VEE country once per band<br>Each CQ zone once per band                                                                                                       |
| Score calculation             | Total score = total QSO points x total multipliers                                                                                                                                                             |
| CQI (small legs)              | <a href="http://www.cqwwrtty.com/legcheck/">http://www.cqwwrtty.com/legcheck/</a>                                                                                                                              |
| Upload log                    | Ed Morris, VE3K<br>RD Box 1477<br>Los Gatos, CA 95031-1477<br>USA<br><a href="http://www.cqwwrtty.com/">http://www.cqwwrtty.com/</a>                                                                           |
| Mail bags                     |                                                                                                                                                                                                                |
| 4                             | Logbook                                                                                                                                                                                                        |

only), HF SSB Field Day and VHF National Field Day (VHF-NFD). Successful Field Days need careful planning to ensure the logistics come together to successfully get the station on site, assembled, operated for 24 hours, dismantled and removed from the site. Besides Field Days, there are numerous contests where you can operate away from home, usually adding /P (portable) to your callsign.

#### Do I need to pre-register?

For most contests you don't need to pre-register (give the adjudicator advance notice of your intention to participate). Notable exceptions are the RSGB's Field Days for which pre-registration is required, so that unannounced site inspections can be arranged to check that your station is complying with the rules. There normally is no need to pre-register for other contests whether operating in the field or at home.

#### Next Month

Next month I'll continue the contest theme by looking at questions associated with activities both during and after the contest, including keeping and submitting a log, and the adjudication process.

#### Practical Wireless

[www.pwcontest.org.uk](http://www.pwcontest.org.uk)

#### RSGB HF

[www.rsgbcc.org/hf](http://www.rsgbcc.org/hf)

#### RSGB VHF

[www.rsgbcc.org/vhf](http://www.rsgbcc.org/vhf)

#### UK Microwave Group

[www.microwavers.org/contesting.htm](http://www.microwavers.org/contesting.htm)

#### UK Six Metre Group

[www.uksmg.org/contest.php](http://www.uksmg.org/contest.php)

#### Worked All Britain

<http://wab.intermp.net/default.php>

**Table 2: Where to find contest rules for many popular UK contests.**



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**A** recent formal evening at our club was cancelled at short notice so with my Programme Secretary's hat on, I threw in a spontaneous night of Morse.

Little did I realise that I would have such a successful and enjoyable evening in store.

I am always being mocked over my enthusiasm for CW so I was pleasantly surprised to see the attendance we had. I had asked a friend **Roy G3ZIG**, who runs a museum of radio equipment, to bring along a couple of sounders for people to play with and test their copying ability.

You probably know the story of the derivation of the word LID, where in the US, landline telegraph operators had to read the Morse from the sounder. Those that had difficulties put a tobacco tin lid on the sounder to make the Morse more distinctive. Well, on the evening, we tried this and failed miserably to get the lid to vibrate in any way. However, quite a number of people were able to copy the Morse from the sounder.

Lots of different keys, paddles, straight keys, semi-automatic bug keys, together with keyers were on display and free to use and test. One or two paddles changed hands on the evening, so it proved quite helpful. Somebody wanting to buy a paddle has a difficult time deciding because there is never anywhere at Newark where paddles can be compared. Buying blind, so to speak, is not the ideal way. Paddles do cost a fair amount of money and it is helpful to be able to try a number, both single- and dual-lever paddles, prior to purchasing. They do have to last a long time!

The pictures, **Figs. 1 through 4**, by **Jim G3YLA**, tell the story much better than the text. You can see the number of people around the tables and also get a feeling for the enthusiasm! So, is CW a dying mode? Not on your life! I have every confidence that it will always be used by 'real' amateurs!

## Bootcamps are catching on!

This really is a good news item to prove that CW is not a dying art!

Following on from the report submitted by **Rich G4FAD** in the last column [and see also **Joe Chester's report in this issue – ed.**], I received news of the Bootcamp run at the Scottish (Stirling) radio club GM6NX. They had around 12 students and the event was both popular and successful. Again, the picture, **Fig. 5**, tells more of a story than a lengthy paragraph of text. Photo credit in this case goes to **Col MM0NDX**:

<https://tinyurl.com/yxvj7wp7>

# CW Forever!

**Roger Cooke G3LDI waxes lyrical about the popularity of Morse even in this digital age.**





5



4

Tutors at the Bootcamp were well known Scottish DXers Rob GM3YTS, Gav GM0GAV, Dave GM4EVS and Hugh GM4UYE.

By reporting the success of these Bootcamps, the idea does seem to be catching on and gives me a great deal of satisfaction, having started the idea a few years ago. If your club runs one, please send a report and some pictures to me for inclusion in the column (my e-mail address is at the top). Indeed, the same applies to any CW related event or news you have.

#### Wolfwave

**Richard Newstead G3CWI** of SOTABEAMS attended the Norfolk ARC Barford Rally. He was demonstrating the Wolfwave on his table and it proved to be quite a draw. He lent me one to try at home and also sold a few on the day. I am using the Flex 6600 (see my article in this issue) and the filtering on that is superb, so I don't really feel it necessary to have one. However, the regeneration method with a very tiny delay would help in conversational contacts, with no noise spoiling the copying comfort. It would

**Figs. 1 through 4: The Norfolk ARC evening of Morse. Fig. 5. The Scottish Morse bootcamp.**

also enhance SSB reception, because I am of a certain 'age-related hearing loss' and this would also add to the comfort of a long QSO. For normal use, I prefer to hear what is going on around me. This is one problem that amateurs using readers have. They copy just one signal but are unaware of possible problems on either side.

One new enhancement with the updated firmware is binaural reception. I set up the Wolfwave with my usual 400Hz centre frequency, with double the bandwidth for reception. However, I think age is against me and it didn't give quite the effect I was expecting.

**Don G3XTT** reviewed the Wolfwave fully in the July *PW* so there is no need to duplicate anything here. With the Flex, I don't think the cost would justify me owning one but for somebody with an older receiver, this certainly would and with the firmware free updates, it is well worth considering.

Please keep the input coming, 73 and may the Morse be with you. Roger G3LDI.

# Rallies

Send all your rally info to Georg Wiessala at: [wiessala@hotmail.com](mailto:wiessala@hotmail.com)



Plan your visits with our wide-ranging list of forthcoming events. **Warners (RadioUser & Practical Wireless)** will be attending events marked with an asterisk (\*). Club secretaries/ event organisers: Please send full and accurate details of your events, affiliations and clubs as early as possible if you would like to be mentioned here: [wiessala@hotmail.com](mailto:wiessala@hotmail.com)

## September 22nd (Sunday) **WESTON-SUPER-MARE RADIO RALLY**

The Rally is at Campus Highlands Lane, Weston super Mare BS24 7DX (Jct. 21 M5). Doors are open 10am to 3pm. Entry is £3. There will be trade stands and a Bring-and-Buy stall. Excellent catering and a large car park.

**Dave Dyer**  
Tel: 07871 034 206.  
[G4CXQ@btinternet.com](mailto:G4CXQ@btinternet.com)

## September 25th (Wednesday) **SUFFOLK RADIO & ELECTRONIC DEVELOPMENT**

A hobbyists' meeting with a difference at the Hallowtree Campsite, Ipswich IP10 0JP. The Suffolk RED is a gathering of amateur radio and radio electronics hobbyists, licensed amateur radio operators and those new to the amateur radio hobby. Whether you are just starting out in the amateur radio hobby with an M6 foundation licence, or a long term amateur radio licence holder, Suffolk RED is the place to pop along to. The format includes skills-sharing, demos, building-workshops, field days, and special event stations.  
<https://tinyurl.com/y2hym8x7>

## September 27th and 28th (Friday and Saturday) **NATIONAL HAMFEST \***

The National Hamfest will, once again, take place at the Newark & Nottinghamshire Showground, Lincoln Road, Winthorpe, Newark, Nottinghamshire NG24 2NY. Please check out the website info regarding onsite camping. **Warners, RadioUser and PW** will be present at the show. Meet the editors and grab a subscription bargain.  
[www.nationalhamfest.org.uk](http://www.nationalhamfest.org.uk)

## October 5th (Saturday) **READING DX MEETING**

The Reading International Radio Group will be meeting in Room 3 at Reading International Solidarity Centre (RISC), 35-39 London Street, Reading RG1 4PS. The meeting will take place from 2.30 to 5pm and is an opportunity for those interested in listening to broadcast stations from around the world on the short wave, medium wave and FM bands to get together.  
[barraclough.mike@gmail.com](mailto:barraclough.mike@gmail.com)  
[www.bdxo.org.uk/diary.html](http://www.bdxo.org.uk/diary.html)

## October 6th (Sunday) **WELSH RADIO RALLY**

The 46th Welsh Radio Rally is at Rougemont School, Llanfarnam Hall, Maipas, Newport NP20 6QB. The doors are open from 10am to 4pm, with disabled visitors gaining access at 9.45am. Admittance is £2.50. There will be trade stands, a bring-and-buy, an RSGB bookstall, and special interest groups. Lectures will take place during the day. Catering is available on site.

