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WIRELESS

OCTOBER 2020 THE UK'S NUMBER ONE AMATEUR RADIO MAGAZINE SINCE 1932

RESISTORS & RESISTANCE | A look at their many uses



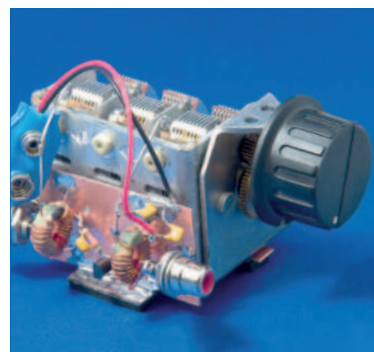
YAESU TEST

We put the versatile FTM-300D transceiver through its paces



Getting started

Looking at the RSGB's 'Beyond Exams' initiative

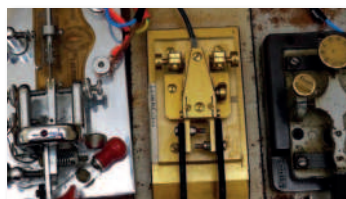


G3RJV revisited

Assessing the pros and cons of this preselector

MORSE An update on CWops and more

The world of continuous wave transmission and a curious key



HOW TO A weather watcher's guide

Log meteorological conditions using your radio and computer

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Peter Waters G3OJV



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Peter Waters G3OJV, operates the first FT-dx101 to come into the UK.

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Components for PW projects

In general, all components used in constructing PW projects are available from a variety of component suppliers. Where special, or difficult to obtain, components are specified a supplier will be quoted in the article.

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We can supply back issues, but we only keep them for one year. If you are looking for an article or review that you missed first time around, we can still help. If we don't have the actual issue we can always supply a photocopy or PDF file of the article.

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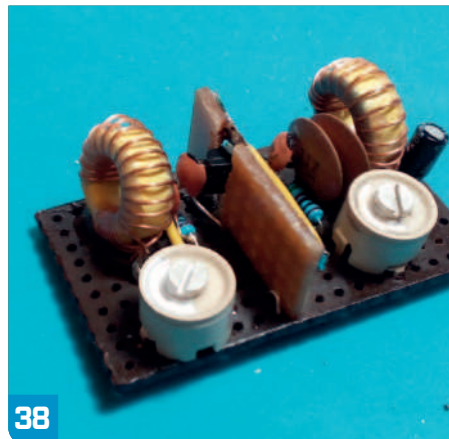
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Topics this month include a return to the hobby, electron flow, contests and more.



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Life is gradually returning to (the new) normal and here in rural Somerset it can be hard to understand what all the fuss is about although I do realise that things have been a great deal tougher in metropolitan areas.

Foundation Licence

As I mentioned in a previous *Keylines*, my ten-year old granddaughter has been studying with the Essex Ham online course for the Foundation exam which, I'm delighted to say, she has now passed.

It's been quite an eye opener. I know there are plenty of old hands who scoff at how easy it is to get started in the hobby nowadays. However, coming at it, as she did, from a position of knowing nothing about radio, the syllabus is actually quite daunting, covering a wide range of topics from antennas to radio theory, from licensing conditions to dealing with interference. While I can accept the need for all this at Intermediate or Full licence level (ie for those who have tried the hobby and want to pursue it further), I'm having trouble reconciling it with the needs of someone who is going to be restricted to 10W from a commercially manufactured transceiver (or approved kit).

Does a Foundation licensee really need to know that mains is at 50Hertz, that the ionosphere reaches to 400km (how many Full licensees would know that?) or, dare I say it, even Ohms Law? We can learn to drive a car without needing to know what goes on under the bonnet. Yes, licensing regulations and basic operating, sure. And something on EMC. But as for the rest of it?

I'm far from convinced. In a recent *Letter* a correspondent mentions the low cost of entry into other hobbies such as railway modelling but perhaps more to the point, there is no exam to be passed to try them out.

While in these pages we have seen a recent discussion about the proposal for a Beginners Licence, I would be more inclined to recast the current Foundation licence, either reducing the pass mark (19 out of 26 would be a Distinction in pretty much any other exam) or simplifying the syllabus, or both.

And, incidentally, one of the biggest hurdles faced by my granddaughter was



the 'grown up' language of the questions, using words such as 'mandate' and 'utilise', which she had not previously come across and which, to my mind, are actually unnecessary in setting the questions – maybe a case of the questions having been drawn up by a worthy committee of elderly men?

Of course, we can all be delighted at the number of newcomers to the hobby during lockdown, but I have a feeling many are older and maybe have an existing background in electronics.

I'd welcome reader thoughts, as always.

Clarification

Our *Icom Antenna Switch* article last month appears to have caused confusion in some quarters, if only because the author had put the word *Icom* on the front of the unit. Just to clarify, this is not an *Icom* product but a homebrew project intended to work with the popular *Icom* IC-7300 transceiver (but which can also be made to work with other gear too).

PW Contents

I must apologise that last month's *Coming Next Month* listing turns out to have been something of a work of fiction in that most of the highlighted articles don't appear in this issue (though they will feature next month). But I did want to squeeze in the FTM300D review and a couple of other articles that were equally timely.

Don Field

Editor, *Practical Wireless Magazine*

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Newsdesk

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



Virtual Ham Expo

Eric Guth 4Z1UG reported that more than 12,000 had registered to attend the first QSO Today Virtual Ham Expo, August 8/9th. This event was rather different to the more typical online presentations and meetings. Expo was built on a live virtual platform commonly used by Fortune 500 companies and major universities. The platform simulates a convention experience with an exhibit hall and booths staffed by live attendants, a speaker auditorium, and even a lobby. Attendance just requires an internet connection and a computer, tablet or smartphone.

The Expo offered four separate speaker tracks focusing on a range of topics. Speakers were also be able to provide related material, such as slides and white papers, that attendees could download. Every session had a Q&A where attendees were able to submit questions in real time via chat. More than 30 booths were open for attendees to visit, and exhibitors were offered different options to engage with attendees. Exhibitor booths could provide downloadable content, such as videos, spec sheets, and manuals, and attendees were able save content in a virtual briefcase to read later. Visitors were also able to interact one-on-one with booth representatives, using a Skype-like system. "The experience of a virtual expo is not meant to replace in-person conventions," Guth said. "However, I strongly believe that virtual events in our community are here to stay. Given COVID-19 and its likely lasting impact on travel, especially given our demographic, this virtual expo enables the ham community to continue coming together to learn and engage."

Guth said that younger hams who have grown up with the internet will feel comfortable with the Expo platform, "making it easier for them to participate and find their place in this remarkable hobby."



New from Nevada

Nevada are pleased to announce the Alinco DM30G, a new 30A (peak) switch mode power supply. The Alinco DM30G is fitted with two pairs of Anderson 5A Power pole sockets on the front panel, as a handy way to feed ancillary equipment. For the main 30A connection a pair of standard terminals are mounted on the back panel. The power supply features a large clear digital display of Voltage and Current, a fixed 13.8V switch or a Variable Voltage control and short circuit protection.

The DM30G is ideal for powering an HF transceiver, as it is reasonably low noise, but with a variable noise offset control, if required. The Alinco DM30G sells for £109.95 and is available from Alinco UK distributors Nevada Radio:

www.nevadaradio.co.uk

Following the success of the event, the plan is to run two such events annually from now on, the first being next March.

PJ4TEN

PJ4TEN is a special event station that will be active during October 2020 to commemorate the 10th anniversary of '10/10/10' - October 10th, 2010. On that date the former country of the Netherlands Antilles was dissolved and Bonaire became a 'special municipality' of the Netherlands. As a result, Bonaire became a new DXCC entity on that date.

To mark the 10th anniversary, Bonaire's radio amateurs are organising a month-long operating event. A PDF award will be available to those who achieve 10 points by making contacts with PJ4 stations during October. There is no fee and no QSLs are required. The rules for the award can be found on the PJ4TEN QRZ.COM page at:

www.qrz.com/db/PJ4TEN

PJ4TEN QSL information is via Tim Beaumont M0URX, direct, via OQRS and via LoTW.

QSL Gallery

The large collection of QSL cards on *Les Nouvelles DX's* website has been updated. Sixteen different galleries include 18,032 cards for the ten Most Wanted DXCC Entities (2010-19), the 62 deleted DXCC Entities, obsolete prefixes, stations from Maghreb from 1945 to 1962, Allied Forces stations in Germany (1945-70), special stations commemorating ITU and IARU, stations using the United Nations prefix (4U), Antarctic bases and TAAF (Terres Australes et Antarctiques Françaises), the various French DXCC island Entities in the Pacific Ocean, the Indian Ocean and the Americas (from 1945 to 1969), pre-1945 countries, French Departments and CONUS, plus a gallery for cards not accepted by DXCC. Your participation is encouraged:

www.lesnouvellesdx.fr/galerieqsl.php

Read more radio news and reviews at www.radioenthusiast.co.uk/news

New (EMC) Coordinator for IARU

The International Amateur Radio Union (IARU) Administrative Council has appointed **Martin Sach G8KDF** as global Electromagnetic Compatibility (EMC) Coordinator, succeeding **Tore Worren LA9QL**.

"EMC is a major challenge for all radiocommunication services", the IARU noted. "Radio amateurs are experiencing increased interference caused by unwanted radio frequency emissions from a wide variety, and rapidly growing number, of electronic devices."

The EMC Coordinator's mission is to ensure that the concerns and needs of radio amateurs are effectively addressed in international standards bodies – particularly the International Special Committee on Radio Interference (CISPR) and the International Telecommunication Union (ITU) – as well as in regional telecommunication organizations and at national levels through IARU member-societies. Assisting in the effort is a network of volunteers with expertise in the field of EMC. IARU President **Tim Ellam VE6SH** said, "The IARU Administrative



Council is grateful for Tore's leadership and for his willingness to continue contributing to this vital work. We are fortunate that someone as qualified as Martin is willing to take the reins. He has already represented the IARU effectively at important international meetings and we look forward to working even more closely with him."

Radio amateurs throughout the world support the work of the IARU through membership and involvement in their national IARU member-societies. The IARU needs qualified volunteers in this and other fields.

TX Factor Episode 26

Running slightly behind schedule, thanks to this dreaded Covid-19 pandemic, but now finally reaching the airwaves, it's a bumper Summer edition of TX Factor!

Episode 26 is packed full of pre-lockdown features, including a very relaxed 'tea and biscuits' interview with Tim Kirby GW4VXE as he speaks of his big passion for VHF/UHF operating and shows us around his new home QTH and what surely must be a blank template for some stunning possibilities with antennas!

Bob G0FGX and Mike G1IAR take the lid off Bob's Icom IC-7300 and fit a Radio Analog PTRX-7300 RF interface module. Coupled with an inexpensive SDR receiver like the SDR Play RSP1A and your computer, this board gives you a proper panadapter display so you can use your mouse to click and pounce on the signals you want to hear.

And in a TX Factor breaking news scoop, Bob gets his hands on one of the very first Icom IC-705 SDR QRP all-mode transceivers to arrive in the UK and gives a comprehensive review of all its wonderful capabilities!

TX Factor is proudly sponsored by Martin Lynch and Sons and the RSGB. Episode 26 is viewable in stunning HD on all devices from smartphones to smart TV's and is available at:

www.txfactor.co.uk



Icom Announces ID-52E

Icom has announced details of the ID-52E D-STAR Digital Handheld Transceiver. The ID-52 VHF/UHF dual-band digital transceiver is the latest in a long line of D-STAR hand portables from Icom and succeeds the popular ID-51EPLUS2.

The radio features a large transreflective colour display that makes it easy to see outdoors, even in bright sunlight. The size of the display has also been increased to 2.3in from 1.7in as in the ID-51E.

The ID-52 supports Bluetooth communication as standard. You can wirelessly connect to Android devices with the ST-4001A/ST-4001I Picture Utility Software when the RS-MS1A Remote Control Software installed. The optional VS-3 Bluetooth headset is also available, for hands-free operation.

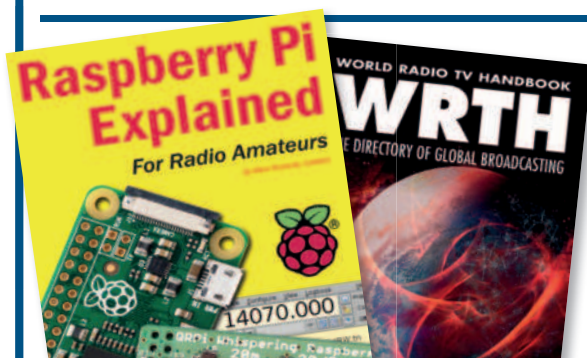
The ID-52 features: Simultaneous reception in V/V, U/U, V/U as well as DV/DV. • Airband reception is expanded from VHF to UHF (225 to 374.995MHz). • Can be charged via a micro USB connector. • Audio output has been increased from 400mW to 750mW. • The latest D-STAR functions allow you to send, receive and view saved photos on an installed microSD card using only the ID-52. • Accessories for the ID-51E, including battery packs and microphones, can be used. In addition to the above, the ID-52 has a variety of other features, including DR function with easy set-up, built-in GPS receiver, microSD card slot, IPX7 waterproof construction (1m depth of water for 30 minutes), and Terminal/Access Point modes.

<https://tinyurl.com/y3mzvvhky>

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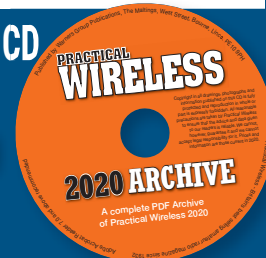
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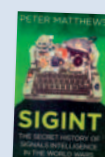
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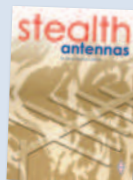
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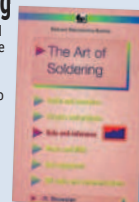
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Richard Constantine G3UGF
practicalwireless@warnersgroup.co.uk

Yaesu FTM-300DE/R

Richard Constantine G3UGF takes a look at the latest, feature packed Fusion-capable transceiver from Yaesu.

There's no doubt that C4FM is now a well-established choice in a maturing market for digital amateur radio. The new feature-packed, FTM-300DE VHF/UHF transceiver is the latest member of Yaesu's C4FM family, offering FM plus, with immediate access to worldwide communication via Wires X™ enabled repeaters.

First impressions count and it's immediately obvious that Yaesu have upped their game in terms of design and construction. They appear to have taken a few styling cues from some other radios, innovated and improved the package overall.

Picking the radio out of the box, you get a shock – it feels a little heavy, but much of that is the substantial 350gram, steel, slide-mount cradle, that fits either above or below the radio. There's a spring-loaded release catch for quick removal, reminiscent of the old FT-290, plus a hidden screw for secure fixing, if preferred. I wouldn't recommend hanging the radio below a dashboard with the self-tapping screws – but who does that any more in a modern car?

Innovation is immediately apparent as the solid, one piece, cast alloy chassis

with steel covers, is a radical, ventilated design that actively draws air through the chassis, courtesy of a really nice, compact, but larger than usual, near silent cooling fan – essential on a dashboard top, or hot climate.

Current consumption is 0.5A receive and 11A transmit for maximum output at 50W with appropriate reductions in 25W or 5W modes. It easily achieves these ratings at slightly less than the 13.8V quoted and there's no sign of overheating.

The UHF PA consumes 1A less than either the FT-400D or FTM-100D models, implying a slightly more efficient PA module and despite having two independent receivers, like big brother, the FTM-400D.

The separate, wideband receivers are optimised for the amateur bands at 0.2µV SINAD (test model squelch opened at approx., 0.18µV on VHF). It has Air-band AM, Marine and PMR receive-only capability, all at slightly reduced but very practical sensitivities.

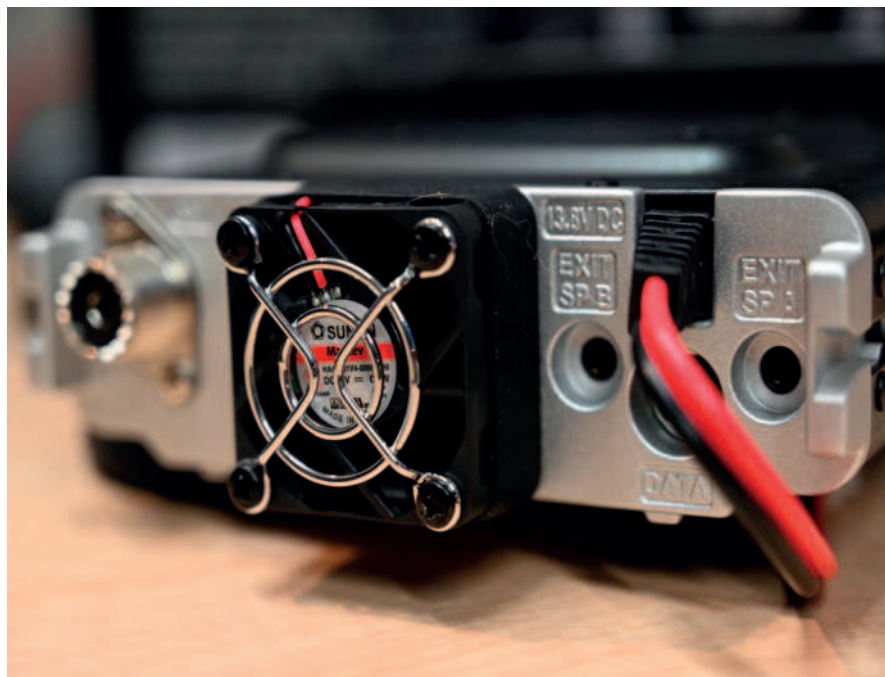
The head unit clips directly to the transceiver body and at last, they've included a 3m remote cable as standard – no need to buy it separately as in earlier radios (I always thought it a little mean, but that's value-added selling for you). A 6m cable is also available.

Unlike some other makers and presumably for manufacturing economy reasons, the microphone socket remains on the transceiver body, less than ideal for remote mounting.

In its one-piece, click together form, there's a small gap on both lower Left and Right front corners of the main body. This conveniently allows the microphone lead to come out either side – a nice touch for Right- or Left-hand drive.

Either by design or default, Yaesu have gone some way to addressing the microphone issue as it's possible to plug their optional, but very costly snapshot microphone directly into the mini-USB data socket on the side of the head unit.

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However, you do lose the benefits of the keypad microphone, now thankfully with larger buttons for Western fingers, a great improvement on the ubiquitous tiny button, MH-48 microphones. An optional mic extension cable is available but, there's another option that I'll come too later.

The 50mm (2in) square, colour display is the same as used in the FT-3D hand portable. Photographs infer that it's larger than it really is, as it's recessed with bevelled edges to reduce reflections and glare in sunlight. It's not a problem and the screen is excellent, better than many, has an appealing typeface, clear and legible at around half a metre – even with my aging eyes. Somewhat puzzling and disappointingly, for FT3D or FTM-400D owners, it's not a touchscreen, which is annoying when you forget.

I do like the permanent display of the supply volts top right corner, plus pushing the SQL button momentarily changes the left-hand volume controls, to allow squelch level adjustments, without navigating programming routines.

There's 3 watts of nice, clear audio available from the onboard, top-mounted speaker. We're all used to having a single 3.5mm rear mounted socket for external audio but uniquely this radio has two! It's possible to combine or separate out the audio feeds from either A or B receivers, or leave the internal speaker connected to the A receiver. I'm not sure how useful this feature will be, unless you are actively monitoring a closed digital/analogue call group of like-minded owners.

Firmware

Gone are the days when a radio came with all its amateur frequencies plumbed in and all you needed to do was to connect up, select the correct sub-audible CTCSS repeater tone and start making friends.

Microprocessors mean that radios now have much more, 'play value'. Equipment is feature rich, requiring firmware upgrades, SD cards, time navigating menus, sub menus, sub-sub menus, programming and storing.

A USB cable is provided for firmware updates from the Yaesu website and both head unit and main body have very tiny concealed switches that must first be changed from Normal to Update.

All memory options can be programmed manually but with 999 available, plus five home channels and 50 pairs of Programmable Memory Scan channels (PMS) it would be a long and laborious job. Readers may be familiar with RT Systems comprehensive, after-market software, but perhaps not realise that Yaesu's programming software is also available free, directly from their website. Plug a 32GB max SD card into a PC and program to your hearts content.

The FTM-300D has another clever trick, in the form of Memory Channel Band, Auto Grouping (MAG). It automatically stores and groups memory channels in each frequency band together, making it much easier to find and select a wanted frequency.

Unlike other models, the SD memory card holder is now located on the head unit,

not hidden between head and body, thus making it easier and quicker to remove and update. There's also a mixed memory bank for your favourites.

Feature Packed

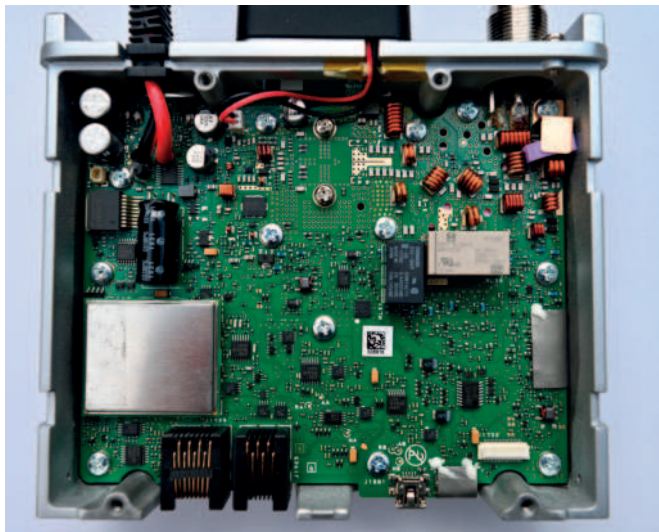
Pressing the Display button enables the fixed centre, 61 channel Band-Scope on the active VFO, temporarily disabling the non-active one. Re-tuning relies on using the VFO dial because the radio doesn't have a touchscreen, so you can't point and 'jump' but nevertheless it's a useful feature that also works in memory mode.

Others include Digital Group Monitor, Message & Paging facility, APRS, Altitude Display, Electronic Compass, Internal GPS driven Clock/Timer, Latitude and Longitude location with back track, external GPS connection, rear panel Data socket, multiple repeater shifts and the ability to name channels, etc. There's more, as this radio is designed for international distribution

Of course, the big plus is the Wires X™ option via a link or repeater. Connecting to an appropriate internet-linked Fusion repeater and pressing the DX button opens up a whole new world. It provides extended UK and European range plus the ability to cross time zones, activate otherwise dormant repeaters and in some cases cross-link to other digital platforms.

Detailing everything you can do would fill every page of *PW* but safe to say, that the FTM-300D does most things well. For more Wires X™ information, see the Yaesu website

Read more radio news and reviews at www.radioenthusiast.co.uk/news



Bluetooth

Earlier, I mentioned an alternative solution to the microphone issue, when using the head unit remote from the transceiver body. This radio comes with Bluetooth as standard, something I first suggested to a manufacturer around ten years ago and something that until recently has been seen as either not relevant, or only available as a costly option.

While claiming that some (but not all) other devices will link, Yaesu have a history of coding their Bluetooth offering to direct buyers to their own product and this radio is no different.

However, the new SSM-BT10 earpiece is in a whole different league from earlier models such as the BH1/BH2 models for the FTM-400D and costs far less.