**Rob Evans MW0CVT**  
Tel: 01495 220 455  
[mw0cvt@sky.com](mailto:mw0cvt@sky.com)

## October 11th to 13th (Friday to Sunday) **RSGB CONVENTION**

The RSGB Convention will take place at Kent's Hill Park Training and Conference Centre, Swallow House, Timbold Drive, Kent's Hill Park, Milton Keynes, Buckinghamshire MK7 6BZ.  
<https://rsgb.org>

## October 13th (Sunday) **HOLSWORTHY RALLY**

The Holsworthy Rally will take place at the Holsworthy Leisure Centre, Well Park, Western Road, Holsworthy, Devon EX22 6DH. There will be traders, a bring-and-buy and catering. The venue will have separate disabled access, via the traders' side-door entrance. The rally opens at 8am for traders, and at 10am for visitors.

**Howard M0MYB**  
[holsworthyarc@gmail.com](mailto:holsworthyarc@gmail.com)  
<https://www.qsl.net/m0omc>

## October 13th (Sunday) **HORNSEA AMATEUR RADIO RALLY**

The rally takes place at the Floral Hall, Hornsea HU18 1NQ. Doors open at 10am, admission is £2 (under 14s free). There will be trade stands exhibiting radio equipment, computers and so on. The bring-and-buy will be run by the Hornsea ARC. There will also be an RSGB bookstand. Hot and cold food will be available in the cafe.

**Les 2E0LBJ**  
Tel: 01377 252 393  
[lbjpinkney1@hotmail.co.uk](mailto:lbjpinkney1@hotmail.co.uk)  
[www.hornseaarc.co.uk](http://www.hornseaarc.co.uk)

## October 19th (Saturday) **CARRICKFERGUS AMATEUR RADIO GROUP RALLY**

The Carrickfergus ARG rally will take place at the Downshire

Secondary School, Downshire Road, Carrickfergus. Doors will be open to the public at 12 noon. All proceeds from the sale of beverages will be going to Belfast Samaritans, a very worthy charity. All visitors will be very welcome.

**Liz Forde**  
[elizabethforde64@yahoo.com](mailto:elizabethforde64@yahoo.com)

## October 19th (Saturday) **CW CONVENTION & CW BOOT CAMP**

The Convention is at the Witham Scout & Guide HQ (rear of Spring Lodge Community Centre), Powers Hall End, Witham, Essex CM8 2HE. Registration is at 8.30am, for a 9am start. The event is due to finish at around 4.30pm. Pre-register, as places are limited.

**GOIBN**  
Tel: 0745 342 60 87  
[g0ibn1@yahoo.com](mailto:g0ibn1@yahoo.com)

## October 20th (Sunday) **GALASHIELS RALLY**

The annual Galashiels and District ARS Rally is held in the Volunteer Hall, St Johns Street, Galashiels, Scottish Borders TD1 3JX. Doors are open from 11am for disabled access, and from 11.15am for everyone else. There will be traders, a bring-and-buy stall and refreshments.

<https://tinyurl.com/yyaxjdc2>

## October 22nd (Tuesday) **BRARS AGM**

The British Railways Amateur Radio Society (BRARS) is holding its AGM on Tuesday 22nd October. We'll be there from noon to meet, greet, chat and eat. The AGM will commence at 1.30pm. All members of BRARS are welcome to attend. It's definitely a case of 'the more the merrier'. For more information please contact the secretary, Ian Brothwell G4EAN (QTHR). Members are welcome to turn up on the day (though booking places in advance will help our preparations for the AGM).

[AGM@BRARS.info](mailto:AGM@BRARS.info)  
[www.BRARS.info](http://www.BRARS.info)

## November 3rd (Sunday) **BUSHVALLEY ARC RALLY**

The rally will take place at the Limavady Football Club, Rathmore Road, Limavady BT49 0DF. Doors are open 11am, and admission is £3.

**Jackie Doyle**  
[mnn0gk1@gmail.com](mailto:mnn0gk1@gmail.com)  
<https://tinyurl.com/y6mem8po>

## November 16th (Saturday) **ROCHDALE & DISTRICT ARS WINTER RALLY**

The rally is at St Vincent de Paul's, Caldershaw Road, off Edenfield Road (A680), Norden, Rochdale, OL12 7QR. Doors open to the public at 10.15am, with disabled visitors gaining access 15 minutes earlier. Admission is £2.50, with those under 12 years free. Cost is £5 per pitch (for traders with own tables), or £10 for a pitch with the table provided. Refreshments available.

**Robert M0NVQ**  
Tel: 07778 113 333  
[m0nvq@outlook.com](mailto:m0nvq@outlook.com)

## November 24th (Sunday) **BISHOP AUCKLAND RADIO AMATEUR CLUB RALLY**

The Bishop Auckland Radio Amateurs Club (BARAC) 2019 Rally will take place at Spennymoor Leisure Centre, on Sunday 24th November 2019. Please note this venue is ideally suited for both traders and disabled visitors, as it boasts good parking and access to a large ground floor hall. The address and postcode for the leisure centre are 32 High Street, Spennymoor, County Durham, DL16 6DB. Doors open at 10.30am.

Disabled visitors doors open at 10.15am. Admission is £2; under 14s go free of charge, with an adult.

**John G4LRG**  
Tel: 07775 696 568  
**Brian G7OCK**  
Tel: 01388 762 678

## November 24th (Sunday) **COULSDON AMATEUR TRANSMITTING SOCIETY**

The 42nd Coulsdon ATS Radio & Electronics Bazaar is at the Oasis Academy Coulsdon, Homefield Road, Old Coulsdon, Surrey CR5 1ES. Time: 10.00am to 2.00pm. Entry £1.50, which also includes a free tea or coffee.

Free parking; second-hand equipment, flea market tables, refreshments and trade stalls. Fully accessible facilities. CATS bring-and-buy. Attendance is invited from clubs, special interest groups and traders/ dealers. Tables cost just £12.00, with each additional table costing £6.00.

**Andy G0KZT**  
Tel: 07729 866 600  
[bazaar@catsradio.org](http://bazaar@catsradio.org)  
[www.catsradio.org](http://www.catsradio.org)



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Welcome to Sharman multiCOM



# A Busy Month of HF News

With the autumn season approaching fast, Steve PJ4DX has a full column covering past and forthcoming activity and an update on solar predictions.

**T**okelau, Fig. 1, is one of the many Pacific DXCC entities that is difficult to work from the UK, and particularly so at the bottom of the sunspot cycle. But you might want to give it a try between October 1st and 11th, because a multinational team of no fewer than 20 operators led by **Hrane YT1AD** is planning to be active as ZK3A on all bands from 160 to 6m using SSB, CW and data modes, including FT8. "We are excited to have an advanced set-up team who will build a 160m four square [antenna system] from an existing 40m-high tower," the group reported in July. Whether the antennas for the other bands will be equally ambitious I do not know, but with such a large and experienced team ZK3A will provide your best chance of working Tokelau, at least until the next solar maximum.

Tokelau has a population of about 1500 Polynesian people and, with no airport, the only means of transport to and from the islands is by ship. A government-run service operates from Apia in Samoa every two weeks.

[tokelau2019.com](http://tokelau2019.com)

## WWV 100th Anniversary

The world-famous standard time and frequency station WWV, Fig. 2, operated by the US National Institute of Standards and Technology (NIST), celebrates its 100th birthday on October 1st. It is located near Fort Collins, Colorado, about 100km north of Denver, and to commemorate the occasion, the Northern Colorado and WWV Amateur Radio Clubs will be operating special event station WW0WWV from September 28th to October 2nd. Their goal is to make as many contacts as possible, using "at least" four simultaneous stations. They're on Facebook (@WWV100) and Twitter (@WWV\_100) in addition to their website: [www100.com](http://www100.com)

WWV operates on 5, 10 and 15MHz with a power of 10kW, and on 2.5, 20



Fig. 1: Satellite photo of Atafu, one of the three atolls that make up Tokelau.

and 25MHz at 2.5kW, 24 hours a day, seven days a week, broadcasting time announcements, standard time intervals, standard frequencies and, at 18 minutes past each hour, the solar flux, A and K indices and geophysical alerts, if any. The time is kept accurate to within less than 0.0001 milliseconds at the transmitter, though may be delayed by a millisecond or two at the receiver due to refraction from the ionosphere (but it's close enough to set your digital watch or computer clock!). As one of the first licensed radio stations in the USA, WWV has a fascinating history, see: [tinyurl.com/h7p2y6t](http://tinyurl.com/h7p2y6t)

## Conditions to Become Even Worse?

Bad news, I'm afraid, for those of us (including me) who were hoping that 2019 would see the beginning of an improvement to HF propagation as solar cycle 24 gradually morphs into cycle 25. In the January HFH column, I wrote "The year 2019 looks like being when sunspot cycle 25 begins in earnest... a gradual improvement in HF propagation, when compared with the last couple of years or



Fig. 2: The 15MHz antenna of WWV, a vertical dipole.

so, should begin to be seen by the end of the year". It seems I spoke too soon, because on August 1st the Australian government's Space Weather Services (SWS) released new data that suggest propagation will continue to deteriorate for a while yet. The SWS 'T Index', which is a measure of how good (or bad) HF propagation is, was at a level of -4 in April 2019 (the latest month of observed data), while their predicted smoothed T index for October is -16. It's predicted to continue falling to -20 by April 2020, an all-time low since SWS records began in 1938.

HF propagation should then gradually



Fig. 3: The QSL of special event station ZB2IG19.

improve, though it won't be until April or May 2021 that conditions are roughly as they were at the beginning of 2019. It's not all doom and gloom, though. Seasonal peaks in HF propagation in the spring and autumn should continue to take place and, if last year is anything to go by, this coming winter may provide some spectacularly good propagation on the lower-frequency bands such as 80 and 160m.