It's made in the Standard-Horizon factory in China and unlike the former it has no boom microphone, can be charged in-car via USB (big plus!) and resembles the classic mobile phone devices. It comes with a spare ear curl.

Connecting the device to the radio should be straightforward, via the radio's on-screen display, with no codes to enter. However, I did struggle initially to remember the menu sub routines and search function, as it repeatedly confused things suggesting connection to my Smart TV, laptop, mouse and car. Perhaps better to do this somewhere with fewer choices.

It has a practical range of around 3 to 5m. Ideal in-shack range and I've monitored activity from one floor below the radio. I was concerned that the lack of a boom microphone may be detrimental but, as one of my initial trial contacts remarked, "If that's Bluetooth all I can say is that it's the Rolls Royce."

It can be operated either as a PTT device

or with the on-board VOX facility in the radio. Prospective buyers should be aware that it's small, black and easily misplaced but at less than £30.00, not a fortune to replace. I'm considering buying some day-glow paint.

Summary.

Owners of the superb FT-3DE handheld will love this radio, particularly with its familiar, but slightly more comprehensive display. The FTM-400D series is still for me top of the tree, but only just.

As a dedicated mobile, the 400's larger display, touchscreen and some additional functions make it an excellent choice. Thus far and with time restrictions I've not been able to successfully cross-connect either older or newer Bluetooth devices to either radio. I may be doing something wrong but I suspect there have been changes and would urge some caution.

There's no doubt that this new radio with its dual receive, colour display and many other functions eclipses the ever reliable FTM-100D, which I suspect will keep its used value for quite some time. How long it remains in production remains to be seen.

Much, but not all of what I like about the FTM-300D has already been said and its performance can't be faulted, but what about the niggly things I'm not so happy with?

The 75-page handbook is comprehensive but labour intensive, needs patience and a certain mindset. It really needs a hard cover or protective jacket, to prevent it tearing or falling apart. It needs constant referral because learning to operate is made harder by the minimal multiple function, front panel controls. The inclusion of a 'quick guide' card to the more common functions would be a great memory aide.

I would swap the complex multiple audio outlets on the rear panel for a touchscreen any day and the microphone socket really does need to be on the head unit.

Pressing the DX button to engage the Wires X connection defaults the radio to the top A channel frequency. Any Fusion repeaters must be either stored in memory or entered on the A channel. It's annoying if one appears on the B channel, for those keeping VHF and UHF separate on the screen, for ease of use.

I'm at a loss to know why the makers chose to include an A/B button among the few front panel controls when the same function is achieved by pressing the channel dials.

A more useful feature in VFO mode might have been to switch off the CTCSS when shifting from Repeater to Simplex. Presentation wise, the separate Red/Black, DC cables are untidy. They would surely be better as flat twin, figure-of-eight and easier to handle.

Though adequate, the desk stand is something of an afterthought and not really of the same quality as the overall package.

In conclusion, this is an excellent and solid offering from Yaesu that performs well as a mobile or home station, with very good transmit and receive audio. Stand out feature, Wires X excluded is, Bluetooth as standard and the headset is really a must have. My personal rating is, 4.5 out of 5. Current retail, at time of press is, £399.95 + SSM-BT-10 £29.95.

I'd like to thank the ML&S team for their kind support and backup in providing their only shop demonstrator (during lockdown) for this review, when there was an unexpected delay in the availability of the one I now own. It's a keeper.

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High Visibility and Resolution QVGA Display with Exceptional Operability
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C4FM/FM 144/430 MHz DUAL BAND
50 W DIGITAL MOBILE TRANSCEIVER

FTM-300DE



WIRES-X





Mobile Operating and More

Harry Leeming G3LLL is back with more wise words of advice and caution.

Harry Leeming G3LLL
HARRYG3LLL@gmail.com

Unless you drive a mammoth heavy goods vehicle, you will almost certainly have to operate your mobile rig from a 12 volt supply, or will you?

The actual voltage from a car battery while the car engine is running, is normally in the region of 13.5 to just under 15 volts. When the car has been parked with the engine stopped for a while, even with a good battery, this can be expected to fall to around 12 volts. If the battery is a few years old, it may fall even lower long before it becomes discharged, so mobile equipment should be designed to cope with these battery voltage variations, but this is not the only problem.

Pete asked in the shop for 'a bit of wire' to make up a mobile lead for his HF rig and was somewhat shocked when I tried to sell him a length of black and red heavy duty cable. "I don't have to pay for this thick stuff" he said, "The rig takes less than 20 amps on the odd peak, and ordinary mains lead should stand that". He had missed an important point.

Let us say that a heavy-duty electric water heater takes 20 amps and the electricity supply entering your house is 230 volts. If the total resistance of your house wiring from the meter to your heater is 0.1Ω, by Ohm's Law you will lose 2.0 volts in the wiring, but out of 230 volts, you are unlikely to notice this. If, however, the resistance of a mobile lead, plus internal wiring from your car battery to your 100 watt SSB mobile rig, measures even half of

that, it will drop over a volt on voice peaks. When your car is parked and the battery is only giving out around 12 volts to start with, this may then drop the voltage to below that at which the voltage stabilisers in your rig can hold it steady. The result will be distortion and FM on your SSB transmissions, and some very bad reports. You could, of course, start the engine to increase the supply voltage by a couple of volts or so, but you would not want to operate for too long with the engine running when you are stationary. The real answer is to use thick, fused, short heavy duty leads that go directly to the battery. If you are in doubt about your lead try checking the voltage that is arriving at the socket on your rig, as you speak into the microphone.

Power Distribution

Have you got a really big PSU Harry, that I can install in my workshop and distribute the 12 volt supply to all my benches? I told the customer that this would not be such a good idea, due to the voltage drop on any longish interconnecting cables, unless his current requirements were very low.

The electricity suppliers are well aware of this problem. In the early 1900s they did not have power stations belching out smoke on the outskirts of towns, they had them polluting the atmosphere right in the town centre. Why? They generated a 220 volts of DC supply, and if you were far from the generator, the voltage drop caused by the resistance of the mains supply cables would be considerable, so much so that villages and farms a mile or two from the centre could not be supplied with

electricity. Just think of it; to bring a few hundred megawatts of electricity at 220 volts to a large modern town, would require a current of millions of amps. Even if you could construct a thick enough cable, the voltage loss would be colossal.

Now with AC supplies, which can be stepped up and down in voltage by transformers, we have a have a National High Voltage AC Grid that distributes electricity nationwide at 400,000 volts, so even megawatts of electricity requires only tens of amps. From this supplies are tapped off and stepped down to a few thousand volts to supply towns, and further transformed down to 230 volts for local distribution to homes, so that at all times the voltage loss is only a small fraction of the whole.

Static 'Mobile' HF Operation Can Be Fun

Years ago, operating from a home in a very built up area was difficult. I was trying to develop and evaluate various kinds of speech processors, but I suffered from local interference and the constant worry of a knock on the door regarding TVI and BCI. I fought back by using my rig in my car, and until then had never realised just how successful operation from a car could be.

The mobile antenna I used was a multiband G-Whip, which was 'top loaded'. The advantage of this arrangement was that an 'Extension Rod' was available. This increased the height to about 6ft, and while only suitable for static operation, it really did boost the performance and bandwidth. It's a pity that it does not seem to be made any more. As I found, however, the success

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Fig. 1: A plastic trimming tool.**Fig. 2: How to melt wax around coil cores.**

of this type of operation was, as the estate agents say, "Location, location and location".

A quarter-wave loaded whip is only half the antenna system, the rest is the earth return. When a vertical antenna is used at home you normally drive a spike into the ground, add a few radials, and hope for good results. However perhaps due to poor soil conductivity, absorption by local buildings, and local QRM these can be disappointing.

When operating from a car, however, you have a wide choice of possible operating locations. I was very lucky and found that about a mile from my Blackburn home, there was a track on the edge of a playing field, well away from any electrical equipment.

Besides being fairly well elevated it was below the peak of the hill, and so was damp and had deep soil, hence the ground conductivity was good. The car's capacity to ground acted like a capacitor in series with the earth return of my antenna, and the results seemed too good to be true. Perhaps it was coincidence, or the /M callsign standing out, but for the first time ever a ZL station came back to a 15m CQ call.

Such operation, however, has its hazards. Once the police came round, as I had been reported as a 'Suspected Spy', and once the car battery went flat and I could not start the engine. Fortunately, an obliging courting couple gave me a push. If you try static mobile yourself, avoid using an automatic car, and always park facing downhill unless you carry, and preferably operate from, a spare fully-charged battery.

Coil Cores

I had an e-mail from Patrick, who was trying to align an old rig but had found that many of the cores in the coils were jammed solid with what appeared to be hardened wax.

Many rigs have ferrite cores with hexagonal holes in them locked in place by wax. The holes in the cores may seem to be the correct size for an Allen key, but don't be tempted because while a metal tool may fit, it will throw the circuits wildly off tune and may well damage the cores. They should be adjusted with a plastic trimming tool, Fig. 1, but if they are stuck, don't try to force them but apply a little heat. The best way I have found to do this

is to wrap some 18 or 20SWG wire round a soldering iron, leaving about an inch poking out as per Fig. 2 and then insert this into the hole in the core to warm them from the inside (don't get them too hot or you may melt the coil former). This will usually do the trick, and enable you to peak them up with a trimming tool. An alternative, which I have heard about but not tried, is to use a few wax softening ear drops, but whether this will do any harm I am not sure.

Undocumented Modifications

Many of my customers had left instructions with their families, on the line of, "If anything happens to me, and you want to get rid of this lot, see Harry".

I was flattered that they trusted me, and it brought in valuable business, but also a few problems. Sometimes I would go to a house, glance at a pile of equipment, hunt down the accessories and the instruction books, and say something like, "Well most of it seems in good condition, and so I should be able to get a good price for it, let me take it with me, and I will check it over, and phone you". Usually I would then be able to check what repairs were needed, and phone them with an offer that covered my costs and a reasonable profit margin.

When I sold equipment on behalf of a customer I did not usually give a long-term guarantee, but sold it on the basis of seven days approval. I always wanted, however, to be in a position to carry out repairs if there was ever trouble in the future, and this was a problem if there were undocumented modifications. Sometimes I would find bits of Veroboard hung in the wiring with no details added to the manual, and occasionally when I did not know what the bits were for, I would have to contact the seller and ask them to come in and have a look at the equipment. I would then point out the problem and quote them for restoring the rig to its original state. Sometimes they just took it back.

"There is nothing so certain about life as its uncertainty" Do your family a favour then, and jot down the details of any mods in the back of the manual, along with any instruction leaflets, now!

Bert said it was his Biggest Mistake?

Bert's wife was getting fed up with him "Making the house seem like a junk shop", and one day things came to a head.

Bert had spotted a pile of WW2 radio equipment in a local auction, and as it looked quite clean he wondered how



little it would sell for. No one else seemed interested, so he did not start bidding until the auctioneer came down to £10 and then, much to his surprise, the hammer came down and it was all his.

He arrived home with the car boot and the back and passenger seats full, to be greeted by his wife. She looked in the car with horror and exclaimed, "If that lot comes in the house, I'm leaving".

That was when Bert said that he made his mistake. He got rid of the radio equipment and tidied up the spare room.

AnyTone

Qixiang Electron Science Technology Co.Ltd. is a high-tech company with more than 25 years built-up experience of research, production and sales in the wireless communication equipment industry. There main products include Digital and Analog Portable Radio/Mobile Radio/Repeater and System, 3G/4G POC Radio and System, CB Radios, Marine Radios, GSM/CDMA/DCS/PCS/3G Repeater and other wireless communication devices and industry application solutions.



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WATTS

Mobile Transceiver

AT-778UV Dual band FM mobile 2m/70cm radio (136-174MHz & 400-490MHz) 25 Watts, 250 channels£99.95
AT-5189 Single band FM mobile 4m radio (66-88Hz), 25 Watts, 250 channels£169.99
AT-588 Single band FM mobile 4m radio (66-88MHz), 40 Watts, 200 channels£169.99 £149.99
AT-5555N Single band AM/FM mobile 10m radio (28-29.700MHz) 30 Watts£199.95 £159.95
AT-6666 Single band AM/FM/USB/LSB 10m radio (25.615-30.105MHz) 60 Watts£199.99 £169.99
AT-D578UV Pro FM/DMR mobile radio This AT-D578UV-pro is a true TWIN band radio for digital DMR radio systems, compatible to MO-TOTRBO Tier 1 and 2. Traditional FM is of course equally supported. In contrast to many other DMR radios the AT-D578UV offers real VFO operations, which makes it much more suitable for amateur radio. Here you can adjust frequency and other parameters as you are used from traditional radios, instead of just using pre-programmed memories. Ofcourse the AT-D578UV offers these memories as well, quite a lot: 4000 to be precise. But you are not limited to those memory channels.£349.99

GJ-0485 power supply for Anytone D578UV
£119.99



Handheld Transceiver

AT-D868UV handheld radio is a VHF and UHF radio with both Digital DMR (Tier 1 and II) and Analog capabilities. Includes GPS Offering a total of 4,000 channels (Analog and Digital), 10,000 Digital Talk Groups, and up to 150,000 contacts, as well as multiple DMR ID numbers (Radio ID's) for a single radio.£129.95
AT-D878UV PLUS BLUETOOTH Digital DMR Dual-band Handheld Commercial Radio with Roaming and GPS VHF/UHF Dual-band Digital/Analog Part 90 DMR commercial transceiver with 1.77 inch colour TFT display and GPS. This model includes DMR Roaming, faster processor and larger memory for future enhancements. Ideal for Fire, Search & Rescue, EMS, Police, Sheriff, Forestry and Security operations. Frequency coverage 140-174 / 400-480 MHz£199.99

Accessories

CPL-02 Battery eliminator for AT-D868UV£9.95
CPL-01 Car charger for AT-D868UV£8.95
CPL-05 Speaker microphone for AT-D868UV£19.99

VGC



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WATTS

Vero Global Communications compant is a science and technology enterprise in Fujian Province, specializing in R&D, production and sales of electronic products and accessories such as radio communication equipment, alarms, radio frequency smart cards, and GPS equipment.

Mobile Transceiver

VR-N7500 is a brand new 50 watt VHF 40 watt UHF Headless mobile transceiver with a solid build quality. It is very different in design compared to any other radio used mobile or base The VR-N7500 uses a smartphone as a control panel and the body is installed in the boot or similar with the mobile phone connected to the body through Bluetooth. The cars hands-free intercom can be utilised through the vehicle Bluetooth and PTT is by th esupplied Bluetooth PTT£189.95

BAOFENG

Started in 2001, Baofeng has always been aiming at creating user value and innovating products. From the first small factory of more than 30 people, Baofeng has developed into a high-tech enterprise specializing in R&D, production, sales and after-sales service of handheld wireless walkie-talkies as well as accessories.



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WATTS

UV-9R PLUS DUALBAND HANDIE

140/174/400-470MHz, IP67 waterproof & dust-proof (Not diving), Relay Forwarding Confirmed, Dual Band, Dual Display and Dual Standby, High & Low Power Switchover. Everything you need for just £34.95!

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UV-5RC PLUS Latest version of this ever popular dual band handie - and now with a 4.5W on 2m - Comes complete with desktop charger, antenna, belt clip & high power 1800mAh battery£29.95
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DM-9HX DMR radio Tier II VFO digital & analogue dual band UHF/VHF handheld transceiver£89.95 £69.95

Accessories

UV-5SM Branded speaker microphone for all listed Baofengs£9.95
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John Adams G3ZSE
g3zse1@gmail.com

In Part 1 we began to appreciate that a passable station on 630m is possible for many amateurs with standard size properties and modest equipment. Moving on to transmit, rather than just receive, is a little more involved. Here I will outline my approach, which may then act as a framework that you may need to modify, depending on your equipment, circumstances and ambitions for the band.

The Transmitter

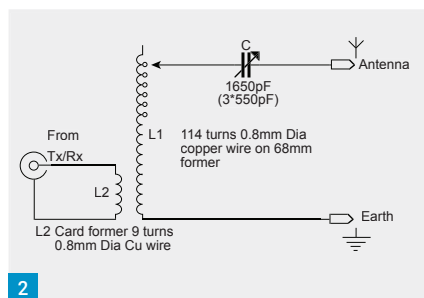
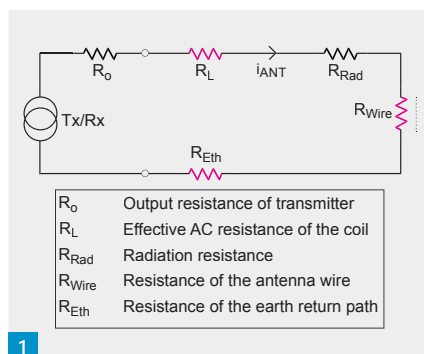
There are a number of possible options for a transmitter. I use my old Icom IC-706 MkII, which I wide-banded some years ago. A number of Icom rigs, when wide-banded, will give an output at 472kHz. The waveform has a lot of undesirable harmonic content, but the ATU cleans this up. Operating outside the manufacturer's parameters has to be at your own risk, of course, but the IC-706 is used by a number of people on the band and performs adequately, provided the power is set to the lowest level. Additionally, I cool the IC-706 with an outboard fan, regardless of the band, mode or power, as I find it never runs too warm then. The IC-706 low power setting on USB is 4W, but at 472kHz it produces 3W. Don't increase the power – it may dissipate too much heat internally. I regularly leave my IC-706 on a transmit/receive cycle on WSPR overnight, and all has been well. Other options are to use a transverter (see links on 472khz.org), or to use a modified audio amplifier. I recommend starting out with transmitter power in the 3 to 10W range, as it keeps things simple and voltages lower, and will provide a working station on 630m. The transmit power allowed at the antenna is 5W EIRP (effective isotropic radiated power). To achieve that you may need a 1kW amplifier though.

Losses in the Transmit System

The diagram, Fig. 1, shows the equivalent circuit of the transmit system for a vertical antenna with a physical earth arrangement. In an ideal world we would only concern ourselves with the radiation resistance. At VHF you will often have a simple antenna of around 50Ω radiation resistance, and the unwanted loss resistances (shown in red in Fig. 1) would be either absent or negligible. R_L is the effective AC resistance of the main ATU coil, and may be about 6Ω. (The inductance calculator on the Hamwaves site is useful to show this element.) R_{RAD} will be

Making a start on the 630m band

John Adams G3ZSE explains transmitting on 630m – an easy approach.



far less than the 50Ω we would like – it may typically be 0.15Ω only. R_{WIRE} will be fairly low normally (but usually greater than R_{RAD}). R_{ETH} is generally the big one – weighing in at 20 to 40Ω. We need to maximise the i_{ANT} , the current in the antenna, to maximise the radiated power in a short vertical antenna. This is because the power will be equal to the current squared multiplied by the radiation resistance. The best chance of maximising i_{ANT} is to reduce the losses, particularly R_{ETH} . Inevitably we still end up putting most of the power into heating the earth, and we can only achieve a very low overall efficiency.

The Antenna and Earth

In Part 1 we looked at antennas and earth systems. The key thing is to do the absolute best possible to achieve a high vertical section with a horizontal top. I use a doublet antenna with the feeder wires strapped together at the shack. An inverted-L wire is also a good option. I know it is possible to use a VHF beam with the feeder strapped at the shack. Do take

care not to use systems with components such as inductors, capacitors or ferrites in them. You might destroy these as well as impairing transmission. You will need to have at least one very good earth stake, and preferably more. I live in a suburban area where the soil is heavy clay, and not particularly good as an RF path, but three earth stakes gives me a reasonable setup. I would strongly advise against using loop antennas, either big or small, as the losses will often be worse than a simple antenna. One last safety point – do not link the transmit earth and the house mains safety earth. This is acknowledged bad practice and can lead to dangerous situations.

The ATU

In essence the ATU (Antenna Tuning Unit) shown in Fig. 2 is very simple, but is the crucial part of this project. Be prepared to spend some time experimenting to get it right for your particular antenna/earth system. I recommend looking at the HB9DUL link on 472khz.org. This will give an extra insight to this topic and outline various approaches to the all-important issue of a coil to provide the high inductance required in the ATU.

At the base connecting-point all short vertical antennas 'look' like a small radiation resistance in series with a large capacitor. The goal is to tune out the capacitance with a large inductor, and then match the remaining resistance (including the losses) to the transmitter. Various approaches can be taken, including mechanically complex variometers, to vary inductance and coupling.

After some experimentation I decided to take the approach I use on 160m, and this design has been in use for generations on the low HF bands. L1 is bigger than the inductance required to tune the antenna, so requires capacitor C as well. Because C is variable, this gives a simple way to resonate the system. The capacitor adds additional loss, but not significantly at low power and low current. Fig. 3 shows the implementation, which remains in its

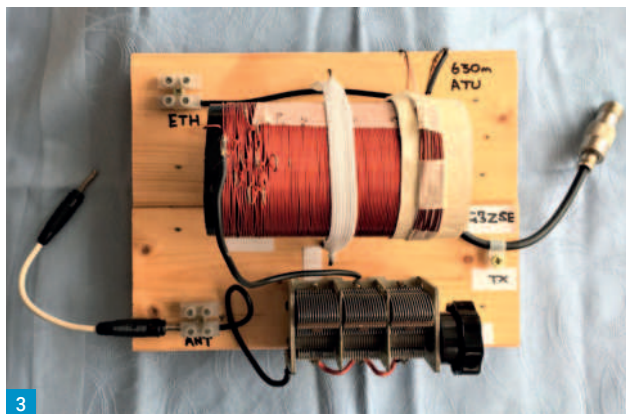


Fig. 1: Equivalent circuit at resonance.

Fig. 2: The Antenna Tuning Unit.

Fig. 3: ATU. Fig. 4: RF ammeter.

experimental state. The main coil former is a 130mm length of standard 68mm rainwater downpipe, wound with 114 turns of 0.8mm enamelled copper wire. This takes about 25m of wire. At the outset I added five taps at points between 92 and 108 turns. These may be fine, but for your setup you may have to add others. It can be a bit tricky partially unwinding and adding another tap, but time spent getting your ATU right is well worth it.

The capacitor I used is an old valve receiver type, with three sections of 550pF paralleled up to give 1,650pF maximum. My system comes to tune with this capacitor about two-thirds meshed. The plate spacing on such capacitors is small but should suffice for low power operation. To couple the tuned antenna/earth to the transmitter a second coil, L2, is used. This is nine turns of the 0.8mm wire wound on to a former made by wrapping some card into a cylinder, such that it is a snug sliding fit over the earth end of the main coil. L2 is held together with masking tape. I have found it works best with the lower end of each coil aligned, but moving it a short way along L1 in either direction may aid tuning.