SWS explains the T index as follows: "The observed T indices are computed from global foF2 data. The predicted T indices are based on the observed data and show the expected behaviour of the global ionosphere as the Sun progresses through its solar cycle." If you've been involved with radio for several solar cycles it's fascinating to compare the SWS T index table with your old logbooks. You can see why propagation was so good in 2000 – 2002, why it was not quite as good at the last peak in 2014, and why those who were active in the mid to late 1950s reckon they experienced the best conditions ever.

[tinyurl.com/ydfkabuu](http://tinyurl.com/ydfkabuu)

### Gibraltar Special Event

Gibraltar hosted the XVIII International Island Games from July 6th to 12th, when 24 teams from across the globe participated in 14 sports, including athletics, triathlon, swimming and sailing. The Gibraltar Amateur Radio Society (GARS) activated ZB2IG19, Fig. 3, using SSB, CW and FT8 on HF.

GARS members John King ZB2JK, Fig. 4, and Kevin Hewitt ZB2GI operated SSB with Ernest Stagnetto ZB2FK looking after the CW. Kevin also operated FT8 and SSTV. The log included 1500 SSB contacts, 600 FT8 contacts and 500 CW contacts. John and Kevin operated SSB from the club station using a Hexbeam as well as from the top of the Rock using a wire antenna.

Most SSB QSOs were on 20m and included contacts with Jamaica, Barbados, Uruguay, Dominican Republic,



Fig. 4: John ZB2JK gets some hands-on assistance operating ZB2IG19.

Colombia, Japan, Brazil, the Falkland Islands, Argentina, Greenland, Costa Rica, Alaska, Venezuela, New Zealand and Paraguay – plus your columnist PJ4DX. "Thank you to John and Ernie, and everyone who worked our special event station," Kevin said.

### Readers' News

Naturally enough Kevin ZB2GI listed "operating the ZB2IG19 station" as one of his HF Highlights this month. His other highlight, when operating from home, was working several of the special event stations that were commemorating the 50th anniversary of the Apollo 11 moon landing (see band reports).

Welcome to Kevin Stock M0YRX, another new contributor to this column. Kevin called me on 10m SSB and e-mailed to say, "Thanks for the 44 on July 11th on 10m SSB; surprised you heard me as my antenna was only three metres AGL!" Kevin said that in July he "worked a total of 45 different DXCC, six being DX (2000 miles plus) and a further 39 from Europe and North Africa" – all on 10m SSB. I was surprised to find that opening on 10m in July and worked Spain, France and Wales as well as a handful of stations in England, plus 5T5PA and HC5DBT. Kevin's 45 DXCC on 10m in July is quite an achievement at this stage in the solar cycle; I assume most of the contacts were made by single- or multiple-hop Sporadic E.

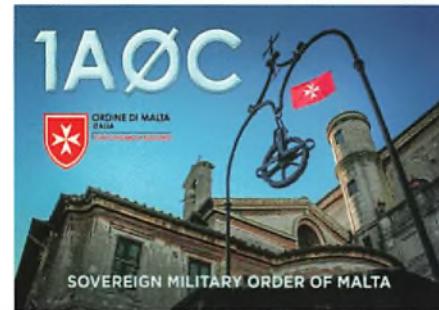


Fig. 5: The Sovereign Military Order of Malta station 1A0C made it into most of our contributors' logs this month.

Tony Usher G4HZW wrote, "My plans to keep the antenna up at 45ft were thwarted by our crazy summer weather with high winds and electrical storms! Additionally, conditions on 28MHz deteriorated somewhat after the first few days of the period and I failed in my quest to work Japan. Nevertheless, I was delighted to contact Serge UA0SC in Irkutsk." Tony noted that meanwhile up on 6m hundreds of contacts were being made between Europe and Japan on FT8, and even one contact between EI and VK3! He commented that "the latter would require nine 'hops' if it was only Sporadic E propagation. So FT8 is really asking questions of the propagation experts!"

Etienne Vrebos OS8D/ON8DN was sweltering in July temperatures as high as 40°C, saying "that's not funny at all, it makes life difficult day and night. I sincerely hope our typical Belgian climate

will return ASAP – I like 20°C and soft rain showers!" As regards the radio, Etienne said: "it really seems very quiet on HF the last weeks. I work mostly portable (P) stations all over Europe. I think we should support people working P; it's not always easy to get them, but they are happy when somebody puts them on the HF Cluster, to be called by many others. Some P stations are making great efforts to activate some difficult places and we can really help them by answering their CQ calls."

**Reg Williams G0OOF** said, "I was pleased to speak to you on 17m on the evening prior to the IARU HF contest; it was a new country for me on that band... One of my activities during the month was the contest. I used my usual 'search and pounce' technique entering for the first time the Single Operator (Assisted) section by making use of the DX Cluster. This certainly helped a good deal by pointing out more distant stations... In the days following the contest I managed to work 1A0C (Fig. 5) on 10m, 15m and 20m, a new country for me on all three bands, also OJ0C on 17m and 20m. Another station I was pleased to work on 17m was G10CWV/P who had his portable station set up with a quarter-wave vertical on a beach on the north-east coast of Northern Ireland. Again, a new country on that band... All in all, a good month for me."

In July **Victor Brand G3JNB** was testing a new multi-band vertical replacing his doublet that had been destroyed, as reported in the August issue. "I put up a 10m SOTA pole with a 45ft helical winding. The feed is still from my shack ATU via 300Ω slotted twin and with existing ground radials. After the anticipated 'fettling', I was delighted to find a splendid match on both 20 and 40m with fairly good loads on most of the other bands, even 160m (60m being impossible due to high impedance). Running 6, 20 or 50W of CW, in the following days the logbook gathered VA1A, OZ8AE (actually Frank OV1CDX on EU-029), TK1K1BPL, 4U1A, K2I, CU8/NU6F Azores and, on the Åland Islands, OH0/DL1SVA. Propagation remained dire and I guess I had picked quite the wrong time to evaluate performance but, standing right up through the middle of a tree, the vertical was working! Still, as the month progressed 1A0C was bagged from 40m to 12m (plus duplicates on QRP on 15 and 17m) and VK3CWB, XQ6CU, VY2TT, LU7YS and OY1CT were worked, albeit many at marginal levels and with rapid and

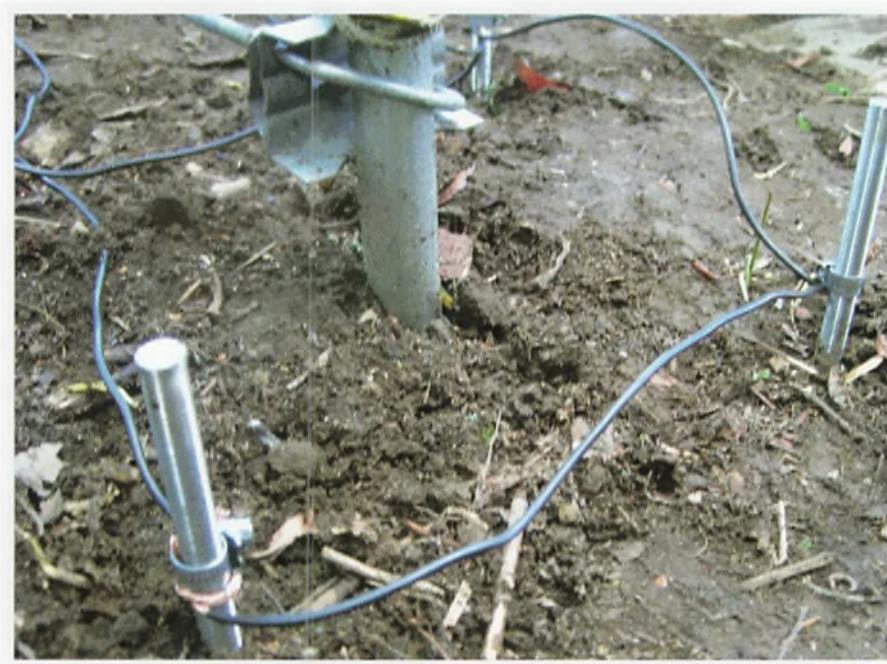


Fig. 6: 33ft of ground rods hammered in for G3JNB's new vertical.

deep QSB. Thank goodness for CW!" On July 29th, Victor finally completed his new antenna project with the wiring-in of six 6ft earth rods, Fig. 6, giving him some 33ft of ground metal right below the mast, plus those vital radials, which include two quarter-waves on topband. Victor says he is "really looking forward to the possibilities of improved DX propagation in the autumn". More details of Victor's new vertical antenna are on the website of the Shefford and District Amateur Radio Society:

[sadars.co.uk/wp/archives/2486](http://sadars.co.uk/wp/archives/2486)

**Martin Evans GW4TPG** thought July a "bit of a mixed bag" with "20m being the band of choice as expected at this point in the sunspot cycle. Nothing on 40 or 80m in July as the antenna was in bits!... Operating this month has been centred around the IARU and IOTA contests, with a couple of interesting DXpeditions active in July. I added 1A0C for a few new bands and OJ0 has been active from the reef. If you work ten OJs this year you can get a certificate and a ceremonial key to the lighthouse, five OJ QSOs nets you a certificate for the shack wall." Like Victor G3JNB, Martin took advantage of the summer weather to do some antenna work. His 'Battle Creek' vertical "has been in bits on the ground for a few weeks. It's now back up in the air with a few mechanical improvements and is working well again on 40 and 80m. As it is working so well I decided to leave it alone and not try to add topband to it and instead install a separate monoband antenna for 160m

Fig. 7: QSL from the operation as JB8PI by Brian GW4DVB.



Fig. 7: QSL from the operation as JB8PI by Brian GW4DVB.

with a big transmit variable capacitor at the base... I have installed a 160m long wire as a sort of Marconi T with 50ft vertical... more news on this next month!"

**Terry Martin M0CLH** wrote from a "very wet and windy Wantage" and attached two logs covering his "dabble" in the IARU HF World Championship contest over the weekend of July 13/14th and a 'normal' log, which included a foray into the new FT4 mode. "My impression is that it performs considerably better than RTTY in terms of sensitivity and similar in speed, so I think we are likely to see it largely displace the traditional mode, save for the electromechanical enthusiasts for which RTTY will always hold a special attraction. It was good to get a few slots on St Paul Island (IOTA NA-94) thanks to CY9C and some from 1A0C, the Sovereign Military Order of Malta. Teenage memories were rekindled by the special event GB55RC."

This station was transmitting from the MV *Ross Revenge* and celebrating 55 years of Radio Caroline. Finally Terry mentions one of his 'bugbears': "When calling CQ using data modes, predominantly FT8 and 4, someone will answer on your own frequency (that's OK but not ideal), and then when the QSO is finished, proceed to call CQ on your frequency – either forgetting to move their transmit frequency or omitting to check the 'Hold Tx Freq' button. It is very irritating, especially when they are very strong – it just needs a little common sense!"

Owen Williams G0PHY wrote, "Thanks for the contact during the IARU contest. During the IOTA contest the Shefford club activated the club call G3B and I worked you on 14 and 7MHz. Most of the contacts made during the IARU were with European stations apart from PJ4DX, LU0HQ, N1UR and NU1AW. I managed contacts with the 1A0C DXpedition on 14 and 18MHz. There was an interesting situation on 14MHz on August 6th: there were two big pile-ups, one for OH0UDG and one for OL88YL (hardly rare ones), yet CY9C was also on and was worked first call." All contacts were on SSB with a power of 190W to a dipole for 14MHz.

It was good to hear from Brian Price GW4DVB, who thanked me for writing about the incident when he was operating as J88PI in the Grenadines, Fig. 7, in which he received interference from a net on 20m SSB (see 'HF Bugbears, Part 2' in HFH, PW September 2019). Although Brian admitted that "the incident was very disturbing/worrying" for him, fortunately it has not put him off from making a return visit to Palm Island, which is now planned for April next year. Talking of 'bugbears', Brian wrote that "Another bugbear for me is the number of DX stations that send me QSL cards for 'assumed contacts' even though we have not worked. A few of these can be attributed to 'pirate' calls but

many are 'chancers' looking for DX to go towards their band totals."

### Band Reports

Kevin ZB2GI enjoyed working the many special event stations this month, as well as some other DX: 40m SSB: EA5/EA7JNC. 20m SSB: 6Y5DX, AO50MOON, DA0APOLLO, GB50AML ('Apollo Moon Landing', operating from Goonhilly), GB5EHL ('Eagle Has Landed'), GB19CGW, GB19CS, HI8CJ, KE8KMX, OZ30EU, SX94MIKIS (Mikis Theodorakis 94th birthday), WA8JNO, ZL2IFB, ZX40ZT. 20m FT8: E7TESLA (Nikola Tesla anniversary). 17m FT8: GB50AML, S92HP.

Another Kevin, this one M0YRX, used 10m SSB to work: 4M6R, 4X6FR, HC5DBT, K2F, N1UR, NU1AW, PJ4DX, VE3DZ, VO1FOG, W3EP.

Reg G0OOF sent in the following log: 40m SSB: EFBK, GB19CSL, LX8HQ, NR3X, PJ2Y, T77LA, TI7W, ZV6O. 20m SSB: 1A0C, CB1HQ, D4Z, FY5FY, HC5DBT, HI8RD, LU0HQ, NP2P, OJ0AW, OJ0C, PJ2HQ, TI7W, ZB2IG19. 17m SSB: 1A0C, FG4NN, GI0CWV/P, HC5DBT, OJ0C, PJ4DX. 15m SSB: EF9Z, IS0SWW, NU1AW, PT5J. 10m SSB: 1A0C, 5P19CWC.

Martin GW4TPG worked 30m CW: 1A0C. 20m SSB: OJ0C, OJ0Z. 20m CW: 1A0C, 4U1A, 5B19CWC, 8P5A, 9A4WY/P (EU-016), LU0HQ, LZ/Z32ZM/P (EU-181), OJ0DX, P40XX, SD1A (EU-020). 20m RTTY: 1A0C. 20m FT8: 4L3NZ, UF0W. 17m CW: 1A0C. 17m FT8: VR2XRW. 15m CW: 1A0C, 4O3A, CE3CT, KP2M. 12m CW: OY1CT, RW0AR. 10m CW: ES2MC, S50HQ.

Etienne OS8D / ON8DN made around 180 QSOs in July; these are the highlights: 80m SSB: a lot of European HQ stations (IARU contest). 40m SSB: 1A0C. 20m SSB: 1A0C, 4L/SP9DLM, 5C20FT, 9M4COO, CY9C, E44WE, E51JD, HS0ZGD, OD5TX, R63RRC (AS063).

VU3WEW, ZD7FT. 17m SSB: OJ0A. 10m SSB: OJ0A, OJ0DX.

Tony G4HZW reports on 10m SSB: 9A0HQ, FY5FY, N1UR, NU1AW, W3EP, W3LL, 10m FT8: E44WE, R9LY, RW9USA, RM8L, UA0SC, UN7JO, VE2EBK, WP4PRD plus 53 EU stations.

Terry M0CLH was busy in the IARU contest and used the new FT4 mode, reporting: 40m SSB: 9A0HQ, DA0HQ, EF4HQ, GR2HQ, HB9HQ, IO2HQ, LX8HQ, LY0HQ, OE0HQ, OP0HQ, OZ1HQ. PA2TMS (EU-038), PA6HQ, S50HQ, SN0HQ, TM0HQ, YL4HQ, YT0HQ. 40m FT8: DA0FONTANE, GB19CGI. 30m CW: 1A0C. 30m FT8: E7TESLA, HF50MOON. 20m SSB: 1A0C, 4U1A, C4W, D4Z, IV3/0E6MBG, J42L, N1UR, OH0C, PJ4DX. 20m CW: 1A0C, CY9C, LZ304AE, OH9A (EU-126). 20m FT4: CX7CO, K0BBC, N1MD, NS2R, SV5AZK, TF3VS. 20m FT8: CT3IQ, CY9C, HB9SPACE. 17m CW: IS0/F8BDQ. 17m FT8: GB55RC, SX94MIKIS, VE3PJ. 15m SSB: 5B4AIX, CR5HQ, CR6K, EF9Z, IS0SWW, TM5T. 15m FT8: 1A0C, A41CK. 12m CW: 1A0C, OL250VEK. 12m FT8: 1A0C, OH0JV. 10m SSB: 9A0HQ, IO8HQ, LY0HQ, OL9HQ, S50HQ, SN0HQ, YR0HQ, YT0HQ. 10m CW: 1A0C. 10m FT8: E44WE, OH0JV, SX94MIKIS, WX4G plus many Europeans.

Owen G0PHY worked, on 40m SSB: OH0/E21EIC, OL88YL. 20m SSB: 1A0C, CY9C, LU0HQ, N1UR, NU1AW, OH0UDG, OJ0C, OJ0DX, OL88YL. PJ4DX, R63RRC. 17m SSB: 1A0C. 15m SSB: OH0UDG. 10m SSB: OH0/E21EIC, OJ0C.

### Signing Off

Thank you to all contributors. Please send all input for this column to teleniuslowe@gmail.com by the 11th of each month – photographs of your station or activity would be particularly welcome. For the December issue the deadline is October 11th. 73, Steve PJ4DX.

# In this month's RadioUser

**SCANNING SCENE** An in-depth assessment of the Uniden Bearcat SDS-200 base/mobile digital trunking scanner  
**AERIALS NOW!** The secrets of using SMA, SMB and QMA connectors in the most effective way.

**AIRBAND NEWS** ATC operations at Newcastle Airport and reports on new ways of reducing wake vortices

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# Flexible Operating for Octogenarians

**Moving to a Software Defined Radio can be a challenge. Roger Cooke G3LDI takes you through his recent adventures while doing exactly that.**

**S**orry about the pun in the header, just couldn't resist it! This is not a review but merely a light-hearted report on how an active all-round octogenarian copes with the latest technology.

## History

I have been in the hobby since I was about 12, taking the usual route – building a crystal set, stepping up to a two-valve receiver on which I heard my first radio amateur. I was hooked and made all sorts of gear, ranging from my first TT11/TT11 transmitter, owning an R1155, progressing though to an AR88D receiver, and building an Elizabethan transmitter in a 5ft rack (owning a rack was a must in my day!). I was also heavily into RTTY with the usual ubiquitous Creed 7B. After a few years I disposed of the Elizabethan and built a tabletop SSB crystal filter exciter, with an 813 linear, Fig. 1.