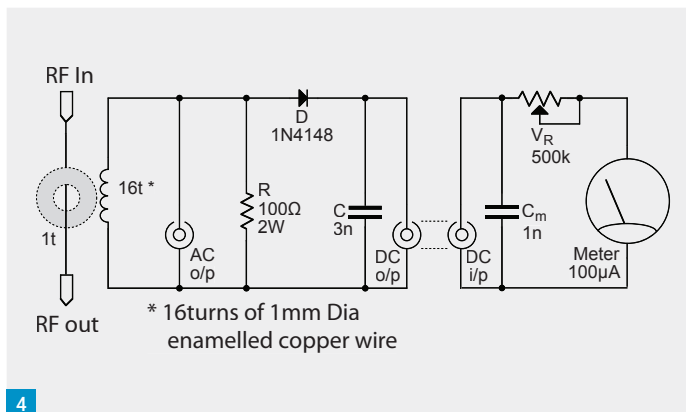
I have found it useful to keep the ATU in a semi-experimental state to facilitate trying out variations in the system. You will find it easier to try things such as different capacitors if your initial ATU is configured using croc clips and choc blocs, before putting it all together. Mine was laid out on the bench prior to assembling it on to a board. If you have software such as MMANA-GAL, you could try modelling your actual antenna. It predicted 0.15Ω for the radiation resistance of mine. Some modern antenna analysers may give you a measurement at 472kHz. Both these methods would throw more light on your

particular antenna arrangement. You might want to try a different coil former, or some thicker wire. The Hamwaves website gives lots of help in coil design if you want to do that. My L1 measures a total of 430μH, and the tap I use is at 380μH.

Assessing Antenna Current

As discussed earlier, we aim for the maximum antenna current i_{ANT} . With my setup I have found that tuning the ATU results in the highest antenna current occurring at the minimum SWR. I use the built in SWR meter in the IC-706 to indicate this. Be wary if you use a separate SWR meter – some have high loss at low frequency. You can test this by tuning for minimum SWR and then removing the meter and checking if i_{ANT} increases. When starting out you have two options – a simple indication of i_{ANT} or making a more accurate measurement of it. You can make a pick-up coil of, say, ten turns of thin insulated wire bunched up, and fit this over the feed to the antenna and feed the small voltage induced across it to an oscilloscope. This suffices to show if tuning is resulting in current increasing or not.

My RF ammeter is built in two parts, the transformer sensor, located in line with the antenna feed, and the display meter linked by a short screened cable. The circuit is shown in Fig. 4 and is one which has cropped up in various forms in various literature for a long time. The photos, Figs. 5, 6 and 7, show the arrangement and boxes I used, although this is non-critical. A plastic box is probably better for the main unit. You could use 4mm post terminals for input and output. I used SO239 sockets and generally use 4mm plugs in the centre contact for 630m. I connected an 'AC' socket to the unit for using the oscilloscope for some monitoring. Initially you will probably be dealing with i_{ANT} in the range 150 to 500mA. R is a 100Ω resistor of 2W rating and this should allow up to 2A to be



measured. I used 4 x 390Ω/0.5W in parallel. You may want to build it all in one plastic box – that's fine.

The critical item is the transformer, where the primary 'turn' is the antenna cable going straight through the middle of the ferrite toroid, as happens in many SWR meter circuits. You need a toroid of around a one-inch centre hole, that is not lossy at 472kHz. Mine is an unmarked grey natural finish of 37mm OD, 23mm ID and 12mm deep. It's useful if the toroid performs the same at 1.8MHz as it does at 472kHz because it is then possible to calibrate the meter by using a dummy load at 1.8MHz and computing the current. You will need to relate the microammeter readings to real current. Thermal ammeters are good for antenna current, but they usually don't go below 1A. If you go for a simple indication of current with a pick-up coil, then with a few watts from a transmitter and a simple antenna as outlined, you could safely assume an EIRP of between 5 and 15mW. Certainly, you know you are well within the licence limit.

Cautionary Note

Large inductances at RF generally lead to very large voltages. A few watts of input power won't get you into any real trouble, but there will rarely be less than 100V RMS at the antenna connection. At the other end of the scale with 5W EIRP you would need to cope with many kV at the antenna, and many high power stations have ended up setting fire to wooden supports such as fences and fascias!

The complete Transmit/Receive Setup

The diagram, Fig. 8, shows the completed setup for transmit and receive. As mentioned, you will need to have a means of measuring SWR, often from the transceiver being used. I often also run another receiver with a very short wire as

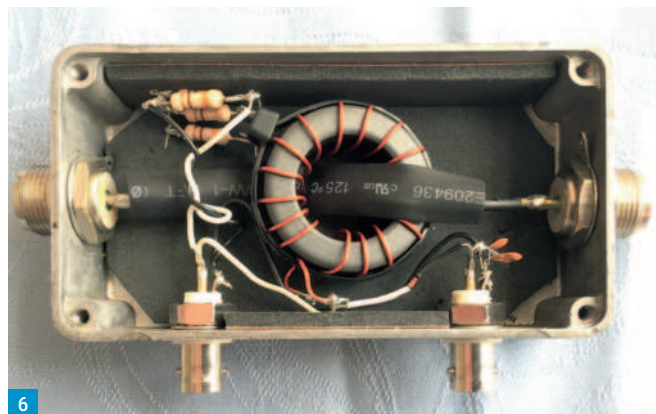


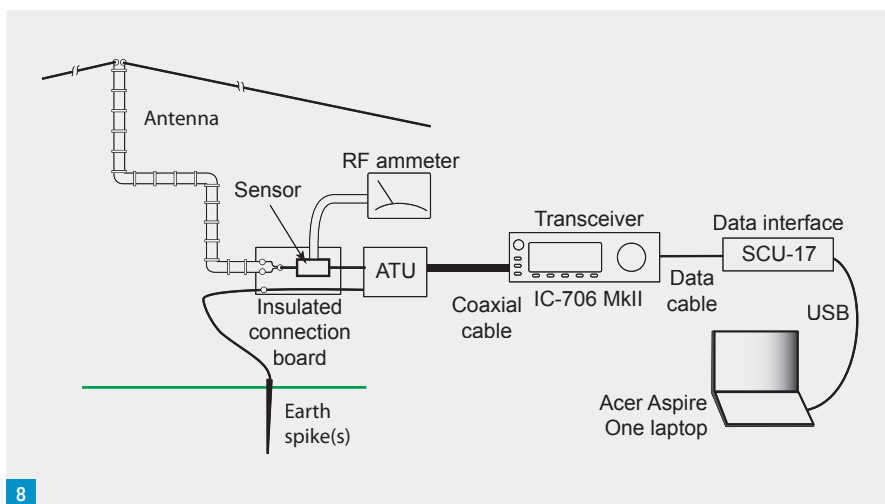
Fig. 5: RF ammeter – boxed. Fig. 6: RF ammeter – inside. Fig. 7: RF ammeter display. Fig. 8: Complete Tx/Rx setup.

an antenna to monitor the signal going out. In Part 1, Fig. 1 shows that I feed the antenna/earth at 7ft above ground level. This is where the wires enter the shack through an air brick. Ground level would be better, but a slightly elevated feed is fine. Feeding the antenna from upstairs though, would probably be less effective.

Going on the Air

You will need to ensure that the 'Radio' tab in the settings for WSJT-X is appropriately set for your transmitter and is working correctly. It might help to consult the WSJT-X User Guide for this. Check that your computer clock is spot on – no more than a second out. Set your transmitter to 474.200kHz USB (or USB data), and then go into the WSPR mode and choose an audio tone frequency in the range 1,400 to 1,600 using the 'Tx (Hz)' box. You can use the WSPRnet website to check nobody else is using that frequency. Ensure the band is set at 630m in WSJT-X and set your power – probably around 10mW. Next set your transmit percentage, starting with something like 25%. The software will transmit for 25% of the time overall, using a random pattern that helps to stop stations all transmitting at the same time and thereby not hearing anyone else.

Use the 'Tune' button on the WSJT-X screen to transmit a signal so you can check SWR and i_{ANT} . Aim for maximum i_{ANT} and minimum SWR. (SWR should be 2:1 or less.) Then ensure your transmit ALC indication is within the zone for sideband transmission. You may need to set the level with a control on your interface unit. When finished, switch off tune, select 'Enable Tx' and 'Tx Next' and wait for the first transmit sequence to commence. After you have transmitted, go to WSPRnet and set up the



database query to see who is spotting you. When conditions are good you can move on to trying the FT8 mode.

What Next?

Options for further experimenting at my station include improving the earth system, trying a bigger coil diameter with thicker wire, looking at higher power and ways to improve the antenna. You may want to try some of these things too.

Useful Web Resources

For everything about 630m, including an excellent 'Useful Links' page:

<http://472khz.org>

For coil calculations and much more:

<https://hamwaves.com>

WSJT-X Installation Package and User Guide:

<https://tinyurl.com/ybugrd7o>

WSPRnet:

<http://wspnet.org>

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Mike Richards G4WNC

practicalwireless@warnersgroup.co.uk

This month I'm continuing my introduction to data modes by looking at the interconnection between your rig and the computer.

Last month we looked at some of the basic principles of the data modes, so here's a quick refresh of the key points.

Telegraph Alphabet: This is the lookup table that's used to convert a keypress on the computer to a number that can be transmitted.

Binary Data: As computers work best with signals that are either on or off, the number generated from each key press, needs to be binary, i.e. only comprising 1s and 0s.

Asynchronous Data: This refers to a signal such as RTTY where each character can be individually decoded because it is wrapped up with additional information to mark its beginning and end.

Redundancy: Refers to any extra data bits that are added to a message, usually to aid synchronisation or error detection/correction.

Serial Data: Data that is transmitted one element after the other, like Morse code.

Frequency Shift Keying (FSK): This is where the transmitter is switched between two closely spaced frequencies, one to represent a digital 1 and the other a digital 0.

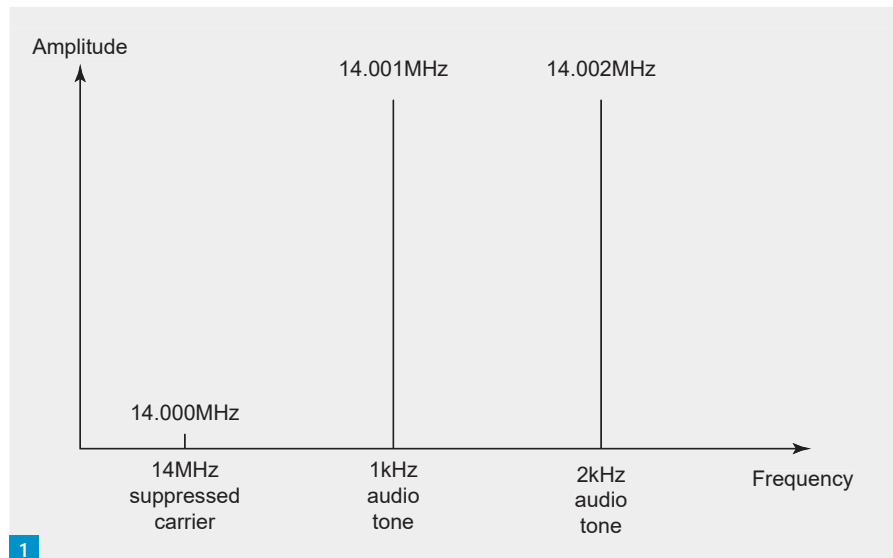
Importance of SSB and Audio Keying

RTTY, as I described last month, was the mainstay of amateur data modes for many years but was hampered by the requirement to own and maintain a teleprinter. These were large, heavy, and noisy machines, so not at all practical for many amateurs. In addition, you needed a terminal unit that converted the $\pm 80V$ from the teleprinter into a signal that could be sent using an amateur radio transceiver. As most amateur transceivers of the time didn't include FSK modulation facilities, a different approach was required. The solution was to use the transceiver in standard SSB mode with two audio tones to simulate the two frequencies that would be used by a true FSK transmitter. This technique is used for most of today's data modes, so it's important to properly understand how this works.

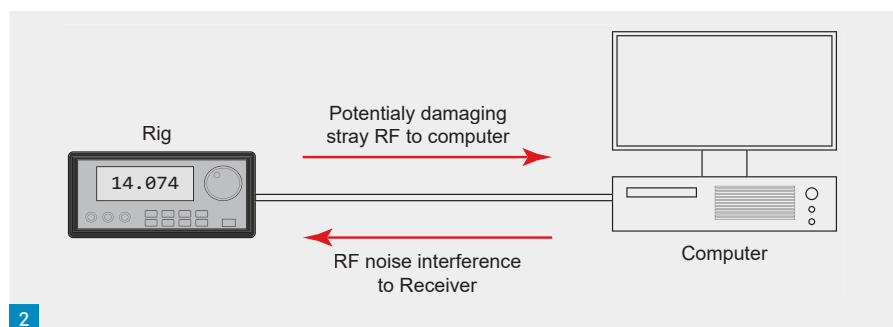
When set to transmit, but with no audio input, an SSB transmitter in USB mode has close to zero output. If we apply a single tone to the microphone input, a

Data Mode Basics (Pt II)

Mike Richards G4WNC continues his introduction to data modes operation.



1



2

single RF carrier will be observed at the output. The frequency of that carrier will be the transceiver tuned frequency plus the frequency of the tone. For example, if we had an SSB transmitter tuned to 14MHz and we applied a 1kHz audio tone to the microphone input, the output would be a single carrier on 14.001MHz. If we changed that audio tone to 2kHz the output would be 14.002MHz, **Fig. 1**. From this, you can see that, to generate an FSK signal, all we need do is apply two audio tones with the required spacing. At the receiving end of the link, the exact opposite happens, i.e. if you were tuned to 14MHz USB, you would hear whatever frequency audio tone is applied to the transmitter. Choosing the right audio tones is important because they need to be somewhere near the centre of the SSB filter passband. If we stray too near the

edges, one of the tones could be affected by the band filter. This can introduce additional losses and propagation delays to one of the tones, which would corrupt the RTTY signal. For RTTY work, there are two standards, known appropriately as high and low tones. The high tones are mainly used in the US and comprise 2125Hz (mark) and 2295Hz (space), while many European stations use the low tones of 1275Hz and 1445Hz. My preference has always been to use the low tones because they are much easier on the ear. I also think that the 2295Hz used in high tones is perilously close to the audio band edge of many SSB transceivers.

I hope you can see from this explanation that we can simulate many amateur data modes by generating the signal at audio frequencies and applying it to a standard SSB transceiver. One extra point to note

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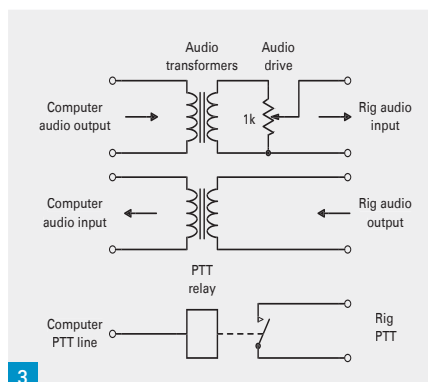


Fig. 1: Using an SSB transmitter to generate FSK signals. Fig. 2: Hazards when connecting computing and radio equipment. Fig. 3: Simple data modes interface providing isolation between rig and computer. Fig. 4: Traditional CAT control using RS-232 standard. Fig. 5: Today's CAT leads with integrated RS-232 to USB conversion. Fig. 6: Selecting your rig in data modes software (WSJT-X).

here is that we always use upper sideband (USB) for data modes, regardless of the SSB convention for the band. This is necessary to keep the tones the right way around. If you were to accidentally select LSB, the tones would appear below the tuned carrier frequency and they would be inverted, i.e the high and low tones would be swapped. Data modes modulation systems using audio tones are usually indicated in the modulation mode. In the RTTY example, the modulation is Audio Frequency Shift Keying (AFSK) as opposed to FSK with a true FSK transmitter. However, the radiated signal is very nearly identical.

It is this simple audio modulation technique, combined with the availability of home computers with soundcards, that has made data modes accessible for most radio amateurs. Today's data modes are all generated and operated entirely from the computer, with a simple two-way audio link to the rig. As the link between computer and transceiver is so important, there has been plenty of activity and new products developed around this area. Much of the early work concentrated on providing better isolation between the computer and transceiver.

There are two potential problems that arise from connecting radio kit and computers, **Fig. 2**. The first is the transfer of RF interference from the computer to the rig, while the other is the risk of high RF levels getting into the computer and causing corruption or damage. The most common solution is to provide

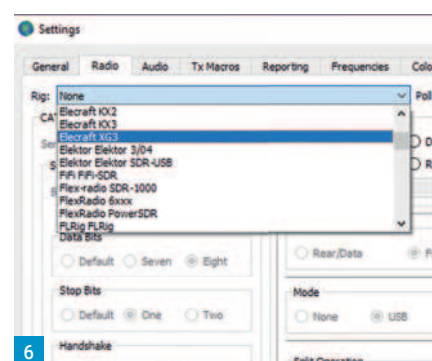
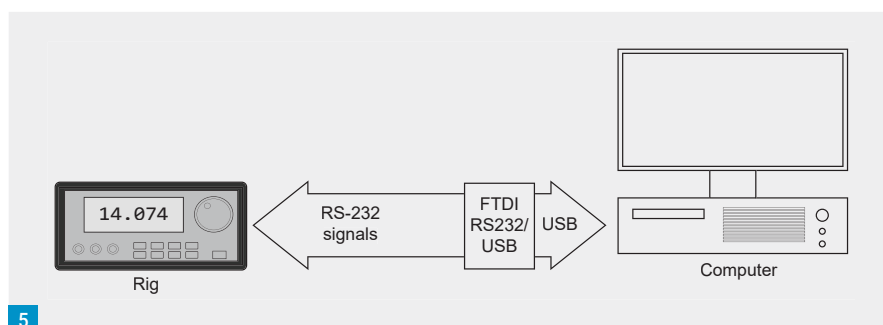
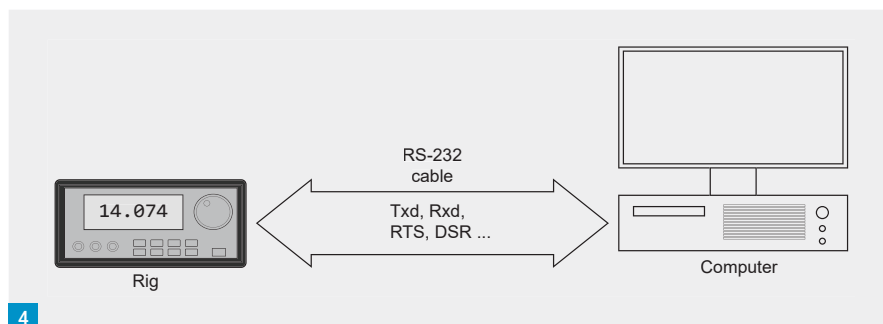
transformer-based isolation for the audio signals along with relay or optical switching for control signals such as the PTT line.

There are a host of products in this busy marketplace but, if you enjoy homebrew, it is easy to build your own interface, as good quality audio transformers are readily available. One especially useful addition to the computer/radio interface is a transmit level control. This can be a simple potentiometer and is useful because many transceivers require different audio drive levels for a given output power as you change bands.

The transmit level control is a convenient way to control the drive. I've shown a typical interface unit in **Fig. 3**. Those of you with the latest rigs may find that their rig includes a USB soundcard and serial adapter. In that case, there is no need for a separate interface as you can plug the rig's USB connector directly into your computer. All the filtering and isolation requirements are met by the rig.

CAT Control

If you want to keep things simple, you will find that most of the popular data modes can be successfully operated using VOX (voice operated switching) for Tx/Rx control. While this makes for a simple station and is great for those testing the water, you will inevitably want to progress to full transceiver control at some point. Full control is attractive because most data modes software can work with a wide range of transceivers so you can



tune around from within the data modes software. The link is also convenient for logging because the rig settings can be transferred directly to the log via the data modes software.

For many years, CAT (Computer Aided Transceiver) control has been handled via a serial connection based on the RS232 standard, **Fig. 4**. This was fine while RS-232 ports were fitted to most PCs, but I doubt you'll find a modern PC with a serial port! Today the link is handled using an RS-232 to USB conversion.

As this is such a common requirement in many computing fields, dedicated chips have been developed to handle the conversion. By far the most common are those manufactured by FTDI. The conversion electronics are so compact that they are often built into the USB plug. As a result, there are CAT control, USB cables readily available for most rigs. You will also find several interface units that provide the audio and CAT connections. The CAT cables/interfaces comprise the

dedicated CAT plug for your transceiver at one end, and a standard USB plug at the other, **Fig. 5**.

With the physical link solved, the next area to consider is how the data modes software will be able to communicate with a wide range of rigs. The solution is to use another software package that acts as an interpreter between the data modes software and the rig. There are several solutions available but the most popular for data modes applications is Hamlib. Hamlib provides a standard way for the data modes software to send and receive commands from the rig. You can think of Hamlib as an interpreter or translator. When the software sends a request to transmit, Hamlib converts that request to the appropriate command for your rig and sends it over the serial link. It can do this for commands in both directions. This is a real bonus for software developers because they only need to learn how to communicate with Hamlib. The onward translation into the rig control system is handled in the background by Hamlib.

Once you have the required physical connections between your rig and computer, you still need to configure a few items in your data modes software. The first is the audio link where you must tell the data modes software which soundcard to use. In the simplest of cases you may only have one soundcard, in which case you may well find it is already selected.

However, if you have a modern rig with a USB link for audio and CAT controls, there will be an additional soundcard on your system, so you need to make sure that's selected. To enable CAT control, you need to head to the Settings - Rig or CAT Control in the data modes software. In this section you will usually find a drop-down list showing all the supported rigs where you can select yours, **Fig. 6**. Selecting the rig is only part of the story because you also have to set up the serial link. For this you need to know the COM port (Windows users) and the baud rate of the CAT link. You often need to enter the number of data bits, stop bits, etc. You should be able to locate all those details in the rig manual.

This month I've covered most of the things you need to know to prepare your station for data modes operation. Although I've covered a lot of detail you can get going very simply using VOX Tx/Rx switching and audio cables from your rig to soundcard. Next time I'll introduce you to some of the popular data modes.

Radio Round-up



ML&S LATEST: ML&S are pleased to announce their recent appointment for the distribution of the mAT Tuner range of products.

The entire range was featured in a recent ML&S *SFTW Video* on their YouTube channel showing how beautifully constructed these new tuners are.

From the miniature mAT-10 portable QRP battery powered tuner to the mAT-40 remote wire auto-ATU, the mAT Tuner range has a product for most automatic tuning scenarios.

The manufacturer has just finished designing a specific QRP tuner for the new Icom IC-705 called the mAT-705. The ultra-compact package is powered by a PP3 battery stored internally and lasts for ages due to the low current design of the tuner. The aluminium shell makes it sturdy, shock-resistant and suitable for portable use. First shipments arrive with ML&S in August 2020 in time for the release of the Icom IC-705 itself.

For the entire range of mAT Tuners see:

www.HamRadio.co.uk/MAT

EXTRA ONLINE SUPPORT FOR NEW

AMATEURS IN THE UK: New licence-holders, especially those who took their exams via remote invigilation, now have a place to call their own. The Radio Society of Great Britain has established a group on Facebook to provide guidance to new amateurs as well as those who are returnees to radio. The group provides guidance on establishing a home station and a connection to a number of experienced amateurs who can advise on a range of issues.

The Facebook page is one of several resources the Society is making available at this challenging time of social distancing. New amateurs interested in exploring this and other resources should visit the website at:

rsgb.org/beyond-exams

It is also worth noting that OFCOM has also made changes in testing for the Intermediate Level licence, eliminating the practical test as it did with the Foundation level. This means Intermediate Level exams can now be given over the internet via remote invigilation.

VIRTUAL AMSAT-UK COLLOQUIUM 2020:

In the light of the current conditions, the AMSAT-UK Committee have agreed that it will not be possible to hold a physical meeting this year. Along with many other organisations, RSGB, BATC, ARRL and AMSAT-NA to name a few, they are planning to have an online 'virtual' Colloquium. It will take place on Sunday October 11th, the day after the RSGB's online event. There will be a number of presentations starting at 1100BST (1000UTC), and there are plans for a number of interactive and demo sessions as well. The provisional timings are:

- 1030 webinar stream open for testing etc
- 1100 Colloquium Opening
- 1300-1400 'Lunch' Break
- 1400-1600 Presentations
- 1700 General Discussion and party session

The event will be free to attend, and you do not have to be a member of AMSAT-UK to join in.

<https://amsat-uk.org>

OCEANIA 2020: Once a year in October the global amateur radio community is presented with the opportunity to partake in one of the world's oldest radio contests, the Oceania DX contest. First established in 1934 and earlier known as the VK/ZL contest, it is one of the most prestigious on the contesting calendar. Mark the dates in October for both Phone & CW, noting the new operating times.

PHONE: 0600UTC Saturday October 3rd to 0600UTC Sunday October 4th 2020

CW: 0600UTC Saturday October 10th to 0600UTC Sunday October 11th 2020

The object is for:

- Oceania transmitting stations to contact as many stations as possible both inside and outside the Oceania region.
- Non-Oceania transmitting stations to contact as many stations as possible inside the Oceania region. There is no penalty for working non-Oceania stations but contacts between non-Oceania stations will score no points or multiplier credits.

www.oceaniadxcontest.com

BARTG DIAMOND JUBILEE AWARD: BARTG is pleased to announce that its Diamond Jubilee award is available. This award is based on QSOs with GB60ATG, which was on the air over a period of 12 months, operated by a team of ten volunteers across the UK, to commemorate BARTG's diamond jubilee (see article in this issue). Each contact with GB60ATG on a new band, mode or UK country counted one point towards the BARTG Diamond Jubilee Award. The award starts at Bronze level at 10 points and goes up to Diamond level at 50-75 points depending on mode.

www.bartg.org.uk

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"easy-to-use device that improves the audio clarity of amateur signals" EQ20B-DSP QST Dec 2019 review

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Tim Kirby

longworthtim@gmail.com

A new IARU Region 1 tropo record was set on July 17th when EI2FG and EA8CXN worked on 23cm during a marine ducting event.

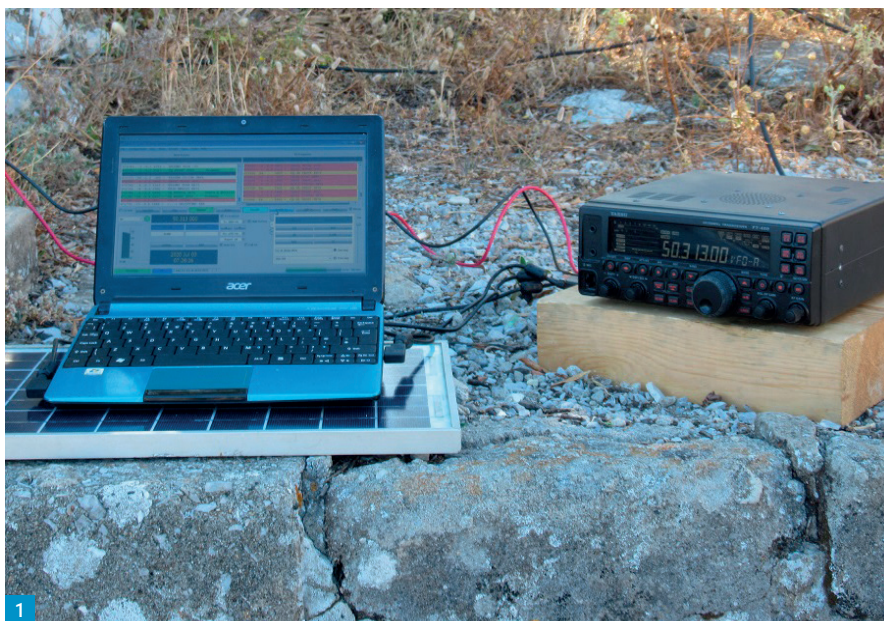
Dave G7RAU on the Lizard in Cornwall was the first to work EA8CXN on SSB using 5W into a 56-element Yagi. **Tim G4LOH**, also in Cornwall, completed a contact. The record-breaking contact between **John Hearne EI2FG** and **Cesar Regalado Leon EA8CXN** was over a distance of 2714km. 5/1 and 5/3 reports were exchanged on SSB, although there was deep fading on the path. Cesar EA8CXN runs 150W into a 50cm parabolic dish, with the feedpoint being a 3-element horizontally polarised PCB Yagi. EI2FG has an EME-capable system on 23cm, 200W into a 3m dish. I know for a fact that several stations in West Wales are improving their 23cm capability with a view to this path – and beyond! Many congratulations to all involved, John, Cesar, Dave and Tim, for some great contacts.

Hubnet – a Place to Talk?

Driving from West Wales to visit my mother in Gloucestershire the other day, I had the mobile rig scanning as I drove along the M4. As well as the usual repeaters the rig stopped on an Echolink gateway, MB7IHN in Swansea. This did a good job of covering much of the motorway between Port Talbot and the western side of Cardiff (congratulations to GW8LGX who provides the gateway). MB7IHN was connected to the Hubnet network and I was struck by how much activity there was on the network with people calling in from all over the country and beyond, having what I would term 'regular' QSOs. Certainly, a quick listen on there would convince you that people do still talk on the radio – if you ever had any doubts!

I have covered some details about Hubnet in the past, but perhaps its success can be attributed to the many options that you have to connect to it. For example, as I write this, I am listening to Hubnet using a DMR radio going through my hotspot. Other people have their own analogue gateways or connect using Echolink. If you miss having a chat on your VHF/UHF radio, then perhaps Hubnet might be something to try.

If it interests you, then do have a look at the Hubnet website (below) where you can read more about the options you have to connect up and have a chat. If you enjoy Hubnet, like many other facilities



Record Breaking on 1296MHz

Tim Kirby GW4VXE has all the VHF and UHF news, including a new tropo record on 1296MHz (23cm).

in amateur radio, it is good to send a little monetary support and you'll find a link on the website to do just that.

www.hubnetwork.uk/index.php

Behind the scenes at GW4VXE

Back in March, **Bob G0FGX** and **Nick 2E0FGQ** from the TX Factor braved the trip to Pembrokeshire to come and chat to me about VHF/UHF. They did a wonderful job of putting the video together and you can see our chat, as well as some lovely shots of the location in Episode 26 (link below). The rumour is that you will be able to see their chat with **Don G3XTT** in the next episode!

www.txfactor.co.uk

The 6m Band

Kevin Hewitt ZB2GI (Gibraltar) writes, "I continued my early morning walks up the Rock on July 2, 3, 4 & 6th to operate 6m FT8. The log included 300+ 6m FT8 QSOs working into the UK, Europe, Kuwait, Dominican Republic, Bahrain, Kazakhstan, Tajikistan, United Arab Emirates & Japan. I worked seven stations in Japan on July

3rd. I also made 60+ 6m SSB QSOs in the afternoon on the same day. Operating on 6m from my home station, during the month I logged 250+ FT8 QSOs".

Jef Van Raepenbusch ON8NT (Aalter) logged plenty during the month, running 10W from his Icom IC-7300 to a V-2000 vertical. The highlights were V01HP (GN37), N1DG (FN42), AA1V (FN42), VE1PZ (FN85), WA1NPZ (FN43), K2XA (FN32), TF1A (HP94), JW7QIA (IQ78), TA1D/3 (KM39), 7X2KF (JM06), OH0/OH1XFE, EA8DBM (IL18), ZB2GI and ZB2IF (IM76), UN9L (MO12) and LX1JX (JO30).

Phil Oakley G0BVD (Great Torrington) has had a good month working 16 new squares on the band. Highlights have been OD5KU (KM73), CN8AM (IM63), N5RP (EM57), N3MK (FM27), N4QS (EM56) and N2QT (FM07).

Dave Thorpe G4FKI (Amphill) worked plenty during the month, using a vertical antenna. On July 25th he worked US0KW (KO30) on FT8 and next day 9A0FF (JN74), EA5BLP (JN00) and IT9VJO (JM78), all on CW.

Colin Fawcett G8YIG (Manchester)

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Photo 1: ZB2GI's portable 50MHz station on the top of the Rock of Gibraltar

Photo 2: Screenshot of video received from PY2RN via QO-100 showing his antennas

took part in the August 50MHz UK Activity Contest and made some nice contacts, including G14SNA (IO64), G3TXF (IO71), G4ASR (IO81), G4FZN (IO94) and G4BEE/P (IO91)

Here at GW4VXE, I've mostly been looking for new squares after all the excitement of the multihop openings earlier in the season. Notable contacts during the month include 4X5BR (KM71), OH0AZX (JP90), HB0WR (JN47), UN3M (LO61), CU2GI (HM77) and ZB2GI (IM76). The Perseids gave some opportunities to work some 'awkward' squares in Germany, Belgium and The Netherlands. Not all the long-haul stuff has gone though. I turned the beam to the west just before writing this (on August 15th) to work EI9JA (IO53) for a new square and while writing received WB5TUF (EL29) and three stations from Florida. Things improved further during the afternoon and I scraped a contact with K0GU (DN70) along with K4PI (EM73) and W4AS (EL95). NP4BM from Puerto Rico was also heard.

The 4m Band

Kevin ZB2GI made over 40 FT8 contacts on 4m on July 2nd and another 100 FT8 and nine SSB contacts on July 26th. Log highlights were 9A6R (JN83), DK6FX (JO30), EA8JF (IL38), EA9ACD (IM75), EB1B (IN73), EI8KN (IO62), G0JLJ (IO91), GM8IEM (IO78), GW8ASA (IO81), ON7GB (JO21), PA4VHF (JO32), S52OR (JN76), S57A (JN65), S57TW (JN75), SP2FH (JO92), SV2DCD (KN00) on FT8 and PA4VHF (JO32), ON4PS (JO22), PA7MM (JO23), DJ5MN (JN58), DK2PH (JO41), EA8TX (IL18), DL7ULM (JN58), DK5MV (JN58), G0JBA (JO01) on SSB

Jef ON8NT had a good month on the band, running 10W to a halo on his balcony. Highlights of his log are EA8DBM (IL18), 9H1CG (JM75), OH7TE (KP30), OH0Z (JP90), LA7DFA (JP33), LZ2HM (KN12), ZB2GI (IM76), EA9ACD (IM75), EA6XQ (JM19), EI8GG (IO52) and EA9AK (IM75).

Steve Macdonald G4AQB (Bolton) writes, "Things have been very quiet here over the last few weeks now that Sporadic E has died down. It has however given me chance to try out FM on 4m, which is something I have never done before. I remember operating AM on 70.26MHz back in the early 70s with a Low Band Pye



Vanguard. We have a local 4m FM net every morning around 11:15am. This has become more popular over the lockdown and quite a few stations are now active. I needed a 4m FM transceiver so that I could join in. There are only a couple of handhelds available for 4m but these are not easy to buy as suppliers don't seem to stock them. Instead I started looking for a Low Band PMR. I had heard about Tait PMR transceivers, so found out more about them. A search on eBay brought loads of these Tait PMRs. Many were high band and UHF, but I came across a seller that sells fully reconditioned Low Band Tait 2015 PMRs fully programmed for all the 4m FM channels. I sent for one and I am very pleased with it. It puts out 25 watts and I have received good reports on the net with a 4m end-fed half-wave antenna that I made up. The 4m FM net is usually on 70.475MHz". If anyone wants the details of where Steve got his transceiver, e-mail me and I'll pass it on.

Dave G4FKI heard a Maltese station on FM on July 31st and a station from Slovenia, also on FM, on August 12th.

The 2m Band

Both **Keith Watkins G8IXN** (Redruth) and **Richard Brooks GW1JFV** (Haverfordwest) found the 2m path to D4VHF open on the morning of July 18th. Although the station was not active at the time, both of them saw D4VHF reporting their signals on the PSKReporter website. They both made a two-way QSO later on in the day. Here at **GW4VXE** I caught D4VHF on July 22nd and 30th – signals on the 22nd being exceptional even on my vertical antenna. The opening on the 22nd was pure marine ducting and didn't extend very far inland,

but fortunately the opening on the 30th gave many away from the coast the chance to work into Cape Verde.

It's good to hear from **Chris Colclough G1VDP** (Nuneaton) who is back on VHF/UHF after a break of some years. He is using a TS-790 to a dual-band 2m/70cm beam and is enjoying FT8 on both bands. Chris also plans some satellite activity in due course.

Jef ON8NT found some nice tropo on July 7th, working GW7SMV (IO81) and M0VXX/P (IO82).

Simon Evans G6AHX (Twynning) took part in the RSGB UK Activity Contest on August 4th, using 10W to an 8-element Yagi. Simon made 24 QSOs with the best DX being G8PNN/P (IO95).

Phil G0BVD worked G100TC (IO65), MM0CEZ (IO75), F8DBF (IN78) and GD3YEO (IO74) on FT8 on July 31st.

Roger Daniel G4RUW (Newbury) reflects that it's been a funny Es season, with a good opening at the end of May, very little in June but he found a good opening on July 13th. Things started off with a contact with SM5KWU (JO89) on FT8, followed by OH1TM (KP01) and nine more OH stations. Roger worked OH1TM on FT8 and then switched to SSB, working stations in KP01, KP41, KP14 and KP02. Roger says that he has been looking for Finland on 2m for 37 years! **John Hawes G8CQX** (Cheltenham) told me in a QSO that in the same opening, he heard a strong signal on 144.300MHz, assuming it was a local and found it was OH5LK (KP30) who he was able to work on SSB. Here at GW4VXE I was delighted to catch the opening too, working ES1KK (KO29), ES4RM (KO49), UA1ALD (KO59) and OH2BYJ (KP10). With the 6m beam

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up and the 2m beam down it was all on the V-2000 using 50W of FT8.

Andy Adams GW0KZG (Letterston) caught the Es opening on July 13th and says it's the best he's heard from Pembrokeshire towards Eastern Europe. Andy worked ES4RM, RM1A and OH2FQV, all on FT8. On July 17th, Andy caught the tropo to the southwest, working D4VHF, EA8CXN, EA1UR and EA1TF. On July 18th there was more tropo with GM0HBK, F6IFX, F0EYI, EC1A, EA1U and F5PHW all worked. July 29th saw D4VHF worked again as well as GM0HBK and MM0CEZ with EA8CSB and D4VHF worked again on the 30th. During the Perseids, Andy worked CT1HIX, S50L, CT7ABA, OK1UGA and HB9FAP.

The 70cm Band

At GW4VXE I was very excited to hear D4VHF (HK76) on the 70cm band on July 22nd. I had left the system monitoring 432.174MHz and they came up to workable strength for a good few minutes, on my V-2000 vertical over a 4280km path. The bad news is that I wasn't in the shack as we had a visitor! I was able to console myself with a QSO with EA8CSB who I also worked on July 30th. I was running 50W to the V-2000 vertical.

Kevin ZB2GI writes, "EA7JNC called into the Gibraltar UHF repeater situated at the top of the Rock from the playa at Cabo de Gata in Almeria. He was able to open the repeater using a Baofeng handheld with the stock antenna. Using a 4-element Yagi stuck in the sand he was fully quieting into the repeater 412km from Gibraltar. In the morning he was unable to get into the repeater until the Levanter (sea mist) shrouding the Rock had cleared. A CT1/M0 station called into the Gibraltar UHF repeater from Faro in Portugal using a Baofeng handheld also with the stock antenna. He was also fully quieting into the repeater 250km from Gibraltar, but his signal faded out after 10 minutes".

Satellites

Graham Jones G3VKV (Cheltenham) has been operating DATV through the QO-100 satellite. Graham received some video from PY2RN near Sao Paulo. PY2RN is right on the edge of the footprint so the offset dish for narrow band is inverted with the feed at the top in order to beam to the 7° elevation that is needed from there. For video transmit, a 2.3m dish is used and on receive a 1.5m dish, both prime focus dishes. On the narrow band transponder, Graham enjoyed a long chat with Derek

V51DM in Swakopmund, Namibia.

Simon G6AHX has been helping **Adrian GOVLG** with his QO-100 uplink and has been enjoying using an AOR AR5700D receiver, which he has been loaned.

Thank you, as always, to **Patrick Stoddard WD9EWK** (Phoenix) who has sent his regular fascinating e-mail regarding his satellite work during the month. He writes, "July saw me get back into making a series of trips around Arizona, to operate from different grids around the state. This was also the start of the Mexican special-event station 4A15DXXE on the satellites, to commemorate the 15th anniversary of the DXCE group. Others added to the activity on satellites from different locations around North America.

"**Rafael XE2RV**, the satellite operator for the 4A15DXXE station, said on Twitter that he was hoping 4A15DXXE could get a satellite DXCC award, for confirming contacts with at least 100 grid locators. After working 4A15DXXE from home on July 9th, I started to think about where I could go to give 4A15DXXE more grids. I didn't wait long, as the first of my road trips went to the DM34/DM44 line north of the Phoenix area. I parked along a dirt track in a national forest, and worked 4A15DXXE on AO-91 and AO-92 passes, along with a bunch of other stations around North America.

"During the next week, I operated from grid DM32 south of the Phoenix area on July 16th, followed by the DM33/DM43 boundary in Phoenix the next day. I worked 4A15DXXE from both of these locations on SO-50 passes, bringing my contribution to that special callsign to five grids. These weren't my last trips to help 4A15DXXE...

"On July 23rd, I drove to the DM23/DM24 line in western Arizona, operating from there for a few hours. I worked 4A15DXXE on the first SO-50 pass I attempted out there, adding two more grids. A week later, on July 30th, a trip to northern Arizona. I parked on the DM35/DM45 line along old US-66, and logged 4A15DXXE on an AO-92 pass.

"In early August, Rafael reported that 4A15DXXE had confirmed contacts with 100 grid locators in Logbook of the World. All of his operating had been from his home grid in northern Mexico, DL55. Rafael said he wanted to make one more activation of 4A15DXXE, but from grid DL56. I decided to make one more road trip, to the DM52/DM53 grid boundary in southeastern Arizona. I worked 4A15DXXE on two AO-92 passes from out there, and Rafael's location was close enough to his home grid DL55 so

the DL56 activation could be applied to the same satellite VUCC award Rafael wanted for 4A15DXXE.

"With these road trips, I had operated from a total of 11 different grids around Arizona. It was fun to get out and operate away from home again, after so many months stuck at home earlier in 2020.

"I was part of a fun contact last weekend (August 8th). **Endaf N6UTC/MW1BQO** has been operating from islands around southern California, as part of the US Islands program (<http://usislands.org>). Endaf and I had been talking about the possibility of an island-to-island contact, but I didn't think there would be many islands in a landlocked state like Arizona. Fortunately, the US Islands program has a more liberal definition of an island, compared to the Islands on the Air (IOTA) program, and there was an 'island' only a few minutes from my house.

"This 'island', called Sunward Island, is connected to the banks of the Salt River by bridges, between a freeway and an Indian reservation. The west side of the road that crosses the 'island' has a large area where I could park and operate. I drove over there, and on an AO-92 pass made the quick contact with Endaf, who was on Terminal Island near Los Angeles. Endaf and I worked other stations around the USA and Mexico, after we made our contact.

"Along with my travels around Arizona, **Mitch AD0HJ** completed a long road trip through North Dakota, activating all of the grids in that state. Mitch is about to do a similar road trip through South Dakota.

"A new distance record was set on AO-7 this week. **Joe KE9AJ** in Colorado worked **Jerome F4DXV** in France, covering a distance of 8204km. This is pushing the limits of the old satellite, which had been thought to support contacts spanning around 8000km".

DATV

Graham G3VKV writes, "During the BATC contest on August 9th I received some TV from **Dave MOYDH/P** on Brown Cleve, Shropshire, and **Dave G4FRE/P** at Dorstone near Hay-on-Wye, Herefordshire. Signals were very strong on both 146.5MHz and 437MHz using 333kS DVB-S2 at 70km distance. Transmissions were 450kHz wide on both bands".

That's it for this month. Thanks to everyone who has contributed – but there's always room for more. Remember, your experiments and results may inspire someone else to try something new. That's what the hobby is all about!