Marriage and family happened and after a few more years I disposed of the homebrew gear and ended up with a Drake C line. I built another linear – again in a rack – with a pair of 3-500Z, Fig. 2, which I used to transport to Rackheath to help run GB4ANT. We contested from there for about 15 years, winning numerous contests along the way with our multi-multi station.

The big D happened in 1982 and I had to move. This was not a happy time of my life but within a year or so I was lucky to find a dilapidated old nursery with a few acres of land, which is where I am now. I finished up with a Yaesu FT-2000 and an Expert linear, Fig. 3. That brings me up to my Octogenarian status!

## The Challenges of Old Age!

Getting old has problems! I can no longer see that well to handle SMD components, hate drilling cases and the like and have



- Fig. 1: An early (and very smart!) G3LDI.**  
**Fig. 2: Later G3LDI station with Drake 'separates'**  
**- the Rolls Royce of radios at that time!**  
**Fig. 3: The recent but pre-Flex station.**  
**Fig. 4: Power and earthing in the shack.**  
**Fig. 5: Mains filter.**  
**Fig. 6: Look, no radio! The 'glass-fronted station'.**

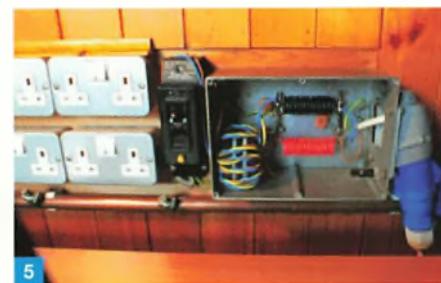
finished with building altogether. However, a couple of locals bought a Flex 6500 and after visiting and playing, I was hooked. So, I now have a Flex 6600 and am getting to grips with it, slowly!

I thought I would have a complete change in the shack. I spent some time thinking about ergonomics and ease of operating. This is a personal decision, of course, based on your own interests. I am mainly interested in HF operating – CW, RTTY/Data and SSB. This entails chasing DX, contesting and chatting so I wanted to be as comfortable as possible in all three operating environments. I had managed with one 15in monitor up until the change so I decided on two 27in screens, at eye level. They are mounted on a combination swivel arm for ease of wiring, cleaning and installing other units underneath.

I cleared the shack completely, re-decorated it and put some new carpet tiles down to allow my castor chair to move more easily. A new desk with a curved end allows me to mount my Transmatch and antenna switching panel in a table-top unit. The big rack has gone and has been replaced with a smaller cabinet that was a server cabinet on castors, and that now houses the Flex and the Expert linear. Mains outlets on the wall with a 12V distribution board are just above my 22mm copper earth bar along the back of the desk. This goes out of the wall as 22m pipe into the ground just outside the shack. My mains filter is also on the back wall, Figs. 4 and 5. This feeds the Flex 6600 and the computer plus rotator control units and ancillary 12V gear. The linear is powered from a separate mains supply direct from the consumer unit. I paid a lot of attention to the earthing arrangements to eliminate as much noise as possible. Fig. 6 shows my new, and probably last, glass-fronted amateur radio station!

## Fundamentals

I had ordered the Flex 6600 at the 2017 Newark show and didn't receive it until just over a year later. There were some problems in production at Flex that caused this delay. I was not over fussed about it. Good things are, after all, worth waiting for. I did



get ribbed incessantly at the local Club about it, however! It finally arrived and I unpacked it. It comes with a handout sheet, fist microphone, Ethernet cable and 12V DC lead. I had updated my shack computer to a dual-core i5 machine with Windows 10 Pro. My Flex is the version without the front control panel, just the display on the screen. The front panel model has to sit on the desk for obvious reasons and I wanted to use the computer and two screens. The Maestro is also available and enables the user to operate the Flex remotely. Since I don't travel any more, that would have been a waste of money to me.

The picture, Fig. 7, shows my Flex in the cabinet and ready to use. Malcolm G3PDH, who had bought one a year earlier than me, suffered a problem with his unit and it had to return to Germany three times before it was fixed. Jim G3YLA also had a problem with his, so I was hoping that mine would be fine, having been cured of these seeming 'teething' problems.

With trepidation and a good deal of hope, I finally switched mine on. The Flex units take a minute or two to reach an operational state and go through a series of relays switching when booting up until

there is finally a steady green light. If there is a problem, the green light will flash red. The fault is indicated by a series of flashing red lights, on a scale from 1 to 6, showing just what is wrong. Imagine my dismay when mine flashed red three times. This indicates a boot failure! Wonderful! I finally take delivery and on the first day it doesn't even work. Anyway, phone calls to ML&S ensued and it was decided it too would have to have a holiday in Germany.

I must admit it was dealt with very quickly by ML&S, no complaints there at all. It finally came back and I had all fingers crossed this time. I connected it to 12V, plugged in the Ethernet cable, put the earth strap on and the antenna plug in and then switched on. It did boot up and it did work. I sat there looking at it for a few

minutes, just to be sure. I then invoked the SmartSDR (Smart Software Defined Radio) software and was very pleased to see it all happen on the screen, **Fig. 8**.

I also had to set up the trackball that I decided to use instead of a normal mouse, and familiarise myself with that. It's not easy to use but is configurable. The only problem I personally have is keeping my fingers from drooping down to the wheel. You only have to touch that and it scrolls immediately.

### Tuning

One thing that had delayed me investing in this technology was the tuning. The first thing to try when changing transceivers is the tuning knob. This is understandable for an amateur of my age because it was always thus. A silky-smooth heavy flywheel tuning knob was a must and it seemed we all approached a transceiver this way. I remember the difference I found between the R1155 and the AR88D. The AR88D was the aristocrat whereas the R1155 was the utility receiver. So, I had bought the add-on tuning knob and although it is not quite the 'heavy' knob, it feels pretty good and does work well.

I had set up the tuning knob as per Malcolm G3PDH who has the same model. It is made by K6TD/K6TU. The main tuning is fine, just like a normal tuning knob on a conventional radio. There are three other controls above it. One controls the AF gain, the middle one the RIT and the right-hand one the MED control, which is like an RF gain. Each control lights up when invoked and the main tuning knob switches it off when pushed at the top. There are several ways to set up this device, and the user decides what he would best like to control. This is not part of the Flex package and has to be purchased separately.

### What Does it Look Like?

So how does it look? Well, nothing like an AR88D or an FT-2000 for that matter! The basic version with no front panel is a box 14 x 7 x 11in. The on/off switch glows green, or at least you hope it does! If it glows a series of red, 1 to 6, you have a problem! The flash in the middle of the front panel glows blue. I took the covers off to take an inside view, **Figs. 9**, while **Fig. 10** shows the rear panel view. What do you get for the money? In truth, physically, not a lot! The secrets of this transceiver are all in the SDR software. Mine came with version 2.4.9. There are updates every year or so. Downloading is not free, however. There is a charge for these.



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### RTFM

There is a lot of terminology and jargon and lots of setting up to learn when changing to a Flex. Panafall, SCUs, slices, profiles of various sorts to set up, DAX audio control, CAT designation for various functions, split operation with two slices, audio tailoring. Setting up for RTTY, PSK, CW and SSB all require different parameters and saving to profiles. I am lucky in that I have two locals who have had theirs over a year and I can ask if I don't know. However, the best advice, and it really does pay dividends in this case, is to sit in front of it and plough your way through the 187-page software manual. The Big P word does come into prominence here and I cannot emphasise that enough. Although I am writing this article, I am not a source of knowledge, for I am still learning myself, but hey, that's what the hobby is all about, self-training.

I don't intend giving a complete list of the numerous parameters that present themselves on the screen, as there are so many. I will try to cover what is different, however, comment on the way I operate the Flex and compare it to my 'normal' radio. Operating a Flex radio is so different from using a 'normal' radio such as my Yaesu FT-2000 that it can be daunting. It pays to devote a lot of time to learning your way around the windows first of all, and to find out just what they all are, without using it on the air.

### Architecture

The architecture of a Flex is completely different and used in conjunction with SmartSDR performs wideband sampling of the RF spectrum. The SCU (Spectral Capture Unit) comprises an antenna input, an

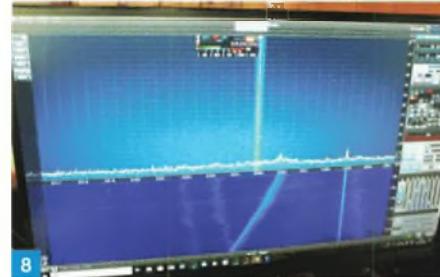


Fig. 7: The Flex 6600; no need for it on the operating desk.

Fig. 8: Magic – the Flex display lights up for the first time.

Fig. 9: An internal view.

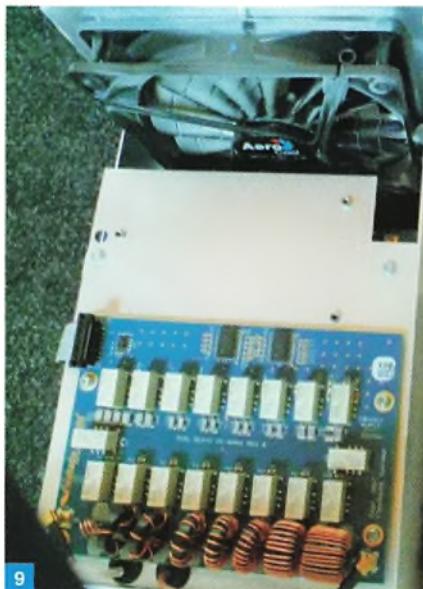
Fig. 10: The rear panel.

optional set of receive preselectors, and an analogue-to-digital converter (ADC). It can support several receivers or slices, each of which can be set up with desired parameters. Data from the SCU is then turned into a visual representation on the screen in the form of the Panadaptor. Beneath the Panadaptor is the Waterfall, which is the standard type of waterfall seen in programs such as Digipan when decoding PSK and similar.

In my case with the 6600, I can open up to four separate and independent slices should I desire. Two are sufficient for normal use for me.

### Setting Up

The display on the screen is worth setting up first, to suit individual needs. I usually run with one slice, or receiver, except when working split. I then invoke another slice that, on CW, automatically becomes the transmit frequency, with independently adjustable volume on each channel. One disappointing thing on CW is that even with



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the sophistication of this technology, it is not possible to change the keying waveform. I do like to be able to adjust the rise and decay times and listen to the keyed CW until I am happy with it. This mandates using an external keyer – in my case I have an MM3. I digress.

The screen appearance is again a personal choice. Clicking and dragging can allow the Panadaptor to occupy two thirds and the waterfall one third of the screen. Using the same method it's possible to zoom in or out of the frequency range by clicking on the frequency band in the middle of the screen. It's a good idea to bring the display in the Panadaptor to just above the bar in the middle by clicking and dragging on the vertical scale on the right of the Panadaptor. Changing the display parameters is achieved by clicking on the display in the top left menu on the screen. Again, all this is personal choice and the options available are covered in the Smart-SDR manual.

The next thing to do is to set up profiles for each band and mode. It pays to set these up first. It can take some time to do so but it pays off. I have at least three for each band, covering CW, RTTY and SSB. Various parameters can be set for each

mode. Then changing band and mode is down to just clicking on the desired profile. Mine are just global profiles but you can choose to set up other modes, microphones and so on. You can get another user to send you his profiles if you wish to short-cut the editing! I must admit to doing this when I first started.

Some parameters are not too obvious, so frequent reading of the manual is a useful thing to do. I missed one SSB setting, namely the transmit audio bandwidth. It wasn't obvious on the screen because it is in the phone settings, but was cut off at the bottom of the screen. More RTFM needed! There are five panels on the right-hand side of the screen:

**TX Panel:** The TX panel has power out, SWR, ATU and memories, power level slider.

**RX Panel:** This shows freq, mode, Noise filters, speaker control, filter widths selected, RIT/XIT, tuning step, speaker controls, AGC.

**CW Panel:** The in-built keyer has TX/RX delay, speed up to 100WPM, sidetone, control of the internal keyer, pitch setting.

**Equaliser panel:** Eight controls ranging from 63Hz to 8kHz.

**Vox panel:** Vox delay control, TX filter settings low cut and high cut, DEXP.

The DEXP Downward Expander is a balancing control that reduces microphone gain during quiet periods. This optimises the transmit audio.

Operating FM is also catered for and it's possible to work the US repeaters on HF but I fear not for a few years! Memories are available to program too and lists can be constructed that can be shared with others. This would be very useful for net

operations, skeds and so on. ATU memories are also available and there are 12 Hot Key pre-sets for CW use. They are stored as part of the global profiles so remember to name your Global Profiles accordingly. Transverter operation is also catered for with a large section covering this in the manual.

### Digital Modes

Operating digital modes has made my MicroHam II redundant now. With the Flex 6000 series and the use of the DAX (Digital Audio Exchange), audio can be transferred from the radio to third-party soundcard-based applications without the need for a radio-to-PC audio interface or a physical sound card in the PC. Again, there is a large section of the user manual devoted to digital operations using DAX. It would serve no purpose to go through a lot of that information here. One thing I did miss was the settings on the slice receiver. DAX should be highlighted blue and mode should be set to DIGU for PSK and RTTY for RTTY. Make sure all audio processing is off, not highlighted blue, turn off VOX, select ACC, highlighted blue again.

Operating RTTY, normally with N1MM+ in my case, the keying is very clean, unlike a lot of RTTY heard these days, and I have used it on both 45.45 Bauds and 75 Bauds in the BARTG 75 Baud RTTY Sprint. PSK is very good too, with no perceptible IMD products, and I have received no complaints whatsoever.

### Operating the Glass-Fronted Way

Once I had taken the decision to change from my FT-2000 to a completely different 'radio', I was committed. Some locals thought I shouldn't have been, changing at this stage in life but what the heck, it's exciting and a challenge too. I cannot stress enough the necessity to 'play' with it first, at length and with the manual open on one screen. It's totally alien at first but once you get used to the basic controls, you can at least get on the air with it. The first thing that impressed me was the ability to 'see' the band. I started on 80m and set out before me along the horizontal axis I could see all sorts of peaks, weird rolling humps displayed, signals that were very wide, all mixed in with some amateur signals. Thoughts that immediately spring to mind are: *"What on earth is that? That transmission is loud and wide, obviously not of amateur origin. That sheep fence at the top of my garden is raising the whole noise floor!"* What used to appear when casually

tuning across the band on my FT-2000 one at a time can now be seen all at once! It's possible to watch some of those drifting signals go across the screen, leaving their trail on the Waterfall.

It certainly does wake you up to what is actually happening on our bands, and how doomed we are, doomed I say! In particular, I have an annoying cheap Chinese solar installation near me that causes noise on all bands, every 100kHz or so. There are several peaks around S9 occupying about 10kHz at each 100kHz spot. Luckily, I don't yet suffer the dreaded VDSL that some in more suburban housing areas in Norwich do. I guess it's too late for amateur radio now. Ofcom are not interested in addressing the issue. If I were a billionaire, it would be fun trying!

### The Real Advantages of Flex SDR

Operating in a DX pile-up is great. I can find a clear frequency when the DX station says 'UP' and watch to see if it stays clear. If all the callers obeyed the DX code of conduct, it would be possible to see exactly where the caller was and know the direction the DX station was tuning, unless of course he was operating in 'grasshopper' mode. However, that's not going to happen, unfortunately.

Operating in a contest is also good for the same reason. I no longer have to either look for a clear frequency or send 'QRLL?' I can see the clear frequencies, check how long the frequency has been clear by referring to the waterfall, and can move there immediately to start calling CQ. The only people I am likely to upset are the SO2R (single-op, two radio) guys who think they can hold two frequencies simultaneously. No, they can't! Operating split is easy. Hitting SPLIT on the slice flag opens another receive slice. Moving the flags around is easy with the mouse. Just click on the light blue area, hold and drag to where you want it. Display parameters can be set quite easily by clicking on DISPLAY in the top left corner of the panadaptor.

### Modes

There is a CW memory feature with 12 memories. Click on CWX at the bottom left to set it up. Bandwidth filtering is configurable down to 50Hz, with no ringing. Unfortunately, CW rise and decay times are not adjustable at all as I said earlier. I would like to have seen that feature but perhaps in a future software update. The keying is, however, very clean with no clicks, thumps or chirps. Speed is adjustable up



Fig. 11: Roger enjoying his new way of operating.

to 100WPM. Hmm.

On SSB, filter bandwidth is adjustable and the speech processor with its three settings needs to be set in conjunction with the TX filter control, so that the processing appears in the frequency range containing the most intelligibility. This would probably have to be set up depending on the gender of the operator. Setting up the equaliser will depend on what microphone is used, so help from a local would be useful here. You will need to set the +20dB gain preamp to 'enabled' in the setting/radio/phone tab. There is no DVK but I always use the DVK in N1MM+ for contesting, so that's no problem.

Operating DIGI modes requires an understanding of the DAX. No PC soundcard is used when using DAX. When selecting RTTY, make sure that DAX is enabled, both on the slice flag and in the P/CW window on the right-hand side. Both must be BLUE. The DAX control panel is minimised in the task bar at the bottom. RTTY is conventionally LSB, so make sure this shows on the slice flag, click on LSB in the small box and select RTTY.

PSK is conventionally USB, so again click on LSB and select DIGU.

### Disadvantages of a FLEX

There are a few disadvantages of the FLEX approach but they could be construed as a reason for not buying one. First, the cost. It is a top performance transceiver but it doesn't look like one! You can also invest

in the add-on Maestro but that increases the cost even further. Secondly, without the Maestro, you have to have a computer with the SDR software to operate it, so it's not 'all in one box' and not easily transportable. You would need a monitor as well. Thirdly, you do have to pay around \$150 or so for each upgrade to maintain the latest operating system. Lastly, as with most modern transceivers anyway, it is definitely a box it up and return it job if it has a major fault.

### The Octogenarian

Is this a transceiver for the Octogenarian? Well, it depends on the individual. If you are of sound mind and thrive on a challenge, then I would say yes. It is a steep learning curve but I have always had those in my life. Some people prefer crosswords, or Sudoku but a keen DXer, CW operator and contesteer would derive a huge amount of mental stimulation and fun from using a Flex. Running a glass-fronted amateur station might not appeal to everybody. However, it suits my needs. Perhaps it might suit yours! The final installation and the GOM (Grand Old Man) himself are shown in Fig. 11.

Using a Flex is like starting again. It's not intuitive and I spent a while just looking at the screen and the various windows. I had previously bought a desktop tuning knob, having been used to tuning normal radios for the last 60+ years. I'm glad I made that purchase because it did give a feeling of control to some extent.