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- Power: 1.5kW
- Freq: 3.5-54MHz
- Power: 1kW

£499.95

MAT-705 for Icom 705



- Freq: 1.8 - 54MHz
- Powered by 9V Alkaline battery

£229.95

MAT-40 Outdoor Auto-tuner



- Freq: 1.8-54MHz
- Power: 0.1-120W
- Tunes from 10ft + wires

£244.95

Requires adaptor cable for your rig
Request when ordering, Icom, Yaesu, Kenwood

MAT-30 For Yaesu radios



- Freq: 1.8-54MHz
- Power: 0.1-120W
- Interface cable supplied

£189.95

MAT-125E General purpose Auto Tuner with internal battery



- Freq: 1.8-54MHz
- Power: 0.1-120W

£189.95

MAT-180H For modern Icom & Kenwood radios (Supplied with Icom interface lead). Allows manual tuning also



- Freq: 1.8-54MHz
- Power: 0.1-120W

£174.95

MAT-10

'One touch' tuner for Yaesu FT-818/817
Can also be used with any QRP transceiver

- Freq: 1.8-54MHz
- Power: 30W

£219.95

MAT-K100 For Icom & Kenwood radios (Kenwood lead included)



- Freq: 1.8-54 MHz
- Power: 0.1-120W

£189.95

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- 70cms 10 element
- Wideband 400-470MHz
- Boom: 2m, Gain: 14 dBi

£119.00

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CX440.....	(440 - 455)MHz pwr 4.15 dBi.....£39.95
CX455.....	(455 - 470)MHz pwr 4.15 dBi.....£39.95
TORNADO 50-60.....	(50 - 60)MHz 6m 3.5dBi.....£59.95

HF/VHF/UHF Beams

SY3.....	3 element (26-28)MHz 10.65 dBi.....£99.95
SY4.....	3 element (26-28)MHz 13.15 dBi.....£119.95
SY50-3.....	3 element 50MHz 8.5 dBi.....£99.95
SY50-5.....	5 element 50MHz 10.5dBi.....£129.95
SY68-3.....	3 element 70MHz 7.0 dBi.....£79.95



WY140-6N

6 element 144MHz (wide band) 10.5dBi

£99.95

WY108-3N.....	3 element 108-137MHz 3 el. Air Band.....£89.95
WY400-6N.....	6 element 432MHz (wide band) 11.0dBi.....£79.95
WY400-10N.....	10 element 432MHz (wide band) 14.0dBi.....£119.00

COMET



CHA-250B XII Multi-Band Vertical

- TX: (1.8-50) MHz
- RX: (2-90) MHz
- Power: 300W
- Length: 7 metres

£349.00



H-422 4 Band Dipole

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- Use as V or straight
- Vee: 7.4m
- Straight: 10.3m
- Covers 7/14/21/28MHz

£289.95

HF BASE ANTENNAS

CHA-250BX11.....	3.5 - 57MHz (RX: 2.0 - 90MHz).....£349.00
CWA-1000.....	Multi-Band dipole 3.5/7/14/21/28MHz.....£124.95
AB1230H.....	Handheld Airband Antenna - RX only.....£29.95
AB380.....	Civil/Military Base Antenna -RX only.....£89.95

VHF/UHF FIBREGLASS BASE ANTENNAS

GP-15N.....	50/144/430MHz, length 2.4m N Type.....£109.95
GP-1M.....	144/430MHz length 1.2m (SO239).....£59.95
GP-3M.....	144/430MHz, SO-239 Lgh 1.78m (SO239).....£69.95
GP-6M.....	144/430MHz, SO-239 Lgh 3.07m (SO239).....£99.95
GP-93N.....	144/430/1200MHz, Length 1.78m N Type.....£99.95
GP-9M.....	144/430MHz SO-239 Lgh 5.15m (SO239).....£149.95
GP285.....	VHF 5/8 Collinear 135 - 175MHz 3.34m.....£89.95

VHF/UHF BEAMS

CYA-1216E.....	16 Element 1200MHz, N Type.....£99.95
CA-52HB.....	2 Element HB9CV for 50MHz.....£79.95
CA-52HB4.....	4 Element HB9CV for 50MHz.....£129.95
CYA2414.....	2.4 GHz 14 Element Yagi 15.5 dBi 0.75m.....£99.95

MOBILE ANTENNAS

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SB7700.....	Hi Gain 144/430MHz length 1.28m.....£69.95
SB7900.....	Hi Gain 144/430MHz length 1.56m.....£79.95
CSW201G.....	2 Way Antenna Switch SO239 1kW 600MHz.....£29.95

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CAT-10.....	10W Antenna tuner (3.5 - 50)MHz.....£129.95

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CBL-2500.....	1.8-56MHz, 2.5kW/CW.....£39.95

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CF-50MR.....	1.8 - 57MHz, 1kW/CW.....£59.95

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CFX514N.....	50/144/430 MHz N/PL/PL.....£69.95

DUPLEXERS

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CF-416B.....	SO239 + 1 x PL259/N leads.....£39.95
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CF-530.....	1.3-90/125-470MHz, 2x SO239, PL259 lead.....£49.95
CF-530C.....	1.3-90/125-470MHz, SO239 2 x PL259 lead.....£49.95
CF-706.....	1.3-57/75-550MHz, SO239, 2 x PL259 leads.....£49.95
CF-706N.....	1.3-57/75-550MHz, SO239 N type, PL259 leads.....£49.95

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- Shows: Humidity, temp, Winds speed, Direction, Pressure, Rainfall, Lux meter, Windchill, Dew point
- Internet connectivity
- Micro SD card slot


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



Other models:


W-8686.....	Wi-Fi, colour display.....£189.95
W-8681 MKII.....	Wireless, mono display.....£89.95
W-8682-MKII.....	Wireless, mono display.....£69.95

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G6MXL 
Colin REDWOOD
 53 Woodpecker Drive
 POOLE BH17 7SB
 England
 QSL: LOTW or Bureau
 Ham Member Lookups: 8551



Biography **Detail** **Logbook 8014** **Awards 4**

Lookups: 6553 (9787)

See Also: [EAB/G6MXL](#) [G6MXL/P](#) [SVB/G6MXL](#) [EA/G6MXL](#)

QRZ Record: 769671

QRZ Admin: G6MXL

Last Update: 2020-05-22 14:08:30

Class: A

Latitude: 50.744629 (50°44'40"N)

Longitude: -2.007971 (2°0'28"W)

Grid Square: IO80xr

Geo Source: User supplied

Sunrise: 04:46:03 UTC

Sunset: 19:41:11 UTC

ITU Zone: 27

CQ Zone: 14

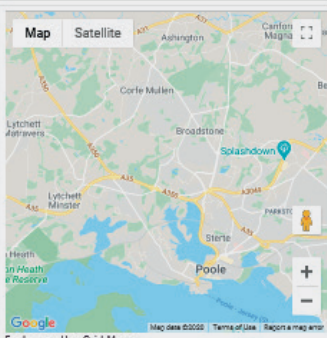
IOTA: EU-005 Great Britain

QSL Info: LOTW or Bureau

QSL by Mail? Yes (e.g. Will this ham QSL by Postal Mail?)

QSL by eQSL? Yes (e.g. Will this ham QSL with eQSL?)

Uses LOTW? Yes (e.g. Does this ham use ARRL's LOTW?)



Colin Redwood G6MXL
 practicalwireless@warnersgroup.co.uk

Getting Started (Part III)

Colin Redwood G6MXL continues his theme of getting started in amateur radio, with a selection of useful advice.

Having looked at establishing a station and making some contacts, this month I'm moving on to look at sending and receiving QSL cards and some other things that newly licensed operators may wish to consider. I'll also update readers on some online Intermediate Licence courses.

QRZ.COM

I'd suggest that all amateurs register their callsign on QRZ.COM. Many operators worldwide will use QRZ.COM to find out information about you, your station and in particular your preferred arrangements for confirming contacts (e.g. sending and receiving QSL cards). You'll need to get another licensed amateur who is already on QRZ.COM to create your basic record (this no longer happens automatically from data supplied by Ofcom). Once you've been added, feel free to include as much or as little information in your entry as you wish, **Fig. 1**. I'd suggest revisiting your entry from time to time as your interests in the various aspects of the hobby evolve.

QSLing

Traditionally proof of contact has been obtained by the exchange of QSL cards, **Fig. 2**, between the two stations involved in a contact. These days there are also electronic ways of obtaining proof of contact. Regardless of the benefits of electronic proof of contact, many amateurs like to exchange QSL cards as a memento of a contact.

Receiving QSL Cards

I'd suggest sending some stamped addressed

envelopes (SAEs) to your QSL sub-manager for your callsign group, so that you can receive card through the RSGB QSL bureau. You can find the relevant contact details at: <https://tinyurl.com/y6lxkwu3>

If you aren't a member of the RSGB, then you'll need to pay an annual fee to receive cards through the QSL bureau:

<https://tinyurl.com/jgigatu>

Sending QSL Cards

There is absolutely no rush to design and buy yourself QSL cards, and you certainly don't need to send a QSL card for every contact. It will be some months before you start to receive anything like a steady stream of QSL cards through the QSL bureau. To keep postal costs down, most amateurs who send and receive QSL cards do so using their national society's (RSGB in the UK) QSL Bureau. To send cards through the RSGB QSL bureau, you'll need to be a member of the RSGB. I'd suggest looking at the information about the bureau on the RSGB website, and in particular the recommended size (140mm x 90mm) and the station worked callsign clearly in the top right-hand corner of the card, and the preferred sequence to sort your outgoing cards:

<https://tinyurl.com/y44jh2p9>

Before writing and sending a QSL card to

a station, I'd strongly recommend looking up the relevant callsign on QRZ.COM. The QRZ.COM entry should clearly state the station's QSL policy, **Fig. 3**. Some stations don't send or receive QSL cards so sending a card will be a complete waste. Some only QSL direct, so you have to post your card direct to the station (this may be due to the station not being a member of their national society or their national society does not have a QSL bureau). Some stations may request cards only via the QSL bureau (often abbreviated Buro).

QSL Managers

Some (mainly DX) stations use a QSL manager to handle their QSLing. This may be due to the lack of a QSL bureau in their country, an insecure or irregular postal service (perhaps they live on a remote island), or they would prefer to spend their limited spare time making contacts rather than writing QSL cards. For stations using a QSL manager, you'll need to clearly mark the card via their QSL manager (e.g. AX6ABC via 7X7XY). The station sends their logs (usually electronically) to their QSL Manager.

If you use the QSL bureau, you should be prepared to wait some time for QSL cards to be received. In my experience cards for UK contacts arrive 9 to 18 months after the con-

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Logging Program	Website
Aalog	www.dxsoft.com/en/products/aalog
DX4WIN	https://dx4win.com
Dxlab	www.dxlabsuite.com
Easylog	www.easylog.com
Log4OM	www.log4om.com
Logger 32	www.logger32.net
PZTLog	www.m0pzt.com/pztlog
Turbolog	www.turbolog.de
Winlog32	www.winlog32.co.uk

Table 1: A selection of popular station logging programs for Windows computers.

tact. Cards from abroad usually take longer (usually a minimum of 18 months – often much longer).

Designing a QSL Card

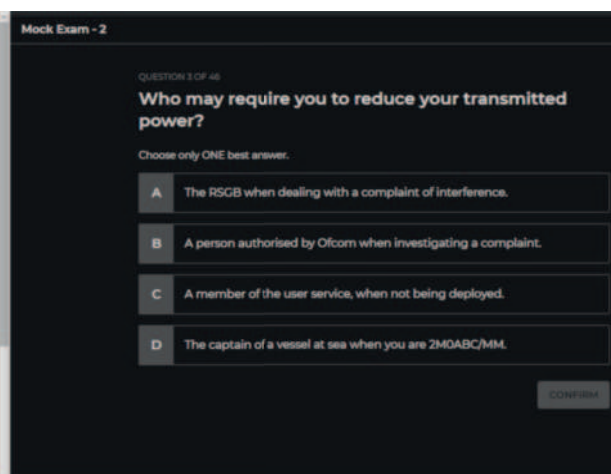
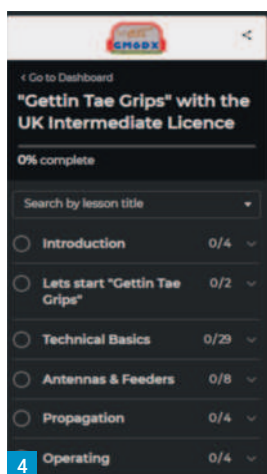
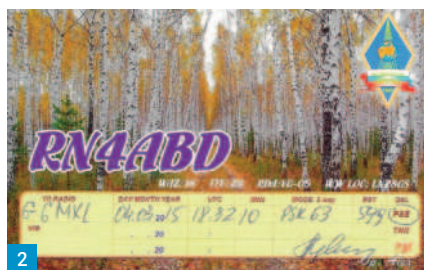
If you visit the websites of several QSL card printers (they sometimes advertise in the small-ads section at the back of *Practical Wireless*), you'll soon see that there are plenty of designs for QSL cards. Many amateurs focus on a colour illustration for one side of their QSL card. This is entirely your choice. In fact, you don't even need an illustration at all. You can have a simple one-sided card with just the details of your contact. Initially, I'd arrange to have a small quantity (no more than about 250) printed because your requirements are likely to change as you get more established in the hobby.

Electronic Logs

These days, many amateurs use computer-based logging programs as an alternative to paper logs. These programs vary a lot in their sophistication. Some amateurs like the simplicity of spreadsheets, while others prefer programs designed specifically for the purpose of logging contacts. In general computer logging programs are designed for either general (not contest) logging or for use during contests.

I've listed a few of the popular general logging programs (most of which are free) for Windows computers in **Table 1**. For MAC computers, RumLogNG and Maclogger DX are both well respected. Whichever you decide to try, make sure that it can import and export log files in ADIF (.adi) format so that you can transfer your log from one logging program to another if you change your mind. ADIF is also the format used to upload logs to electronic logging databases I mention below. **Table 2** lists a few popular contest logging programs.

The difference between station logging programs and contest logging programs is



that the former will probably include tracking for various awards while the latter will have built-in scoring algorithms for many of the more popular contests. There are other differences too but most nowadays will connect to your radio for CAT (computer aided transceiver) control, maybe control a rotator, interface to the internet for various purposes (uploads to LoTW and eQSL, connection to Cluster and/or RBN, etc), support for data modes and more.

Electronic Confirmations

Some award schemes issue awards based on electronic confirmation of your contacts as an alternative or in addition to paper QSL cards. These operate by stations uploading their electronic logs to a common database. Routines are then run automatically to match logs received to identify matching contacts (Date UTC, Time UTC, Callsign, Band, Mode). The advantages include speed (confirmations in as little as a few minutes and often within days or weeks), no postal costs and no cards to print, write, post or store.

Many new amateurs wonder which of the popular electronic confirmation databases to sign up with and use. I'd recommend signing up with several of the popular ones. To my mind these are Logbook of the World (LoTW), which is run by the ARRL (the national society in the USA) and eQSL, which is independent of national societies. Contacts that are confirmed through LoTW are valid

Fig. 1: A basic QRZ.COM entry. Fig. 2: A QSL card. Fig. 3: The QSL policy of Croatian Station 9A5ST on QRZ.COM. Fig. 4: A mock exam question on William McFarland's popular Intermediate course. Fig. 5: The Intermediate Licence Manual for Radio Amateurs.

for many awards, including some RSGB and CQ Magazine awards – not just those sponsored by the ARRL. Even if you prefer one of these to another, other amateurs will have different preferences, so I think it is in the amateur spirit to help one another by at least registering with these and uploading your logs. I'll look at both LoTW and eQSL in a future *What Next* column.

www.arrl.org/logbook-of-the-world
<http://eqsl.net>

Beyond Exams

The RSGB have introduced an initiative to encourage exploration of the many facets of amateur radio and to build skills. There are two strands, the first being for individual radio amateurs. This strand consists of 150 activities ranging from simple to advanced, based around nine themes. The themes include various aspects of the hobby such as operating, construction, and promoting amateur radio. The second strand is a club version of Beyond Exams, but this is probably less appropriate at present with clubs not meeting face-to-face. There is no cost to participate, and you don't need to be a member of the RSGB. I'll look at Beyond Exams in

Logging Program	Website	Application
N1MM	https://n1mmwp.hamdocs.com	HF/VHF/UHF/SHF
Minos	http://minos.sourceforge.net	VHF/UHF/SHF
SD	www.ei5di.com	HF
Win-Test	www.win-test.com	HF
Writelog for Windows	http://writelog.com	HF

Table 2: A selection of the most popular contest logging programs for Windows computers.

a future *What Next* column and see also the article in this month's issue by **Tony Jones G7ETW**.

<https://tinyurl.com/y6bgssxn>

RSGB Foundation Award

You can obtain awards (certificates) to mark various operating achievements in amateur radio. These are totally optional and will not appeal to every amateur. Many of the more prestigious awards require proof of contact.

For those new to the hobby, the RSGB Foundation award is a good introduction to award chasing. The basic bronze level requires a minimum of 40 contacts using any mix of SSB, FM and CW across the 40m, 20m, 17m and 2m bands with a minimum of 10 contacts per band. You'll need to have proof of contact by means of QSL cards.

<https://tinyurl.com/y29xeqhc>

Contests

If you are fairly new to operating, one of the things that you'll encounter sooner or later is a contest. If you've not come across one before it can sometimes seem like a load of fairly meaningless information being exchanged between stations in very short contacts.

Contests are very different to the leisurely style of operating that is often encountered at other times.

The information exchanged during a contest is determined by the contest rules. A summary of the rules for most HF contests can be found at:

www.contestcalendar.com/index.html

The RSGB VHF Contest committee organises most, but not all, VHF and UHF contests in the UK. Their website is a good place to start. Other VHF and UHF contests are organised by the Worked All Britain group, and of course there are the *Practical Wireless* 144MHz and 70MHz contests.

www.rsgbcc.org/cgi-bin/readcal.pl

I looked at contests and contest terminology in some detail in the October, November and December 2019 issues of *Practical Wireless*. Back numbers and a DVD with all the 2019 issues of *Practical Wireless* can be obtained from the PW Book Store at:

www.radioenthusiast.co.uk

If contests aren't for you, then you'll be

pleased to know that the 12m (24MHz), 17m (18MHz) and 30m (10MHz) bands are all contest-free.

Intermediate Licence Courses

If you have your Foundation Licence and are considering progressing to the next stage, the Radio Society of Harrow have recently published a very useful set of videos that cover the syllabus of the Intermediate exam. They are short, sharp and to the point. I think that they would be a good introduction to grasp the basics before reading the Intermediate book (see below). They might also be a good way to revise after you have read the book.

<https://tinyurl.com/y4pxv4lr>

William McFarland GM6DX provides a very popular Intermediate course in addition to his Foundation course. It helpfully includes some mock exam questions, **Fig. 4**. So far over 770 people have used it.

<https://gm6dx.thinkific.com>

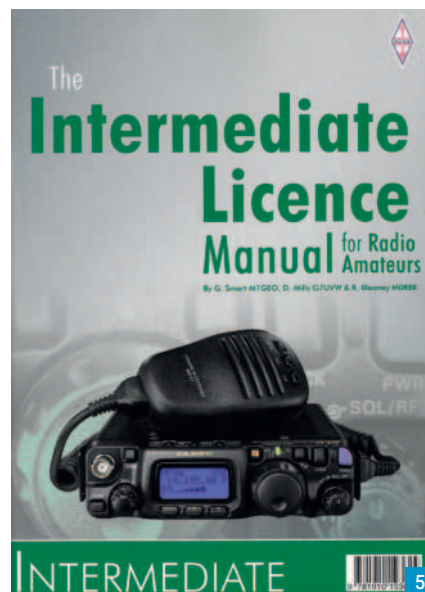
The Online Amateur Radio Community has recently launched a fast-track online Intermediate Licence course. This runs over just 6 to 8 weeks, with weekly Zoom sessions with other candidates, weekly reading lists and activities. To quote the organisers, "It's targeted at those who are comfortable with modern communication methods, from Google Classroom, Zoom through to Discord and who are prepared to commit real time and effort to additional self-study & revision throughout the week". More details can be found at:

www.oarc.uk

Intermediate Book

As with the Foundation exam, you should obtain an up-to-date copy of *The Intermediate Licence Manual for Radio Amateurs* by **George Smart M1GEO, David Mills G7UVW & Roger Bleaney M0RBK**, **Fig. 5**. You can obtain the book from the PW Bookshop or the RSGB. Just as you did when you sat your Foundation exam, you should also visit the RSGB website and download and print the reference data booklet for the Intermediate exam as you'll find it will assist you in answering several questions:

<https://tinyurl.com/y45d7bog>



I'd also suggest downloading a copy of the Intermediate exam syllabus from the RSGB website. It clearly distinguishes between things you need to just remember ('recall') and topics where you need to 'understand' something. You'll note a higher proportion of 'understand' topics at Intermediate level than at Foundation level.

<https://tinyurl.com/yxoe57r3>

Exam Syllabus

The RSGB Examinations Standards Committee and Examination and Syllabus Review Group have made some very minor changes to the syllabus for the exams at all three levels. These are not significant changes – just welcome clarifications, and in one or two instances removal of duplications. For example, dummy loads used to be part of both Feeders & Antennas and EMC sections at Foundation and Intermediate level – they are now fully covered in the respective EMC sections. I'd suggest that tutors review their training materials to make sure that they fully reflect the small changes. The practical aspects of the Intermediate course have also been dropped permanently and are no longer a prerequisite for sitting the Intermediate exam. The change document can be found at:

<https://tinyurl.com/y3oaj7f2>

Remotely Invigilated Exams

The arrangements for remotely invigilated online Foundation and Intermediate exams are still proving immensely popular, with about 600 candidates sitting them every month. If you're considering booking an exam, don't delay because at the time of writing, the earliest available slots are about six or seven weeks away.



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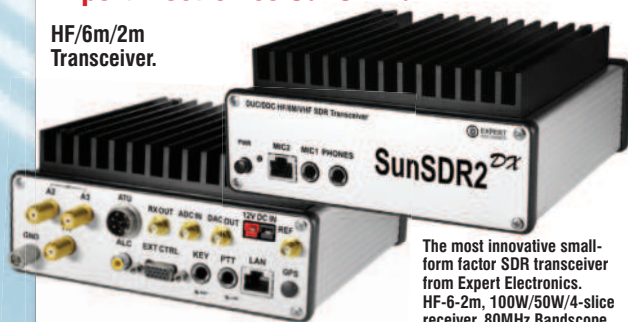
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The SunSDR2 DX transceiver based on the well-known SunSDR2 PRO transceiver with several hardware improvements. It is a 100W-HF, 50W-6M, 8W-2M transceiver, very compact, has a separate connector for active cooling and improved supply system, meaning it's perfectly suited for DXpeditions. Also, we've added a separate connector for an external ATU, thus SunSDR2 DX has all the functionality you got used to in our radios and even more. Improved hardware along with the ExpertSDR2 software makes this high-performance SDR transceiver the perfect base station. The evident choice for a true contest!

ML&S PRICE: **ONLY £1899.95**

Click: HamRadio.co.uk/sdr2dx



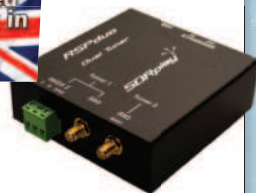
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Dual Tuner 14-bit SDR.

Dual-Tuner wideband full feature 14-bit SDR, 1kHz to 2GHz, 10MHz of spectrum visibility. Simultaneously monitor 2 separate 2MHz bands of spectrum between 1kHz and 2GHz. 3 software selectable antenna inputs, & clocking features ideally suited to industrial, scientific, Ham & educational applications. Windows 10.

See www.HamRadio.co.uk/RSPDUO

ML&S PRICE: **ONLY £239.95**



SDRplay RSP-1a



1kHz-2GHz & 10MHz BW.

Brand new design, the RSP1A is a major upgrade to the popular RSP1 offering a powerful wideband full featured SDR covering 1kHz to 2GHz & up to 10MHz visible bandwidth. Better still, it's "Built & Designed in Britain"!!

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Mid-range SDRplay Radio.

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www.HamRadio.co.uk/sdrplaydx

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See: www.HamRadio.co.uk/flex

FREE!

Flex-Controller with 6400 worth **£169.95**



SHUTTLEEXPRESS SDR Multifunction Wheel

Inexpensive customisable wheel that can be configured for use with various SDR programmes.

ML&S PRICE: **ONLY £44.95**



Elad FDM-DUO

The FDM-DUO is a game-changer - a top-end SDR with dials and knobs!

This transceiver has a 5W output that can operate as a stand-alone unit, without a PC! The small transceiver is equipped with the latest SDR technology.

ML&S PRICE: **ONLY £929.95**



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All ZUMspot Packages supplied by ML&S Include:

ZUMspot Pi UHF Board, UHF Antenna, Raspberry Pi Zero WH, MMDVM software and Plastic Case

ZUMspot RPi New Updated Version

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Featuring DMR, D-Star, C4FM, P25 & NXDN Hotspot.

Advanced Radio Module Board. Paired with a Raspberry Pi and the MMDVM software becomes a small and efficient multi-mode digital hotspot.

For more info see HamRadio.co.uk/ZUMspot



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Revisiting a Familiar Circuit

Lee Aldridge G4EJB
leeG4EJB@outlook.com

So there I was, still looking through all of the work that **George Dobbs G3RJV** had put together over all those years of *Carrying on the Practical Way* when I stumbled on his take of a circuit familiar to me – one that I had already built.

About two and a half years ago, while wrestling with my Howes 20m CW transceiver, I thought a modest tuned RF amplifier might help liven up the simple Direct Conversion (DC) receiver as well as improve broadcast station rejection. I'd found an HF preselector circuit on the G-QRP Sprat DVD (Winter 1995) in **Steve Ortmayer G4RAW's** Novice section. It was a grounded-gate amplifier with very few parts and at that time that suited my very limited resources.

So what is a preselector? George describes that in his *PW CoTPW* March 2007 article: "The tuned circuits in the preselector allow only a very small portion of the RF spectrum to reach the receiver and attenuate other (unwanted) frequencies. Reducing the out-of-band signals increases the signal-to-noise ratio and reduces undesired effects such as cross modulation and broadcast signal breakthrough".

George's circuit is shown in **Fig. 1** with photo as **Fig. 2**.