## £20 STAR LETTER

### The Girl Electrician

Dear Don,

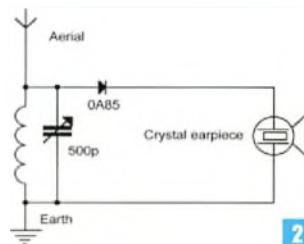
While clearing a cupboard I found a variable air-spaced capacitor mounted on a wooden base. On impulse I wound a coil and built a crystal set. It was some seven decades since I had last listened to such a set but the thrill was still there.

A few days later my three granddaughters (aged 9 to 12) visited, and I let them listen to my crystal set. They were thrilled and wanted to build their own sets, and so the idea of the girl electrician was born. At first I wanted the set they were to build to look much like that of those of the early days of broadcasting, and my research took me to my edition (1930) of *The Boy Electrician* for a circuit of a crystal set, Fig. 1. I was horrified!

There was no tuning capacitor but a multi-tapped coil with two rotary switches (to be home-made if difficult to find) for tuning. The detector (cat's whisker) was of course, a lump of 'hertzite', which, if faulty, then "few results will be secured". The headphones were  $4000\Omega$  'telephone receivers' and probably expensive to buy.

It would have taken several girl-hours to construct, with uncertain performance on completion. By comparison, a modern set is much simpler and more sensitive, using a germanium diode and a crystal earpiece, Fig. 2. I can just hear BBC Radio 5 on 909kHz without an antenna (I live about 12 miles from the Brookmans Park 150kW transmitter).

To get my visiting girls



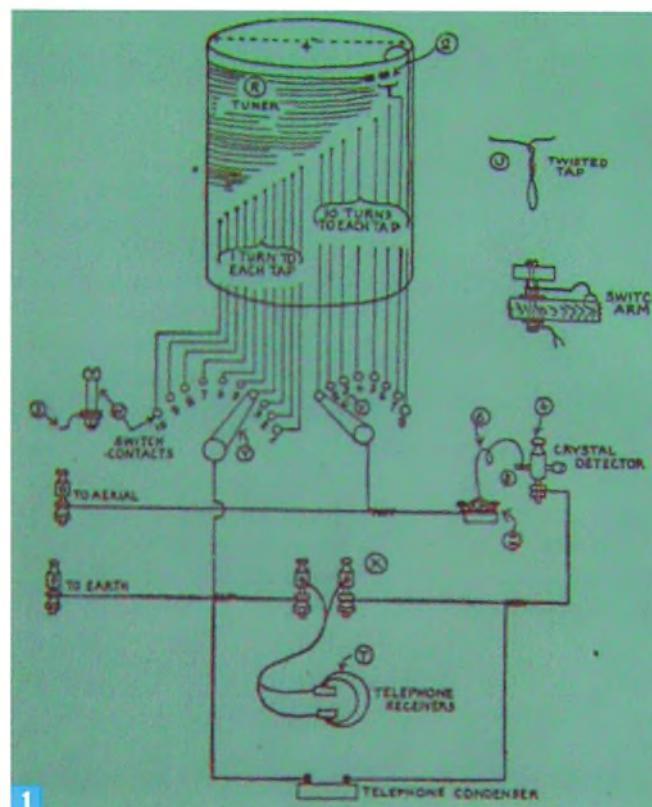
2

working I had limited time and their attention span, so I built three identical sets with all the wires requiring soldering done by me. Fig. 3. I wound the coil on a 5cm diameter cardboard tube about 11cm long, using 45 turns of insulated 22SWG wire. The tuning capacitor was a 200+300pF variable air spaced capacitor bought from PW advertiser Birkett with the two sections wired in parallel. A terminal strip screwed to the baseboard provided a place to connect wires and components using only a screwdriver, Fig. 3. I provided each child with a diagram showing where each coloured wire and component should be placed. With an antenna 8m high and 30m long four stations could be heard. No earth was employed.

Building a crystal set with modern components makes it much easier to inspire and instruct newcomers or nascent engineers. My description is only a guide. If you were to get a youngster totally involved in developing engineering skills, then building a crystal set could involve carpentry, drilling and screwing, soldering.

The girls enjoyed building their sets, Fig. 4, and hopefully the experience will encourage them to further explore the world of technology.

Bob Harry G3NRT



1

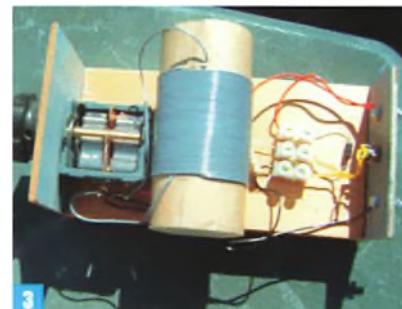


Fig. 1: Crystal set circuit from 1930.  
 Fig. 2: A 'modern' crystal set circuit.  
 Fig. 3: The circuit of Fig. 2 built up with home-wound coil.  
 Fig. 4: The 'girl electricians' hard at work!



4

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## Suggested Learning Resources

**Dear Don,**

With reference to the letter from **Will Brooks** (August 2019), can I suggest the *Short Wave Listening Handbook* by **Joe Pritchard G1UQW**. I was given a copy some years ago by a late friend and found it highly informative on all aspects. If Will tries the internet, it is still available albeit used, via eBay and elsewhere. I hope this helps.

**Denis Speirs 2M0DOI**  
Arbroath

**Dear Don,**

Regarding the letter from Will Brooks, I think the best book would be the *RSGB Radio Communication Handbook*, which goes from Ohms law to some complex projects.

**Mike North G4EZV**  
Torquay

**Dear Don,**

This e-mail is in (belated) response to your Letters contributor Will Brooks about learning electronics. If it is mainly electronics, as opposed to 'radio', training, then I can totally recommend the *Learnabout Electronics* course (URL below), which I have been through and found extremely good. There are seven modules covering everything from basic electric theory to amplifiers, oscillators and power supplies. (I haven't done the final module on Digital Circuits yet.) It goes into detail about circuits and how to calculate component values, and there are 'practical' circuits to build and test.

<https://tinyurl.com/yyqwc1x9>

The course is free to use/download so there's no tutor backup, which may deter some people. You can follow it purely on-screen or, as in my case (and being old-fashioned and liking a book to hold), print it all out:

550 pages in total for modules 1 to 6. You will need the ability to obtain components and to do any realistic testing a signal generator and oscilloscope are required. One negative is that these requirements are not stated at the start. An impecunious schoolboy (as I used to be) could get just so far and then realise that it was impossible to proceed.

You may already know about this website but having tried it myself I can recommend it. Without making too many commitments, I would add that I am happy to advise any of your readers of my experience.

**Doug Howat G7FCO**  
Bristol

**Dear Don,**

The *ARRL Handbook* (updated annually) is worth a look because there are usually a few drifting about in cyberspace although they're more adverts than articles.

The *All About Circuits* forum (URL below) has a book section that's worth a look. A rival forum, *Talking Electronics*, has a few books for free download too.

[www.allaboutcircuits.com](http://www.allaboutcircuits.com)  
[www.talkingelectronics.com](http://www.talkingelectronics.com)  
[archive.org](http://archive.org) is mostly an archive of expired copyright publications but there's also more modern and relevant stuff if you hit the right search words. Databook, for example, will get you a lot of hits, although the user interface is a pain and you have to sign up.

Survivalist blogs/archives are also worth sniffing out. Some of the content assumes there will be a need to rebuild some form of communications in a post-apocalyptic barren landscape. Some of them have got hold of data on surprisingly nifty military tech.

**Ian Field**  
Letchworth

**(Editor's comment:** My thanks for these ongoing suggestions,

which I am sure will be helpful to many readers. When I came into amateur radio, in the 1960s, the majority of new licensees were ex-Services, working in electronics or studying electronics. Nowadays, many come into the hobby from very different and unrelated backgrounds. They enjoy the freedom to communicate over the airwaves but don't necessarily understand the underlying technology. There's nothing like getting hands-on, with the smell of hot solder, and learning by building.)

## Amateur Radio in Germany in WWII

**Dear Don,**

Nice edition of *PW* (August 2019) with some very interesting stuff in it. I am determined now to go to my local haunt, Pepperbox Hill, and do what **Joe MW1MWD** could not do

– make a few QSOs from atop that mound. In fairness to Joe (please don't tell him!), I have tried many times from the top of Pepperbox and almost all my expeditions have failed to bear fruit. We used to run the Andover IMD event from there many years ago but I can't recall with what success. The trouble is it is mostly dry chalk and rather poor for RF. I think **Marconi**'s true genius was in sales and marketing rather than radio design and development – a bit like the Big 3 today then!

Anyway, the reason I am writing is that in your August *Keylines* you state that the Germans closed down all the amateur stations in WW2 for fear they might be spies. This is not true. The German state specifically allowed some DL amateurs to remain active during the war and there are some good stories behind these (*Morsum Magnificat* carried at least one, wherein a German amateur was instrumental in

saving his friend, also a pre-war amateur, from a toasty death after he crashed in the desert).

German amateurs were active both to present a civilised face to the world at large and to garner information, so precisely to be spies if you like. This latter point was also considered a valuable function of their own amateurs by the Allied governments.