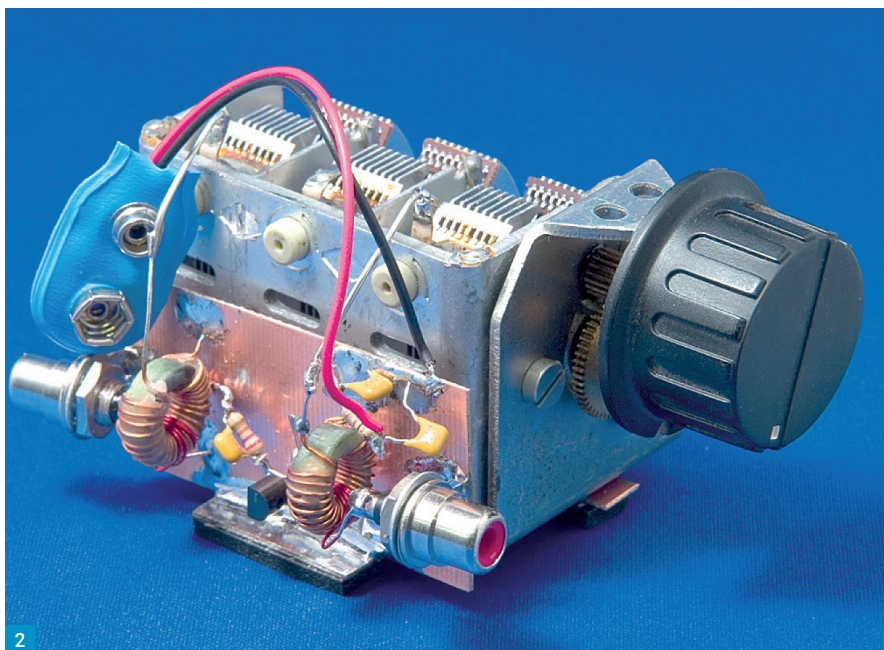
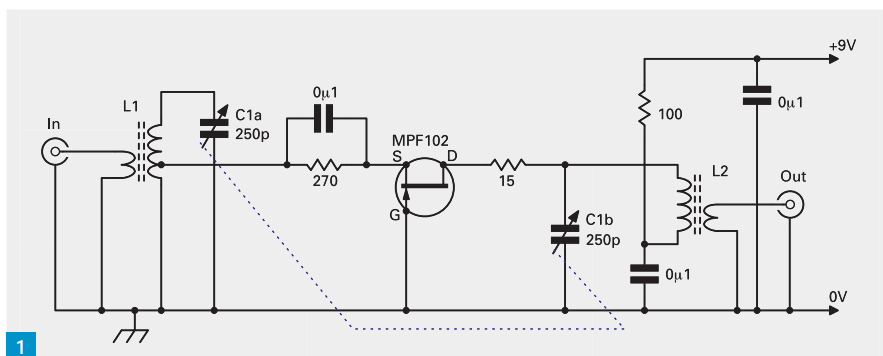
Well, I did build the preselector and it worked well in front of the Howes receiver without any detrimental effects I could hear. It did improve sensitivity and reduce the occasional HF broadcast breakthrough.

My Board

My board was similar to George's example in his article with two minor differences, I'd used the 2N3819 FET and a 12V supply (so I had replaced the 100Ω drain resistor with 510Ω – though probably not that critical). But there was one major difference. I'd built it on copper clad stripboard! Some constructors would be horrified about building RF circuitry on stripboard, others have no such qualms. (At that time I hadn't ventured on to other ways of building).

The preselector was to be fitted inside my transceiver without the dual 365pF variable capacitor (Fig. 1 C1a and C1b) as it would only be required for 20m. (At that time I started to call it an RF amplifier as the Howes DC receiver didn't have one). Each section of the

As his final look back, for the time being at least, **Lee Aldridge G4EJB** revisits a preselector from the G3RJV stable.



variable capacitor was to be replaced with a fixed capacitor and 10-40pF ceramic trimmer in parallel. I had no way of measuring capacitance back then and could only guess the capacitance value by the amount of moving vane meshed when the preselector was peaked on 20m.

Sadly I destroyed the board attempting to modify it and built another, again on stripboard using most of the parts from the original. The RF amplifier trimmers were peaked by assuming if they peaked twice, there was a good chance the tuned circuit was resonant at that point – well that was the theory.

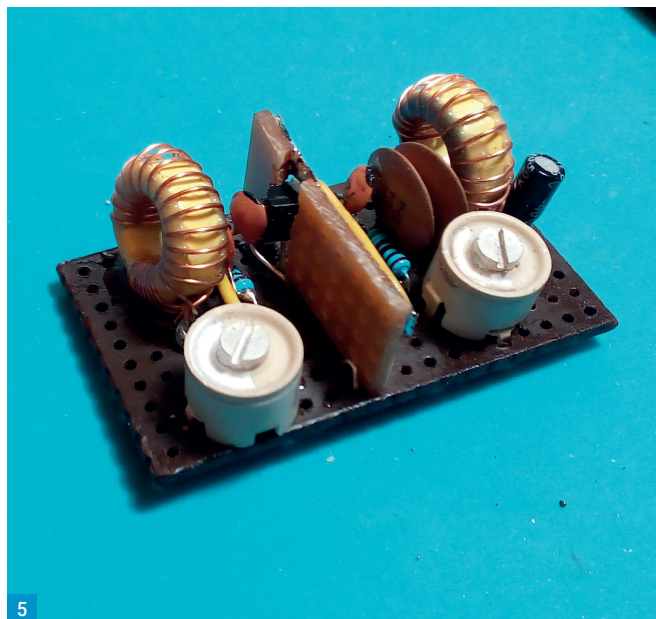
It seemed to perform well and was fitted

into the transceiver with antenna change-over relay and in/out of circuit relay. The RF amplifier and the Howes radio lived happily ever after – well, for about two years or so. Then one day, I switched on the transceiver and signals seemed very weak, switched out the RF amplifier and signals improved. Off came the lid and I found one of the ceramic trimmers had gone open circuit – yes, I'd had this happen in the past (we called it drying out then) and knew it just needed a few little turns backwards and forwards to remake the riveted connection on the underside – see photo, **Fig. 3**. Sure enough, the trimmer started to work again.

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4



5



3

Why Revisit?

So why the revisit now? George's article had sown a few seeds with me. A little line he mentioned and can also be found in the **Doug DeMaw W1FB** article he quoted... "keep the gate lead as short as possible" ... I knew my board was not laid out that well and I also have to admit one of the trimmers didn't seem to peak twice as expounded in my theory.

With George's article now as my guide, my plan was to rebuild the board using a variation of the Manhattan style of building on a small copper clad board with as many of the components as I could salvage again from the original.

That plan came to a halt almost immediately because close inspection of the RF amplifier revealed the epoxy-resin fairies had for some reason glued down most of the components. Just don't ask me what possessed me to epoxy resin so much of the board at that time.

Again, George's advice would have made a huge difference: "My usual method is to prepare on the main windings and cover the windings with a layer of bee's wax to hold

Fig. 1 The G3RJV preselector circuit.

Fig. 2 George's preselector.

Fig. 3 Ceramic trimmer rivet connection.

Fig. 4. Improved grounded area.

Fig 5. RF amplifier with screening.

the turns in place. Bee's wax can easily be melted with the soldering iron tip. The wax quickly burns off leaving the tip ready for fresh solder."

With the salvage plan seemingly in tatters, the Arkwright streak took over and I decided it seemed tragic to throw away a 'working' board when a few enhancements might be worthy of George's insights – particularly if money wasn't involved.

One of the first concerns I had with my board was that a number of copper strips were not grounded so using old desoldering braid, I built up a much bigger grounded area on the board, hopefully to reduce RF resistance, earth paths and stray capacitance. One upshot was the connection of the FET gate was now much shorter to ground and another was better grounding of the tuned circuits as George also detailed, **Fig. 4**.

A final touch was a little screening between input and output (it also meant I picked up one last floating piece of track and earthed it), **Fig. 5**. I then cleaned the board of flux and checked for shorts.

Before I refitted the board, I checked the current drawn by the circuit to ensure I hadn't got carried away with the earthing on the board. I measured 5.8mA – that'll do. The board was re-fitted to the solid copper wire support and re-wired into the radio.

With the radio powered up, the RF amplifier was to be peaked in the CW section

of the 20m band as it's a CW transceiver, and checked for operation throughout the band.

The input trimmer still didn't peak twice so, a little playing with the value of the fixed capacitor in parallel with the trimmer was required. Why the difference between the input and output capacitors? Well, my best guesses are differences in the two coils and maybe capacitance effects of the board. I'm fairly sure I would have wound the main windings with the same number of turns but with the other winding of similar gauge, it was very difficult to check this time around. Anyway, once sorted, the RF amplifier really seemed to perform better than previously and the Howes transceiver receiver input tuning (Preselector) peaked more sharply than before. Over a number of days, there seemed to be no sign of broadcast breakthrough. To be honest, I was really pleased with the improvements. Thank you again, George.

This may be my final tribute to George's work for now but it has been a privilege to tread the path that he laid for us. I hope I've been able to demonstrate his knowledge and experience has helped me improve my very modest amateur radio station and may inspire you to have a go (or even do better). The *PW Carrying on the Practical Way* CD is well worthy of your time and money.

And a final quote from a G3RJV article that I think sums up his approach to his work: "If you can't explain it simply, you don't understand it well enough." (**Albert Einstein**, 1879 – 1955)

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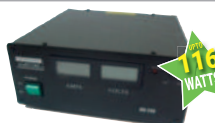


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By 1913, the number of radio amateurs had significantly increased. Many found the topic fascinating and the required technology was becoming far more accessible in the open market, in terms of commercialised Marconi sets. The image of a radio operator was enhanced to unrealistic levels due to the heroism of the Marconi wireless operators, **Jack Binns** of the *RMS Republic* (1909), and **John G Philips** of the ill-fated *RMS Titanic* (1912), who stayed at their posts sending distress messages to the very end. However, the European July crisis of 1914 changed both the Government's and Society's perception of amateur radio, which came under increased scrutiny and regulation. Another attraction was the small fraternity of wireless operators and amateurs. Many people were amazed at the new technology, yet relatively few had the ability to operate or understand its functions.

The Wireless Society of London by 1910 stipulated that prospective members had to provide documentary evidence in the form of qualifications, or at least two years of practical experience as a radio amateur.

Table 1 shows the numbers applying for an amateur radio licence. **Fig. 1** features an early edition of *Radio News*, promoting amateur radio as a hobby. The Society had 151 full members, compared to only 11 unskilled associate members. This suggests that the formation of pioneering societies was not the defining stage in the growth of amateur radio.

In the USA, the situation was rather different. In 1912, Congress finally authorised the Radio Act. It stipulated that all radio amateurs needed to be licensed and their subsequent operation was restricted to a single wavelength of 200 metres. The US authorities inferred that regulation would curtail the interest in amateur radio and initially their perception was correct. However, by 1917 the interest in the dynamics of amateur radio had recovered quite significantly and the number of licensed operators was approximately 6,000.

The Outbreak of the First World War

In August 1914, the alliance system that had maintained the peace and balance of power in Europe finally failed and propelled the continent into armed conflict.

Early Wireless Goes to War

Scott Caldwell discusses the situation faced by amateur radio during the First World War.



The European governments quickly acknowledged the advantages and risks of the amateur radio hobby and considered a host of new regulatory controls. The very nature of wireless posed many potential security risks: mobile communication channels that required limited investment and infrastructure and facilitated a significant strategic asset in modern warfare. August 1914 ushered in a culture of spy mania amongst the civil population, unparalleled since the threat posed by the Spanish Armada. The popular press (*Daily Mail*) played a prominent role in sensationalising the perceived threat posed by radio amateurs, who could possibly also be acting as enemy agents.

The Russo-Japanese War of 1905 had revealed the security risk that wireless communication posed. Russian authorities had suspected that reporter **Lionel James** was using his wireless transmitter to pass information to the Japanese military. In 1909, **William LeQueux** wrote the novel *Spies of the Kaiser*, in which German agents utilised wireless telegraphy to send intelligence back to Germany, concerning the movements of Royal Navy vessels in the

Year	Number of Applications
1912	250
1913	1000
1914	1600

Table 1: UK Applications for Experimental Licences.

North Sea. This novel set the tone for all later publications that enhanced the perceived threat of wireless telegraphy in the hands of the enemy. A British novel *The Spy Hunter*, published in 1916, clearly demonstrated the paranoid mindset that prevailed. The novel depicts the exploits of radio amateur **Harry Nettlefield** and his fiancée **Clotide** who are chasing German spies, who posed as ordinary civilians while secretly transmitting information via wireless.

The Post Office's reaction to the intense spy mania was remarkably reserved. They issued instructions for all licence holders to remove vital components from their receivers, and surrender them to their local police station, rendering their equipment unusable. Many critics viewed this response as an attempt to appease the press, and it remains questionable as to how many carried out this instruction.

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Fig. 1: An early Edition of Radio News Promoting the Amateur Radio Hobby Fig. 2: Liberal Prime Minister H.H Asquith Fig. 3: The Defence of the Realm Act 1914 Fig. 4: Richard John Bayntun Hippisley (All pictures: Public Domain)

By 1914, approximately 5,000 licences were issued by the Post Office; many historians view this process as a pure revenue-generating exercise. No formal qualification was required before the issuing of a radio licence, it also failed to differentiate between receivers or transmitters.

Wireless clubs and societies still managed to organise regular meetings, although attendances were reduced as many members were conscripted into the armed forces. Before, the outbreak of the First World War, the only electrical goods retailed to the general public comprised a small range of electric lighting fittings and lamps. Radio amateurs had to be both knowledgeable and resourceful. Bench skills were a necessity due to the widespread shortage of serviceable and spare components. A newspaper report on the establishment of the Derby Wireless Club also depicted the level of versatility that radio amateurs had to possess: "If you possess a few empty jam jars, a roll or two of copper wire, a rubbish drawer and 30s you can erect a wireless receiving station, and by spending another 30s you may also signal through space to anybody who has a similar installation within a radius of six miles". The September 1914 edition of *The Wireless World* featured an article on the effects of the war. However, the perceived effects were visible to the readership, the content had been significantly reduced from 72 pages to only 58. The publishers acknowledged that due to the war effort there was a chronic shortage of quality printing paper. Ingenious ways for amateurs to practice their hobby were also introduced. *The Wireless Press and Gramophone Company* produced a series of records for disc playing devices that catered for a range of abilities as they played a message made up of Morse code characters.

Before the Liberal Government introduced wireless restrictions, a number of radio amateurs had begun listening to enemy broadcasts. Operator **W Kenneth Alford** intercepted the following message: 'Aug 4th, 1914. POZ Nauen. War is declared against France & Russia'. His friends and neighbours did not believe him until it was featured on the front pages of the following day's newspapers.



The Defence of the Realm Act 1914

The Defence of the Realm Act 1914 provided Asquith's Liberal Government, **Fig. 2**, with a range of exclusive political controls, **Fig. 3**. It became law in the United Kingdom on August 8th 1914. It stipulated that "No person without the permission in writing of the Postmaster-General shall buy, sell, or have in his possession any apparatus for sending or receiving messages by wireless telegraphy, nor any apparatus intended to be used as a component part of such apparatus".

In the early hours of August 5th 1914 the Royal Navy cut Germany's submarine trans-Atlantic cables that transited through the English Channel to Vigo, Tenerife, the Azores and the USA. This forced the German military to rely solely on the medium of wireless telegraphy, ultimately increasing the number of messages transmitted. At the outbreak of hostilities, there was only a single Admiralty longwave monitoring station, located near Stockton-on-Tees, near the North Sea coastline. This station had already begun to become overwhelmed by the sheer volume of Imperial German Navy wireless traffic. However, amateur radio operator **Edward Russell Clarke** (1871 – 1918) (callsign THX) had built up considerable experience listening to post-war German traffic that originated from Neumunster and Norddeich, as part of his hobby. Clarke was also a qualified barrister and had an interest in the developing automotive industry. He had already alerted the Admiralty to the fact that the German's had altered their frequencies to utilise shorter wavelengths. Clarke now offered the Admiralty additional support in

monitoring German signals, on condition that he received official facilities for his exclusive utilisation. An intercept wireless station was set up at Hunstanton that was manned by Clarke and his fellow amateur wireless operators. The Hunstanton site was selected because it was the highest point nearest the German coastline and it already possessed the required infrastructure because it was home to a Marconi wireless station.

Richard John Bayntun Hippisley (1865 – 1956) (**Fig. 4**, callsign HLX, later 2CW) was also a pioneering radio amateur and a close friend of Clarke. They subsequently worked alongside each other at Hunstanton during the war years. The wireless station at Hunstanton would become universally known as *Hippisley's Hut*. In 1903, Hippisley published *The History of Telegraph Operations during the South African War 1899 – 1902*, and he acted as a British representative at the International Conference on Wireless Telegraphy 1906, ironically held in Berlin. Hippisley, was later promoted to the rank of Commander in the Royal Navy Volunteer Reserve (RNVR) for his service with the Naval Intelligence Division. As a result of his wartime service, Hippisley was awarded an OBE in 1918, and a civil CBE in 1937.

A description of the structure of the wireless intercept station at Hunstanton is provided by English Heritage in their publication *First World War Wireless Stations in England* (2015).

"The building consists of two small single-storey structures, both with a pitch roof and large window on the front elevation, on either side of a larger central building. The latter has an overhanging

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first floor to the front elevation supported on posts, with a long run of windows to the upper level. The building is timber clad with a pitch roof and an ornate barge board."

Archival research and surviving primary historical evidence suggest that accommodation for the wireless operators was rather basic. They were usually housed in on-site quarters, or in local lodgings. An example from the wireless station at Flamborough Head describes the accommodation as being within bungalows, which consisted of eight iron bedsteads, four chests of drawers and two showers.

Clarke was also conscripted into the ranks of the RNVR, and the wireless station was operated by a diverse number of roles that included an officer in command, chief operators, operators in command of the watch, clerks, runners and maintenance engineers, and assisting engineers.

Clarke's task was greatly assisted as the three most significant German codebooks were obtained in the first months of the war, one from the German merchantman *Hobart* interned in Melbourne Harbour, one salvaged by the Russians from the German cruiser *Magdeburg* stranded off Odensholm, and one salvaged from the sunken German destroyer *SMS 119* off the Belgium coast. This provided British intelligence in 'Room 40' (Admiralty Headquarters) with the entire codes of the Imperial German Navy and their Mercantile Marine fleet.

Tragically, Clarke died at Penbidwal on October 17th 1918. His death was attributed to sheer exhaustion from his demanding and excessive workload. He was laid to rest in St Michael's Churchyard, Llanfihangel Crucorney.

Overall, in defiance of the Defence of the Realm Act, amateurs continued to operate discreetly and tended not to leave any traces of their illegal activity. The *Daily Telegraph* summed up both the advantages and risks of wireless telegraphy:

"Wireless telegraphy conferred a boom upon mankind, but it is not without its dangers in times of international complications. A representative of the Daily Telegraph was yesterday shown messages originating in Germany, France, and the North Sea, which some time ago were received at a private wireless station in the



West End. Like the telephone when it was in its infancy, the wireless system attracted many amateurs and experimentalists, and numbers of aërials were erected. In times of war, these installations may be used against the public weal. They may also be brought to serve in the best interests of the Empire by catching stray messages intended for the enemy".

There were still small legal loopholes that permitted amateurs to operate during the war and improve their techniques. It seems that amateurs who operated in excess of 50 watts were subjected to the restrictions outlined in the Defence of the Realm Act, allowing the utilisation of low power sets. Some amateurs had moved to other countries before Europe was engulfed in conflict. They readily continued to remain in contact with their native amateur networks. An example relates to an English operator located in Turkey, in 1915, who continued to listen to messages from various foreign Embassies and their naval vessels, predominantly German and French. He referred to their wireless traffic as "the concert of Europe".

After the signing of the armistice (November 11th 1918), a number of radio societies petitioned the Post Office about the restrictive measures contained within the Defence of the Realm Act. They maintained that it was preventing amateurs from contributing as effectively as they might to the development of radio communication. However, it is claimed that the German espionage service had

no intention of risking the safety of their agents with bulky, noisy, obstructive, and electrical power demanding wireless radio equipment. This myth was useful in assisting the authorities unifying the population against a common enemy of the state, either real or imagined. In many ways the perceived dangers of amateur wireless operators greatly assisted the nation's wartime propaganda effort.

Conclusion

Post-war, the utilisation of radio was significantly transformed. A radio amateur of the early 1910s predominantly listened to rare chaotic messages that were intended for technical communications. However, an amateur of the late 1920s was subjected to regular communications from all over the world. Regulation remained and the post-war chaos was systematically reduced by a new licensing system and the segregation of technical messages, radio broadcasts, and radio amateurs by set operating frequencies. Social liberalisation in post-war Britain also facilitated female operators to take up the hobby. **Barbara Mary Dunn**, callsign **G6YL**, was widely known as the first licensed transmitting YL on April 14th, 1927 (though, as I will show in a later article, she was almost certainly the second).

Suggested Further Reading

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Two More for the Shack

Geoff Theasby G8BMI has an Electronic Calculator and a Better Transistor Tester.

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This first kit, by KKMoon, is available from many suppliers (including Amazon – Google ‘KKMoon calculator’), and is very easy to build. Electronically speaking, it takes about two hours to build, using only eight components, including a 20-pin chip, although I had two resistors left over. Assembling the case and marrying the two took far longer, about four hours, as no instructions are included. Preparing the key tops with the correct legend is easy, but repetitive. Once the housing has the correct orientation established, by matching the screw holes and tabs, it can be screwed together, which is easy to say... The LCD display is easier to make up, just four black screws hold the bezel on. The 16-way pin header should be bent to match the angle of the display in the case, which is a little tricky. Just do not damage any item by forcing it.

Powering it up, it worked first time, although the display was almost unreadable due to lack of contrast. It is a common two-line 1602 display, so checking the datasheet online revealed that pin 2 is the one to use. As originally instructed, a potential divider formed of 10kΩ and 1kΩ resistors, tapped at their junction and taken to pin 3 controls the contrast.

If desired, a miniature 20kΩ PCB potentiometer could be fitted, but I tried a 47kΩ pot between pins 2 & 3, to get best contrast without dismantling, and the effective resistance measured. This was about 3kΩ, so 3.3kΩ was permanently added between the pins on the pin header. Pin 1 is on the right-hand end, looking in the back of the case, **Fig. 1**. Complete dismantling is required to change the batteries (CR2032 coin cells x 2) but if you do not completely separate the M2.5 screws and nuts holding the display on, it becomes easier, and you will not lose the nut in ‘the works’.

The device is a basic four-function machine, which is available in many forms for about £1 or £2 ready built. 40 years ago, these machines were very expensive, so it was worthwhile to save money by building

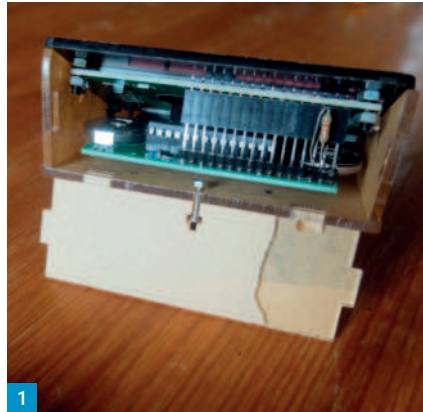


Fig. 1: Looking into the back of the case.



Fig. 2: The completed calculator.