**David Perry G4YVM**  
Salisbury

**(Editor's comment:** Thanks David, I stand corrected! Some interesting history that I was unaware of.)

## 144MHz and the WRC Threat

**Dear Don,**

There were comments in the September issues of both *PW* and *RadCom* about the 2m band potentially being shared by the aeronautical service with a consequential loss of its primary use by UK amateurs.

My immediate reaction was "so what?" From what I can hear almost no amateurs seem to use 2m anymore, clearly indicating they do not need or want the band, so why not let somebody else put it to good use?

I've never been terribly interested in any band below 10m due to the limited range compared to HF but around 1985 I moved to a house with limited space for antennas so I decided to try 2m, bought an Icom transceiver and a beam and tried to work anybody within range. Calling CQ generally proved fruitless, nobody wanted to work anybody new. I found that no 'ham spirit' as I understand it existed in the people who used 2m so I sold the 2m radio. A few years later I tried 2m in the car, easy to install, and used to regularly work a couple of locals driving to work, which was fun.

2m around here used to have reasonable local activity but now it is completely dead, even repeaters are idle. I have no idea whether the various digital modes that require more computer input and less operating skill are widely used but it's the demise of amateurs actually talking to other amateurs that I find strange. Presumably contests may bring some temporary activity to the band.

Every radio dealer advertises a huge range of 2m equipment, which I assume get bought by enough amateurs to keep manufacturers profitably making and dealers profitably selling 2m radios. Yet 2m remains seemingly unused. It seems strange to me to spend money, sometimes a lot of money, on equipment you don't use.

Obviously, my comments can only relate to what I hear, or more accurately don't hear, at my location. Maybe the rest of the country is buzzing with 2m activity, but I doubt it. Or am I in a 2m black spot where no 144MHz signals reach? Again, doubtful since at 150m ASL and clear all round this is probably a good VHF location.

If my impression of 2m is typical of the UK's inactivity on that band, I find it quite strange that people are now complaining about the possibility of losing or sharing a band that they don't bother to use. Why not let others use the band? Radio amateurs have shown by their lack of interest that they do not want the 2m band.

Or am I missing something...?  
**Ken Filmer G3XPO**  
Kent

**(Editor's comment:** Thanks Ken, a controversial view, perhaps, but based on your actual experience, which I suspect is not uncommon. I recall the time when every FM channel would be busy

for much of the time and any opening would fill the lower end with CW and SSB signals. But the abolition of the Morse requirement appeared to lead to a mass exodus to the HF bands. Other than the weekday Activity Contests – when leading entrants can work 200 stations in a couple of hours – the band is often dead. In this issue, Tim G4VXE is encouraging readers to return to 2m and I can only echo that – use it or lose it!)

## Planning Problems

**Dear Don,**

If you have problems with Planners, get in touch with your RSGB Regional Manager, they are there to help. I had a problem that started with a letter from the local council saying I had breached the planning rules and must take my antenna down within three weeks. This came as a bit of a shock to me.

I have been unwell with mental health issues, depression, low mood and anxiety. I had been getting better and doing well but this letter threw me off on a bit of a wobble and I just wanted the problem to go away. I couldn't face ringing or meeting with these people who wanted me to remove my antennas.

I was talking with an amateur friend and he said this area manager was in his radio club, should he pass on my number. I said yes and later the same day I had a call from Ian Douglas Region 4 area manager. He was very understanding and asked if he could come along and have a look at the offending antennas. The very next day we met and he was great. He looked at the antennas and information that I had, then he explained about a four-year rule. He said he would put a case for me to keep the antennas. The next day he phoned and said he had arranged a meeting with the Council planners. I panicked a

bit but he understood about me not wanting to see them and he had arranged to do everything for me. This was a great relief for me. He went on to explain what he was going to say and show them the proof I had that they had been up for more than four years. Actually, it was a Google Earth picture dated over ten years ago.

All the time he kept phoning to make sure I was fine and not doing anything silly, such as removing the antennas, which is what I felt like doing.

Obviously, I was happy to talk with him. What a great guy. In the event, he went to the meeting and had a good result. They discussed my antennas, how they had been up a long time, except one which they continued to argue about. Eventually Ian came out the meeting happy that all was fine provided I could prove that I had had this one antenna for more than four years. I found my receipt, which showed what they needed, and this he sent to them.

All this effort travelling to see me, travelling to the meeting with the Council planners and preparing his notes, was a lot of work and I am so grateful for all of this.

The RSGB have a great team who are really understanding and well informed of planning laws and dealing with people like myself who have a few problems. I am very pleased how they all have helped me, especially Ian Douglas, who is a fantastic, understanding and encouraging person. He was generous with his time and very considerate around my needs. I thank him very much.

A very happy RSGB member  
**Andy Forster G0UYG**  
North Yorkshire

**(Editor's comment:** Thanks for this Andy. I believe that, strictly speaking, the help of RSGB

planning volunteers is for RSGB members, one very good reason to be a member. Dealing with local government officials can indeed be stressful but, as your situation demonstrates, provided it is handled the right way, the outcome can be positive.)

## Lindars Radios

**Dear Don,**

Many thanks for the News item last month (p.10) with the museum picture, it was very much appreciated. In fact, the article has drawn quite a bit of attention, especially the picture of the museum! I wondered if your readers would be interested in some information, prepared by Rob G3MYM, about what was actually in the picture.

The three radios at the back of the table are (left to right) a mid-1920s American 3-valve Crosley Trirdyn 11Z1 reflex receiver, a very rare 4-valve Atkinson 1-V-1/2 receiver circa.1924 and a 1945 WWII Medium and Long Wave utility broadcast receiver.

At the front of the table are (left to right) a rare 1920s French Z slider coil crystal set, a 1920s inter-valve transformer, a 1920s inter-valve resistance capacitance coupler, a WWI R valve, an early 1920s 2.000Ω drive unit for an Amplion horn speaker, a British general aerial tuning unit for O-V-O, O-V-1 and O-V-Z home-made receivers, a small spark transmitter about 100 years old, a Les Logan Speed-X 510 semi-automatic Morse key circa.1940 and an early 1920s Gamages Morse key.

If any PW readers would like more historical or technical information about any of the above items, why not come into the shop in Yeovil, see the real thing and ask questions or give us a call on 01935 474265 and have a chat about them.

**Justin Lindars 2EOJVL**  
Lindars Radios,

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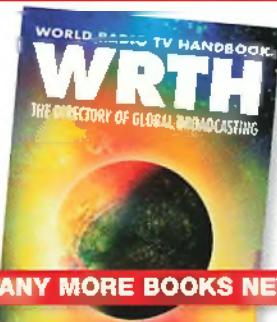
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**MAKING WAVES, THE SUNSPOT MINIMUM** Steve White G3ZVW takes a look at what's happening with sunspots!

**IN FOCUS – ML&S** We have another of our vendor profiles, this time it's Martin Lynch & Sons.

**CARRYING ON THE PRACTICAL WAY** Don G3XTT takes a look at the benefits of Powerpole connectors for our amateur radio activities.

**PSU CURRENT LIMITER** Eric Edwards GW8LJJ describes a variable current (and voltage) add-on unit for high current power supplies.

**THE FORGOTTEN FIRST LADY** Our lady pioneers don't always get the recognition they deserve. Dave Gordon-Smith G3UUR aims to put that right with a look at the life of Beatrice Saltmarsh G6SF.

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# Yaesu FTdx101D (100W)

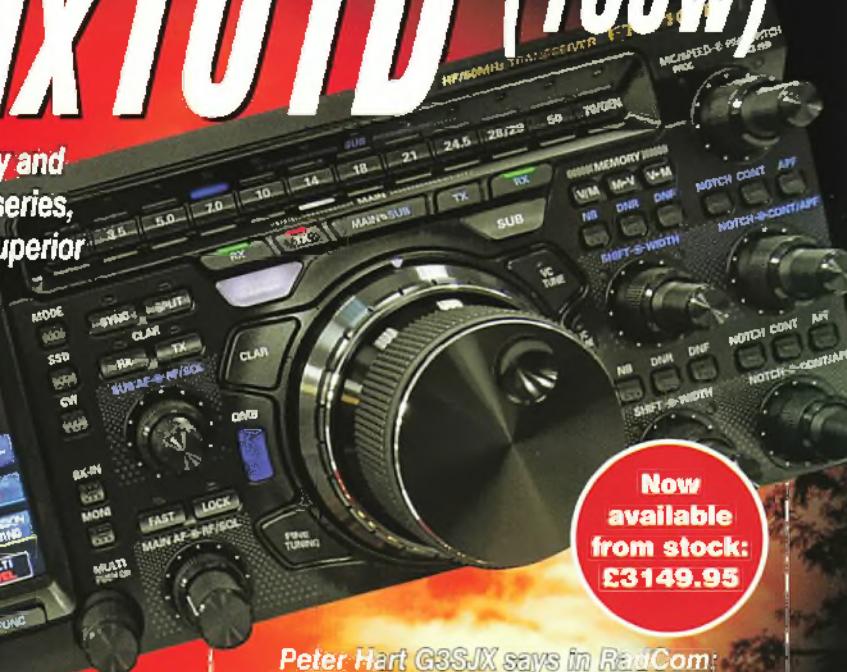
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- 3DSS (Three Dimension Spectrum Stream) Waterfall Display
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\*70MHz Output Power TBA



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*In Homage to the Founder of Yaesu – Sako Hasegawa JA1MP*

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