Fig. 3: The transistor tester.

a kit. Why now build your own? Because, you can say “I built it myself”. Of course, readers need not reveal that it is a very simple kit to make..., **Fig. 2**.

A Better Transistor Tester

In *PW* April 2019 I discussed a small transistor tester, which has since been in constant use here chez Theasby. It is invaluable when assembling kits.

However, the boffins have been busy, and there is now released the GM328, a ‘better mousetrap’ if you will, **Fig. 3**. Again, available from Amazon and others (Google ‘GM328’). Using a pre-programmed AT Mega 328P microcontroller, it performs a much more detailed analysis of many semiconductors, which was outside the scope of the previous version. It is also a square-wave frequency generator, using 20 fixed frequencies twixt 1Hz and 2MHz, although the waveform is most certainly not ‘square’, and it is best kept below 500kHz.

In addition, a frequency meter function, useful from a few Hertz to over 1MHz, and an adjustable PWM generator. Mine could be varied from 10% to 81% as seen on my Hameg HM307 ‘scope. Other facilities include a self-test routine, and all results shown on a 1.8in LCD colour display. The original design was by **Markus Frejek**, see: www.mikrocontroller.net

A 64-page manual updated by **Karl-Heinz Kubbeler** is available online at: www.mikrocontroller.net/



attachment/164956/ttester_eng104k.pdf

Assembly was fairly easy, although components were a little tightly packed in places. Upon connecting a PP3 battery, nothing happened. Investigation found a couple of poor solder joints so I tried applying power once more, with the same results. Voltage tests revealed a solder bridge under a 9012 transistor. After rectifying this, it worked perfectly. No instructions are provided, but see the Bangood entry for this device on eBay. On test it was within 1Hz of my other audio frequency meter, and within 0.1V of my digitally metered power supply.

<https://tinyurl.com/y2lxycxc>
<https://tinyurl.com/y4ur9jj4>

Read more radio news and reviews at www.radioenthusiast.co.uk/news

Weather Watching and Radio: Natural Bedfellows

RadioUser editor **Georg Wiessala** explores different ways of obtaining weather information using your radio and PC, looking at weather maps and images, Fax and RTTY, aviation and maritime weather forecasts.

Georg Wiessala

wiessala@hotmail.com

I think it is probably fair to say that most amateur radio operators and radio enthusiasts also have a healthy interest in the changing weather in these Isles and beyond. Next to radios and accessories, weather stations, I am reliably informed, are among the bestsellers of many of our radio traders and advertisers.

I often hear about new models available to the hobby market. At the time of writing, for example, **Peter Waters G30JV**, from Waters & Stanton, has written in about the new Watson W-8686, offering Wi-Fi functionality and a colour screen. It will be reviewed in full in a forthcoming issue of *RadioUser*.

<https://tinyurl.com/y4g2yhqe>

As for my own shack, I have long been the owner of the *Davis Vantage Vue* model, which sits on the roof and transmits to an indoor console (on 868.0-868.6MHz [US: 902-928MHz]), as it turns out, **Fig. 1**).

Moreover, the weather here in Blighty is often the subject of radio programmes, podcasts and TV documentaries. Naturally, both *Practical Wireless* (PW) and *RadioUser* (RU) regularly publish articles about weather, mostly in connection with propagation (most recently, *From Isobars to Millibars*, in RU 2019/20).

In a more recent contribution on *Time, Frequency and Propagation*, I found that certain time signals also carry coded weather information, for instance, the VLF station DCF77 (77.5kHz).

Furthermore, weather often plays a part in our regular columns, especially when there are specific weather events to report on, such as the Spring 2020 floods. **Tim Kirby GW4VXE** wrote about this recently (*Signals from Space*, RU May 2020).

New technologies are often catalysts for weather-related content in some of our columns. One recent example of this was **Robert Connolly's** 2018 RU contribution on *DRM Data-Casting in Maritime Matters*.

There are some weather-and-radio-related posts on our *Radio Enthusiast* website too.

<https://tinyurl.com/y6eghyga>

Last but not least – and delving into the archives – I find that the weather forms a recurring thread in the rich annual tapestry of our magazines, as do some other, related, subjects.

Overall, the most pertinent one of those seems to be propagation, space weather, and the ionosphere.

However, the areas of 'weather' and 'radio' have also overlapped in many of our (and PW's) articles on Maritime and Space Communications, 'Natural' Radio, VLF Studies and History, to name but a few.

Details of all the articles mentioned here, and some more, are indicated in **Table 1**, later on in this article.

The Radio Weather Watchers

There are multiple reasons why we all keep an eye out for the weather. If you are a radio fan concerned about climate change, you may have studied the International Telecommunications Union's *Use of Radio Spectrum for Meteorology*, or similar papers by other pertinent organisations, such as the World Meteorological Organisation (WMO).

www.itu.int/pub/R-HDB-45

<https://tinyurl.com/ycjyn5nd>

Perhaps closer to home, you might have large antennas, masts or towers in the garden to keep an eye on.

Moreover, whether we are radio amateurs or DXers, skippers or flyers, we all need reliable weather information to assess signal paths and propagation conditions.

However, I feel that many of us are simply fascinated by the changing weather in itself and like to monitor conditions, locally, regionally, or on a wider scale.

Therefore, in the remainder of this article, I am aiming to pick out a handful of ways (ten, in fact), through which you can monitor weather with your radio(s), in



a variety of ways, and without going to any great expense.

As in many other areas of the radio hobby, much of this comes down to personal preferences – some of you might prefer the more traditional ways of weather watching, using 'legacy-equipment' (i.e. radios with knobs on). Alternatively, you might be captivated by the possibilities of more recent technology, such as Software-Defined Radios (SDR) or weather-specific software, such as *SeaTTY*, *JVCom32*, *Yand*, *PropLab*, *Zorns-Lemma 11.4.2*, or the comprehensive *Digital Atmosphere* software suite.

www.weathergraphics.com/da

I am going to include something on all of those methods in what follows, my own modest and limited knowledge of the technology allowing. For this article, I am looking at 'weather-information' in a slightly wider sense, thus also including signals that you might prefer to see as 'atmospheric', 'ionospheric' or general 'propagation' data.

Therefore – since 'weather', in its most general sense, can be defined as *the state of the atmosphere above and around your (or another) location* – I thought it permissible to also include some 'space-weather' and solar observation by radio, and other marginal topics.

Sign up to our FREE email newsletter at www.radioenthusiast.co.uk

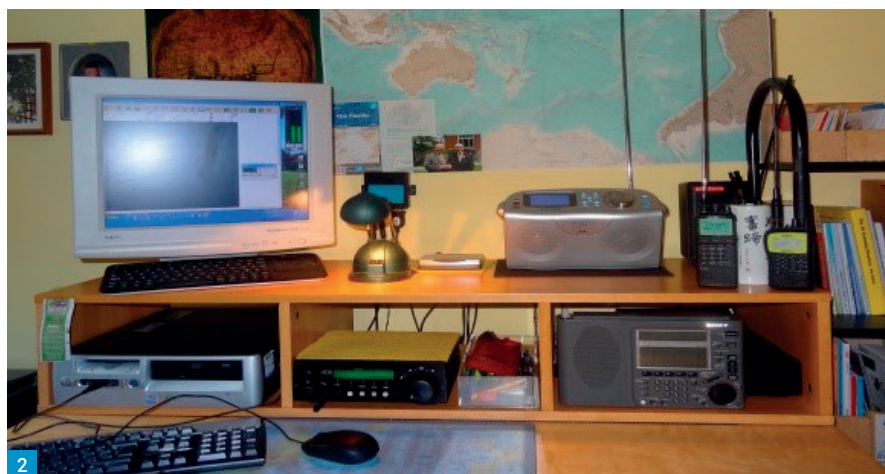
- Bennett, L. (2020) *Portishead Radio* (PW, April 2020: 13-17)
- Connolly, R. (2010) *WEFAX and RTTY on HF Maritime Radio* (RU, December 2010: 34)
- Connolly, R. (2018) *DRM Data-Casting in Maritime Matters* (RU, July 2018: 22-24)
- Hamer, K. and Smith, G. (2019/20): *From Isobars to Millibars* (RU, November 2019: 64-67; March 2020: 27-30).
- Kirby, T. (2020) *Signals from Space* (RU, May 2020: 28-30)
- Richards, M. (2011) *Decoding for Beginners* (RU, July 2011: 16-18)
- Richards, M. (2012) *Maritime Weather Broadcasts* (RU, May 2012: 34)
- Schiffhauer, N. (2018) *VOLMET: Russian Aero Nets* (RU, May 2018: 30-32)
- Schiffhauer, N. (2018) *NAVTEX: Safe Journey on the Seven Seas* (Utility DXing) (RU, September 2018: 40-42)
- Schiffhauer, N. (2018) *FAX: Thou Shalt Make an Image* (RU, November 2018: 40-43)
- Schiffhauer, N. (2019) *MF/HF SSB: Cruising the seven Seas* (RU, February 2019: 56-59)
- Schiffhauer, N. (2019) *Autobahn Across the Ocean* (RU, November 2019: 32-35)
- Schiffhauer, N. (2019) *Air Traffic Nets: HF Data Linking the World* (RU, December 2019: 60-64)
- Schiffhauer, N. (2020) *PropLab* (RU, May 2020: 54-57),
- O'Sullivan, S. (2014) *Monitoring the Sun Using VLF* (RU, April 2014: 54-56)
- White, Steve (2020): *Ionosondes*, PW, May 2020: 72/3
- Wiessala, G. (2012) *My Weather Day* (RU, May 2012: 52)
- Wiessala, G. *Always Take the Weather with You* (Utility DXing) (RU, July 2018: 30-32)
- Wiessala, G. (2015) *Develop a Propagation Monitoring Routine* (RU, February 2015: 52-57)
- Wiessala, G. (2020) *Time, Frequency and Propagation* (RU, April 2020: 28-31)
- Wiessala, G. (2020) *Zorns-Lemma 11.42* (RU, February 2020: 63-66).

Table 1: Selection of Articles on Weather & Radio.

Equipment, Concentric Circles and Case Studies

One final word of introduction: technology has moved on over the last decade. My own 'state-of-the-art' radio weather shack just eight years ago relied heavily on an AOR AR7030, a Sony ICF SW77, an ICOM IC-R 20, a Uniden UBC72XLT scanner, and a Roberts Stream WM-202 internet radio, **Fig. 2**.

Now, I have other HF receivers in my shack, such as the Lowe HF-250, a PURE

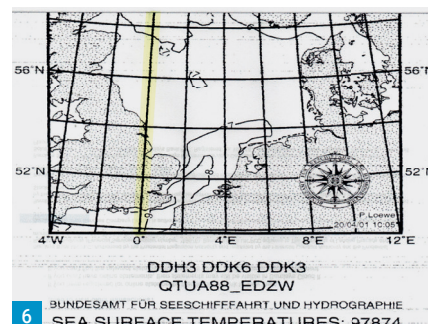
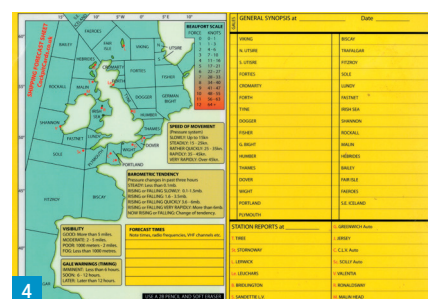


Evolve 3 DAB radio, and a later-model Roberts *Stream107* internet radio.

In the 'SDR corner', there is an *AirSpy HF+* 'Discovery' and a new *SDRPlay RSPdx*.

For VLF observations (of the Sun's influence on the Ionosphere), I use a VLF loop antenna and antenna tuner from the UK Radio Astronomy Association (UKRAA), a *Behringer UMC202HD uPhoria 2x2 192kHz USB Audio Interface*, and my PC, with software such as *Radio Sky Pipe* and *Spectrum Lab*.

My main 'weather-radio antennas' are the Wellbrook ALA150 loop, a new Cross Country Wireless (CCW) loop with an amplifier, occasionally a Tecsun AN-48x, and a Moonraker X1-HF Vertical 1-50MHz



trapped coil receiving antenna.

There are, of course, a plethora of other ways and means by which radio amateurs and listening enthusiasts are now able to gather up-to-date weather information, take a look at **Table 2**.

Many hobbyists think of this in terms of a set of concentric circles, looking at conditions in their home locale first, then at the regional and national picture, and lastly at the wider international trends. Alternatively, you can use a temporal framework and work yourself through a whole day (or night) as I did when I first wrote about this in 2012 and 2015 (see also the reading list in **Table 3**).

Case Study 1: Portable Radio, Pen and Paper

Let's begin with pen and paper, shall we? One of my most treasured daily rituals has always been listening to the iconic

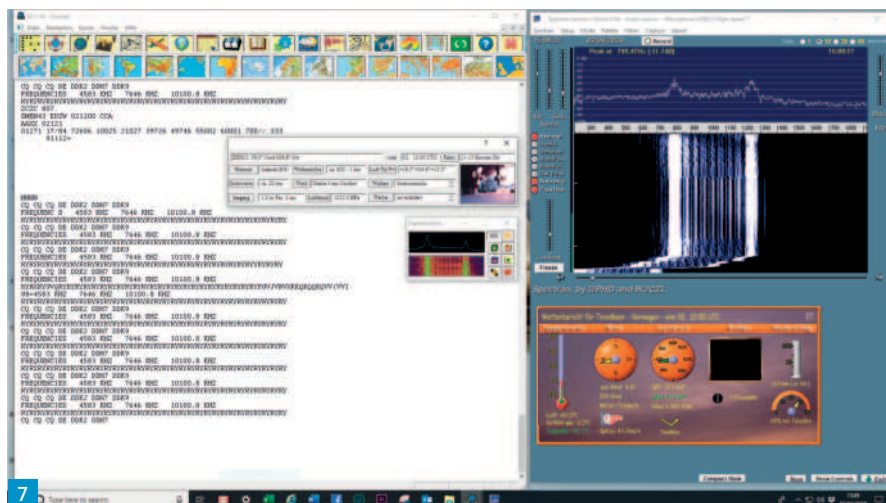


Fig. 1: My Davis Vantage Vue Weather Station.

Fig. 2: My radio/weather shack in 2012. Fig. 3: My

old Sony ICF SW77 on weather watch (RAF Volmet).

Fig. 4: You can log the Shipping Forecasts here.

Fig. 5: Recent weather fax with Greenwich Meridian.

Fig. 6: Sea surface temperatures in May 2020 from Hamburg.

Fig. 7: Zorns Lemma 11.42, in concert with Spectran.

Fig. 8: RTTY synoptics with images.

Fig. 9: A general weather forecast in the clear.

Shipping Forecast on BBC Radio Four Long Wave (198kHz LW/Internet). The Shipping Forecast is said to be the longest-running continuous forecast in the world.

Due to Covid-19, and from Monday March 30th 2020, the BBC Radio 4 Weather Bulletins were due to be broadcast as follows: 00:48 LW, FM Gale Warnings, Shipping Forecast, weather reports from coastal stations and the Inshore Waters Forecast; 05:33 LW, FM Gale Warnings, Shipping Forecast, weather reports from coastal stations and the Inshore Waters Forecast; 12:00 (weekdays only) LW, FM Gale Warnings, Shipping Forecast; and 18:00 (weekends only) LW, FM Gale Warnings, Shipping Forecast.

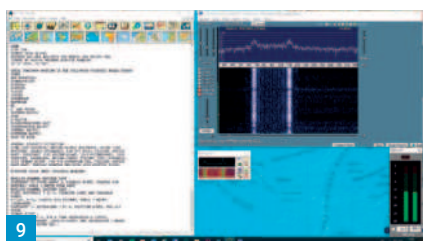
<https://tinyurl.com/uxwe89y>

Some authors have found the Shipping Forecast inspirational enough to write books about it (Connolly, 2005; Jefferson, 2011; Compton, 2016), and you will easily find websites dedicated to the history of the programme.

www.bbc.co.uk/programmes/b006qfzv

<https://tinyurl.com/y2m63kcf>

I frequently listen mobile, with a portable radio such as my trusty old Sony ICF SW77 (Fig. 3, here on RAF VOLMET, 5450kHz). There are many other suitable portables for this, of course, just look at Clint Gouveia's recent series on Portable DXing, in RadioUser (January 2020: 60-63; February 2020: 54-57; April 2020: 24-26).



Most of the time, I use a very nifty, laminated Sea Areas sheet for maritime use to log what I hear, Fig. 4.

Or you can still make use of the once very widespread RYA/R Met Soc Met Maps for your loggings.

www.cockpitcards.co.uk

<https://tinyurl.com/uzvk5z4>

To correlate what you hear with what is going on at your local level, you may wish to complement your listening with checking the readings on your weather station, or a walk through your garden with a general environment meter, such as the CEM DT-8820 – always have a cup of coffee or tea to hand when you do this, believe me, it helps.

A reliable shack clock is always a necessity in this respect, and these have their own history, of course.

<https://tinyurl.com/y3fsqtcv>

If you are green-fingered, don't miss the gardening weather forecasts on

- ACARS (VHF & HF)
- Amateur Radio Emergency Service (ARES-ARRL, USA): www.arrl.org/ares
- DRM Weather 'Datacasting' (Robert Connolly: Weather by All Means)
- GRidded Information in Binary (GRIB) files (from numerical weather prediction programs)
- HF SITOR MFI Broadcasts
- HF VOLMET (RAF [5450 and 11253kHz]; Shannon [3413, 5505, 8957, and 13264kHz])
- Ionosondes and Lightning Detectors (eg. Boltek www.boltek.com)
- Local Amateur Radio Operators and Nets
- Marine Observation Programme (MAROB, USA): www.weather.gov/marine/voluntary
- Maritime Mobile Service Network (MMSN, USA): <http://mmsn.org>
- Morse code (partly historical)
- MSI (Maritime Safety Information Broadcasts, e.g. Liverpool Coastguard on 161.725MHz)
- NAVTEX (408 and 518 kHz)
- Non-Directional Beacons (NDB)
- Online weather sources
- Radiosondes (Weather Balloons) (<https://tinyurl.com/y2n8zffv>)
- RNLI Pager (historical)
- RTTY (clear-text and synoptic reports, many software decoders are available)
- Skywarn (Storm Spotter Programme, USA): www.weather.gov/SKYWARN
- SYNOP Data through Software (Digital Atmosphere, Zorns Lemma)
- Time signals with (encoded) weather information (e.g. DCF77/ METEOTIME)
- VHF VOLMET (Various)
- VLF Observations (Very Low Frequency)
- Weather Fax (WEFAX)
- Weather Satellites (WXSAT, e.g. with the R2FX or Vierling Weatherman systems)

Table 2: Sources of Weather Information via Radio/Amateur Radio.

such programmes as *Gardeners World*, *Gardeners Question Time*, *Country File*, or (online) at *MetCheck*, *BBC Weather* or *Accuweather*.

<https://tinyurl.com/y5v8hjgg>

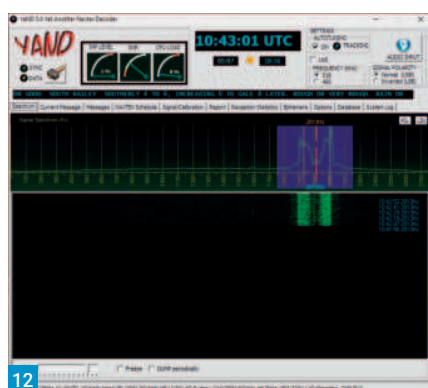
www.bbc.co.uk/programmes/b006qp2f

Case Study 2: Fax, Weather Maps, Images, and Synoptic Forecasts

These transmissions, deriving from the *International Safety of Life at Sea (SOLAS) Agreement*, have had a hold over me for decades. Despite modern technology, I



10



12

Fig. 10: The handy Mörer Infobox (WIB2D) NAVTEX receiver. Fig. 11: The NAVTEX BT-3 from NASA Marine. Fig. 12: YAND NAVTEX reception has just started. Fig. 13: A global weather snapshot using the internet-download facility in Zorns Lemma 11.42.

love to see the weather maps build up on my screen.

The German Weather Service (*Deutscher Wetterdienst*, DWD) near Hamburg is a reliable source on 3.855 (DDH3), 7.880 (DDK3), 13882.5 (DDKL6) and 15.9880kHz. www.dwd.de

The more commercialised *Joint Operational and Meteorological Operations Centre* (JOMOC) transmissions, on 2618.5, 4610, 8040 and 11086.5kHz, come (perhaps not as frequently as they did before, in my memory) from Northwood. JOMOC produces and distributes worldwide environmental information for UK and NATO Forces. www.jomoc.net

Both the DWD and JOMOC schedules can be accessed on the web. If you have archive access, check out Nils Schiffhauer's, Mike Richards G4WNC's or Robert Connolly's previous articles in *RadioUser* for some more background and reception hints on WEFAX (Table 1).

Remember to set the radio at up to 1.9kHz lower (when in USB mode), or



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higher (LSB) than indicated, to get a clear picture, Figs. 5 and 6. This can, at times, be a matter of 'trial-and-error'.

Radio Teletype (RTTY) weather forecasts are available, with changeable reliability, on 147.3 (DDH47), 4583 (DDK2), 7646 (DDH7), 10100.8 (DDK9), 11039 (DDH9), and 14467.3 (DDH8) kHz from DWD.

If you use the *Zorns Lemma* (11.4.2.) software package, you can translate the synoptic forecasts into great images of the ships, buoys and other stations where the data came from. These pop up on-screen as you go along – very neat, Figs. 7 to 9.

The *SeaTTY* and *Black Cat Fax Decoder* software suites are also in regular use in my shack.

Other than those, you might wish to try programmes such as *FLDIGI*, *MixW4*, *MultiPSK*, *Sorcerer*, or *W-Code* to unlock and visualise your weather data.

Case Study 3: Marine Weather

The *Shipping Forecast* has already been mentioned (*Case-Study 1*), and the images and maps available via RTTY and WEFAX (see the previous section) do, of course, have a mainly maritime purpose too. In addition to these, you may wish to decode the regular NAVTEX (SITOR-B [Simplex-Telex-Over-Radio], FEC) transmissions on

- Atkinson, A. and Clayton, M. (2011) *Lundy, Rockall, Dogger, Fair Isle: A Celebration of the Islands Around Britain* (Ebury)
- Compton, N. (2016) *The Shipping Forecast: A Miscellany* (BBC Books)
- Connelly, C. (2005) *Attention All Shipping: A Journey Round the Shipping Forecast* (Abacus)
- Gribbin, J. (2016) *FitzRoy: The Remarkable Story of Darwin's Captain and the Invention of the Weather Forecast* (CreateSpace)
- Harris, M. (2000) *Understanding Weatherfax* (2nd ed.) (London: Adlard Coles Nautical)
- Hood, T. (2017) *The Ionosonde* (*The Spectrum Monitor*, March 2017: 63)
- Houghton, D. (2008) *Weather Forecasts* (Royal Yachting Association)
- Jefferson, P. (2011) *And Now the Shipping Forecast* (UIT)
- Moore, P. (2016) *The Weather Experiment: The Pioneers Who Sought to See the Future* (Vintage)
- Thompson, H. (2006) *This Thing of Darkness* (A novel on Robert FitzRoy) (Tinder)

Table 3: Suggestions for Further Reading.

490 and 518kHz.

NAVTEX covers 21 global NAVAREA regions and is linked to the Global Maritime Distress and Safety System (GMDSS). The signals can be decoded by a hardware receiver, such as the NASA BT-3 or the stand-alone Mörer Infobox (eg: WIB2D, Figs. 10 and 11).

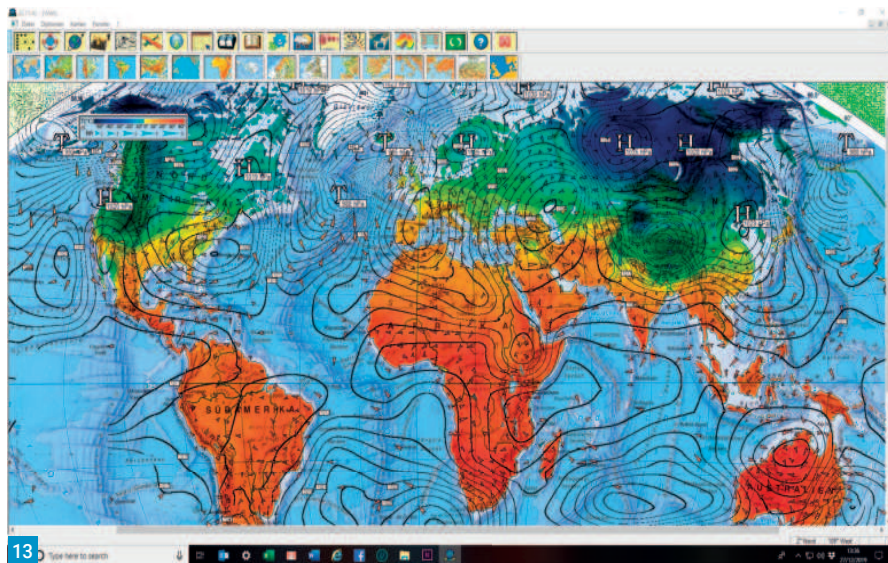
The latter allows you to see the received data on your smartphone, via an app, *Blue NAVTEX 2*. The former device is made for mariners and meant to be carried around.

In addition to this, I am always keen to try out various software NAVTEX decoders, such as *SeaTTY*, *Zorns-Lemma 11.4.2*, *Mscan Meteo Pro*, *Frisnit* and *JVComm32*.

www.jvcomm.de/index_e.html
<http://mscan.com>
www.dxsoft.com/en/products/seatty
<https://tinyurl.com/yyrne726>
www.wettermonitor.de

I have settled on Yand ('Yet Another NAVTEX Decoder', Fig. 12). It runs reliably and trouble-free in the background, hooked up to a variety of receivers, at the moment a Lowe HF-250. Using *DX Atlas* with it, allows you to display where your signals came from. Set the receiver to 516.1kHz USB.

Remember that, although there is but one NAVTEX channel for HF (4209.5kHz), there are many NAVTEX transmissions from coastal stations that are using



Narrow-Band Direct Printing (NBDP).

You will also find a wealth of weather-related information on MF and HF maritime SSB voice channels.

For the wider context, you may wish to check out the comprehensive World Meteorological Organisation document of May 7th 2019, as regards NAVTEX and maritime weather. You can find it at this URL:

<https://tinyurl.com/y9ywc5ny>

The 'quick-fix' option, is to check in with the Met Office, Royal National Lifeboat Service (RNLI) or BBC online, for the latest weather updates. You may also enjoy **Konstantin Sedov's** website, *NAVTEX Live*: www.navtex.lv

In the UK and Ireland, you can also switch to VHF for local MSI (Maritime Safety Information) broadcasts from the Coast Guard. Frequencies are in the Marine Band. Liverpool/Holyhead is on 161.725MHz, for instance.

A full list of UK MSI frequencies can be found, for instance, on the websites of the Royal Yachting Association (RYA) or Maritime and Coastguard Agency (MCA).

<https://tinyurl.com/y5cfqe35>

<https://tinyurl.com/ppkc54b>

If you are interested in the shape of the various Sea Areas, have a look at some of the books in the resources lists, and at these websites:

<https://tinyurl.com/y2tauwer>

In terms of general resources, the *Klingenfuss Guides* are very reliable, as are the *Admiralty List of Radio Signals* and the document *Worldwide Marine Radio Facsimile Broadcast Schedules* by the US Department of Commerce (National Oceanic and Atmospheric Administration, NOAA, as of February 12th 2020).

www.weather.gov/media/marine/rfax.pdf
www.weathergraphics.com/da

Case Study 4: Aviation Weather

VOLMET broadcasts (from the French portfolio-term 'vol' ('flight') and 'met' ('météo' = 'weather-report') cover meteorological information for aircraft in flight. The overall VOLMET envelope covers Aviation Routine Weather Reports (METAR), Special Observations (SPECI), Terminal Area Forecasts (TAF), and other Significant Meteorological Information (SIGMET) (Schiffhauer, 2018).

This, and much more, is described in the *Meteorological Service for International Air Navigation* document by the International Civil Aviation Organisation (ICAO).

<https://tinyurl.com/sh26egb>

Aeronautical weather forecasts on VHF are local to each airport or region (e.g. London Main: 135.375MHz; North: 126.600MHz; South: 128.600MHz and Scottish: 125.725MHz).

HF VOLMET transmissions are, of course, trans-regional. RAF VOLMET comes in on 5450 and 11253kHz (USB), and Shannon VOLMET on 5505 (USB), both can be easily received and may, for many, be their first foray into utility listening. Rostov Volmet on 6617kHz may be more of a challenge.

From here, you may well wish to branch off and explore HF voice comms on the aeronautical HF bands, High-Frequency Data Link (HFDL) communications, Russian Aero Nets and a wide range of other topics (Tables 1 to 4).

<https://tinyurl.com/y2fhbumf>

William Hepburn's Worldwide Volmet Broadcasts HF Aeronautical Stations list at

- BBC Weather Shipping Forecast: <https://tinyurl.com/ouwg5tst>
- Frank Singleton's Weather and Sailing Pages: <https://tinyurl.com/q5xpg7>
- GEO: www.geo-web.org.uk
- International Telecommunications Union (ITU):
 - www.itu.int/en/Pages/default.aspx
- Maritime and Coastguard Agency (MSIB): <https://tinyurl.com/y3c93g8t>
- Met Office: www.metoffice.gov.uk
- Meteotest (Switzerland): www.meteotest.ch
- NOAA Weather Radio: www.weather.gov/nwr
 (162.400, 162.425, 162.450, 162.475, 162.500, 162.525, 162.550MHz (USA))
- NOAA: Worldwide Marine Radio facsimile Broadcast Schedules: www.weather.gov/media/marine/rfax.pdf
- RNLI: www.rnli.org.uk
- UK Hydrographic Office (UKHO): www.ukho.gov.uk
- UK Rain Radar (Met Office): www.metoffice.gov.uk/weather/uk/radar
- Weather Online (UK): www.weatheronline.co.uk
- World Meteorological Organization: www.wmo.int/pages/index_en.html
- YachtCom: www.yachtcom.info/Weather/index.html

Table 4: A Selection of Websites.

the *dxinfo*centre and the Volmet section on *Skybrary* are very good starting points for global HF VOLMET broadcasts.

www.dxinfocentre.com/volmet.htm

www.skybrary.aero/index.php/VOLMET

A comprehensive list of international VOLMET stations, by **Nils Schiffhauer**, is in *RadioUser*, July 2018: 32.

Moreover, this (downloadable) *Aeronautical HF Radio Map* is a piece of pure joy for aviation enthusiasts:

<https://tinyurl.com/ya2bqzef>

Other Weather Resources

In an article of this length, it is just possible to scratch the surface of the plethora of resources available to the radio and weather observation enthusiast (Table 4).

I have been guided by the areas we have covered in *PW* and *RU* magazines before, and by the ease of use for the beginner in this section of the hobby.

There are many other ways of weather

Radio Round-up

monitoring and weather data reception that I have no room to cover here, and which will be covered by our columnists. The reception of data from weather satellites is an obvious example. Tim Kirby will, on occasion, come back to this subject, building on his *Signals from Space* column in *RadioUser* (May 2020: 28-30).

You may also wish to get to grips with GRidded Information in Binary (GRIB) files. These are data derived from numerical weather prediction programs, and the output values appear on a 3D 'grid' of points. You will need a GRIB file viewer, such as *Météociel*, and some of these apps are summarised at this URL:

<https://tinyurl.com/y5jdqzvz>

Alternatively, you may wish to check out the webpages of the 21st Operational US Weather Squadron (Sembach, Germany):

<https://tinyurl.com/uxn3qtff>

Last, but certainly not least, the beautiful weather maps that you can assemble, from synoptic data, with software such as *Zorns Lemma 11.42*, **Fig. 13**, or *Digital Atmosphere*, are almost works of art in themselves.

However, we are getting further away from what you and I might understand as 'radio' here.

Include the concept of 'space weather' and the sky's the limit, but this area does overlap with radio science and propagation science and will, I am sure, be the subject of a future article in *Practical Wireless* or *RadioUser*.

www.hfradio.org

The Swiss company IROX is one of a few in Europe who offer weather stations with the functionality to receive the METEOTIME signals. This data stream can be decoded and displayed in the UK. The Meteotime Weather Centre provides weather forecasts riding on the back of the DCF77 VLF (77.5kHz) time signal, from Mainflingen in Germany. Forecasts are assembled from this by professional meteorologists for 470 cities in Europe (60 regions with four-day forecast, and 30 regions with two-day forecasts).

www.irox.com/web/en/Default.htm

I hope this short overview has made you more aware of just how many ways there are to stay informed about your local, regional and international weather conditions, and to combine this with our great radio hobby.

Maybe, someone out there will want to follow this article up with an overview of the current situation for all radio enthusiasts, amateurs and weather watchers...

HF DIGITAL MODE BAND PLAN REVIEW: Because frequency allocations and amateur radio operating interests vary in different parts of the world, the development of band plans – voluntary guidelines on the use of the spectrum that is available to radio amateurs – is a responsibility of the three IARU regional organisations.

Each of the three Regions has a band planning committee to focus on this work. In recent years there have been increased efforts to bring the regional band plans into alignment wherever possible. Final approval of band plan revisions is generally given by the regional conferences of IARU member-societies that are held every three years on a rotating basis.

This approach to band planning generally has kept pace with the evolution of amateur radio operating. However, the explosive growth in HF (below 30MHz) digital modes, particularly FT8, has led to perceived overcrowding of HF digital mode band segments. Accordingly, a working group has been formed consisting of representatives of the three regional band planning committees. This is the first time the three Regions have joined together to directly coordinate band planning efforts.

The working group has already had fruitful discussions with the WSJT Development Group led by Joe Taylor K1JT. Additional discussions, including with other HF stakeholders, will be held as part of a fundamental review of the different HF digital modes, and how they can be best categorised and arranged to share the limited spectrum available.

The main aim is to develop solutions that reduce congestion within very popular mode segments while preventing mutual interference between incompatible modes to the greatest extent possible. While the proposed band plan revisions will have to be approved by member-societies in each Region, recent administrative changes mean that the changes can be implemented without having to wait for the regional conferences.

Amateurs are encouraged to follow progress through their IARU member society and the IARU websites, which can be reached via:

www.iaru.org

NEW CONTEST FOR DXERS AND PORTABLE OPERATORS:

A new contest has been announced that will level the competitive playing field between the Big Guns and the Little Pistols who operate a portable station. It's called the Fox Mike Hotel Portable Operations Challenge. "The scoring metric is the distance-per-power metric with multipliers for portable operators and the difficulty of the transmission mode," said Ed Durrant DD5LP, a member of the Steering Committee for the POC. "We are using kilometres-per-watt as the score for a contact.

But those using a more difficult transmission mode such as phone will get a higher multiplier than those using the more efficient modes of CW and digital. Being a portable station will receive an additional multiplier, especially when contacting another portable station." The scoring system is based upon the golf metaphor of the handicap index used to equalise the opportunity for all players to win when they have unequal ability and play on courses with varying levels of difficulty. The POC is being sponsored by ARRL's *National Contesting Journal*, the UK DX Foundation (CDXC), the Hellenic Amateur Radio Association of Australia and the South African Amateur Radio League. NCJ Editor, Dr Scott Wright K0MD, said, "NCJ is very pleased to be an official sponsor of this contest event. It will encourage activity by operators who are limited by real-estate, and do not have a full-blown contest station. Events like this stimulate more interest in contesting and it will have an international scope to give chances to snare some new DXCC entities." Don Field G3XTT, Editor of *Practical Wireless* magazine and highly experienced DX contest operator who is President of the UK DX Foundation, added "This is an exciting new contest event. I'm happy to serve on the Steering Committee and help in any way I can!" A highly competitive contest operator from Australia, Tommy Horozakis VK2IR, was very enthusiastic to join the Steering Committee to help plan the POC. "I'm really excited to be part of the team and can't wait to get started." Tommy VK2IR added that the Hellenic Amateur Radio Association of Australia was pleased to be an award plaque sponsor for the event.

The Portable Ops Challenge is the brainchild of Frank Howell K4FMH who says his portable ops team was the inspiration. "I hear many operators who get outdoors and try to dip their hands in a conventional contest saying two things. They enjoyed the competition. And it's a shame that the Big Guns dominate the realistic chances of winning. That's simply the way it is in the vast majority of contests but it made my portable ops team think: is there a way to level the playing field? I think the Steering Committee consisting of both veteran DX contest participants and some of the best portable operators in the world has come up with something worth giving a go," Frank K4FMH also said. "I'd say the question is, whether the Big Guns can win using the handicap system that the Steering Committee has produced. With this scoring metric, it's more about radio sport than radio gear. But we won't know until many of the Big Guns enter the Portable Ops Challenge. We are building it but will the Big Guns come?" Only time will tell but the first POC is nearing its inaugural launch. Scheduled for October 3rd/4th 2020, the POC's rules and other relevant documents are located at:

foxmikeshotel.com/challenge

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Roger Cooke G3LDI, Chairman BARTG
 roger@g3ldi.co.uk

It hardly seems ten years ago that BARTG celebrated the Golden Jubilee with the special call GB50ATG. It certainly does not seem 60 years ago that BARTG was formed. I was one of the founder members, but I must emphasise that I started out as a very young operator indeed! Oh OK, yes, I was 21 at the time. Unfortunately, the two really active founder members, **Arthur 'Doc' Gee G2UK** and **Bill Brennan G3CQE**, are both Silent Keys (SK). There were also quite a number of very keen RTTY ops who joined along the way.

RTTY was new to the UK and one of its first activities as a self-help group was to start a newsletter and help members to acquire teleprinters for their use. Of course, we didn't stop there. RTTY needed a contest and the one we launched is now the oldest extant RTTY HF contest in the world. We launched an awards scheme. We ran a RTTY news broadcast to provide both news and test transmissions for RTTY enthusiasts. Our Shop Window sold components for the RTTY terminal unit (an interface between teleprinter and radio) such as the PCB and the transformer and, of course, we sold BARTG lapel badges.

We grew in membership and became bolder, launching a BARTG rally at Meopham in Kent. It later moved to Harpenden and then to Sandown Park where it outgrew the smaller (1218m²) hall and moved into the larger (2,740m²) hall. Our rally was always aimed at the RTTY and datacoms enthusiast and it came to a close when datacoms became a mainstream technology rather than a specialist one.

The 1980s were a busy time for BARTG. The massive growth of computer use in the home and particularly in the shack brought about a substantial growth in the use of computer based RTTY in amateur radio. Every time we set a target for growth we surpassed it and set a higher one. We eventually had over 3,000 members.

Silver Jubilee

We celebrated our Silver Jubilee in 1984. A 'QSL card design' competition produced an excellent commemorative design and demand for our silver jubilee lapel badges, complete with silver laurel leaves, exceeded our most optimistic expectations.

Datacom

Our magazine was given a title, *Datacom*, received an ISSN number and a spine with title and date. In 1998, under the editor-

The British Amateur Radio Teledata Group's Diamond Jubilee 2019

Roger Cooke G3LDI reports on the BARTG 60th anniversary celebrations.



ship of **Arthur Bard G1XKZ** (SK) it won the national section of the newly inaugurated *PW & Kenwood Club Spotlight Magazine* Competition (February 1998 *PW* has photos on the cover and on page 10 and also has a review by G3LDI of the Kachina computer-controlled HF transceiver).

Continued Success

We've come a long way since 1959. I think two reasons for our continued success are the loyalty of datacoms enthusiasts and the ability of our committee to change and grow BARTG so that it meets the needs of those enthusiasts. Amateur radio is a hobby of progression and development and this applies to datacoms as much as to any other aspect of our hobby. Today BARTG is known principally for its contests and its awards scheme.

BARTG now encompasses all data modes, including the JT modes of course, and long gone are the nostalgic days of oily machinery, paper spewed out all over the shack and noise, sometimes unbearable after a 24-hour contest. These have been replaced with computer-based equipment. How it was in the 60s is shown in **Fig. 1**. I wonder if these guys are still about and if they are still involved in RTTY/Data? All transmit equipment was home built, with some commercial receivers and terminal units. 6ft racks were the order of the day, and boat anchors held down the floor of the shack. It certainly was the days of the dinosaurs, and with all those valves involved the shacks of the day had the characteristic smell and look of a real radio communications room.

I guess it was the equivalent of a modern 'Dad's Shed'. However, these days most amateurs do not build transmitters or much else, except for small projects. Most stations are now commercial and would be acceptable to the boss (the XYL) in any spare room, or indeed tucked up a corner, with a suitably placed rubber plant as a table decoration!

Organising the NoV

Organising the NoV (Notice of Variation) for GB50ATG was pretty straightforward ten years ago. The job of organising GB60ATG again came to me and I thought it would again be quite straightforward. How wrong I was. Talking to Ofcom was a nightmare. I was passed from pillar to post and the bottom line was that I could have an NoV for a month but not for a year. One person told me I could, another told me I couldn't. I contacted the RSGB and was given a direct line to the person (persons) involved. However, again they faltered, tried to say it was impossible and so on. I e-mailed the NoV for GB50ATG so they could see we had done

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this before and then after more phone calls they eventually relented and sent me the NoV. It turned up, and guess what, it was for one month only. My hair – what's left – was getting thinner by the day. More phone calls and with a few days over what should have been the start of our year the NoV did arrive. I doubt I shall be around for the platinum anniversary, so someone else will have all this pleasure to look forward to!

The NoV eventually ran from July 1st 2019 until June 30th 2020 so publicity had to be arranged PDQ and a list of operators for their chosen period put on the calendar. Surprisingly, we were not inundated with volunteers.

Propagation was not good so perhaps that was some of the reason why not many came forward. However, we managed to fill the year with operators free to choose which mode they ran with. The JT modes proved quite popular, mostly due to the fact that the JT modes provided most of the activity on any band. However quite a lot of RTTY also took place so that was gratifying.

Our website (below) carried all the information on the operating schedule, and awards structure.

www.bartg.org.uk

Each contact with GB60ATG on a new band, mode, or country counts one point towards the BARTG Diamond Jubilee Award. There are two categories, Mixed Modes and Single Mode. In each there are four levels, Bronze, Silver, Gold and Diamond. The first applicant to reach Diamond level in either mixed or single mode, can apply for a free salver.

GB60ATG QRV

To be honest we struggled a bit trying to

keep GB60ATG on the air for the full year, but our volunteers were very loyal in keeping it going. Propagation did not help at all, but despite that, all data modes were used, and every operator used RTTY. **Keith GU6EFB** actually used the call on QO-100, the geostationary satellite. With over 20,000 contacts and 154 countries, it was a good result, remembering that each volunteer only used the call when he could get on the air.

I was very pleased to achieve the very first award application and it was for a Bronze, RTTY only. With my poor antenna situation at present, I was lucky in that I managed this all in one day with **Gordon G3PXT**, who lives locally. I would not have achieved it otherwise! See **Fig. 2**.

That has Certificate Nr 1 on it. Certificate Nr 2 went to **Chris G8APB** and it was a Bronze for FT8. **Mike G4DYC** gained Bronze certificate Nr 3, again for RTTY only. **John GW4SKA** has a mixed mode Gold level for certificate Nr 8 and **Chris G8APB** has a Silver level for FT4, Nr 9. **Chris** also holds a Diamond for mixed modes, Nr 7.

Our volunteers were a hard-working bunch and the most prolific was **Gordon G3PXT**, **Andrew G8GNI** also did well. Here are his comments:

"Overall, I had 714 QSOs representing all six continents, 62 DXCCs and all bands 160m to 15m. Best DX included China, Indonesia and New Zealand. Most of my QSOs were on 80, 40 and 20m. I used 10 different modes: FT8, FT4, RTTY, JT9, JT65, PSK31, PSK63, Domino, MFSK16 and Throb, the majority being made with FT8, FT4 and RTTY".

Great selection and **Andrew's** station can be seen in **Fig. 3**.

John GW4SKA is a very keen contester

Fig. 1: An early page from the RTTY Journal.

Fig. 2: Award number 1, to G3LDI. **Fig. 3:** Shack of **Andrew G8GNI**. **Fig. 4:** Shack of **GW4SKA**.

and also provided lots of QSOs during the year. He also has a very tidy shack, **Fig. 4**. I suspect it was somewhat 'tidied' for the picture, however. **John** provided the following comments:

"GB60ATG operation has now ended and I have put all the logs together. Here are a few facts and figures.

"Gordon G3PXT took the most slots, running up to three stations simultaneously. He took part in a multi-mode contest and made contacts using Throb, Olivia and various other data modes.

"Operation was from G, GW, GM, GI and GU. It was difficult to get all the weekly slots filled and proved impossible to find anyone helpful in GD and GJ. The one stint from GU was very brief and didn't help a great deal.

*"The logs have all been uploaded to Hamlogs and passed on to **Charles M00XO** for handling the QSL cards. He will also upload the logs to LoTW.*

"So that's my involvement over. After all the time spent by Roger to get the call, and my constant chasing for ops, I saw little interest in actual award chasing. I doubt there will be many applications outside of our committee!"

I have been involved with the Golden and now the Diamond BARTG celebrations. I am just wondering if there will be a Platinum celebration in ten year's time, 2029/30. I am also carefully considering two possibilities here. One is that RTTY itself may have faded somewhat by then with all the migration to JT modes. The other is that I may not be around to participate. Fingers crossed!

The Return of the DXpedition?

Steve Telenius-Lowe PJ4DX ponders whether we are seeing DXpeditions returning after Covid and also recommends using your callsign!

Steve Telenius-Lowe PJ4DX
teleniuslowe@gmail.com

The date 10/10/10 is a special one for those of us living on Bonaire. It is the date when Bonaire became a 'special municipality' of the Netherlands when the former country of the Netherlands Antilles was dissolved. As a result, Bonaire became a new DXCC entity on that date.

To mark the 10th anniversary, Bonaire's radio amateurs are organising a month-long operating event. Special event station PJ4TEN will be active throughout the month of October, including a multi-operator entry in the CQ World Wide DX Phone contest on October 24/25th.

A PDF award, **Fig. 1**, will be issued to those who achieve 10 points by making contacts with PJ4 stations during October. Full details are at:

www.qrz.com/db/pj4ten

There is no fee and QSL cards are not required, though if you wish to receive a QSL from PJ4TEN they will be available via **Tim Beaumont M0URX**, either direct, through his OQRS service or via LoTW.

The following is a list of all currently-licensed Bonaire stations: PJ4BZL (Berry), PJ4DX (Steve), PJ4EL (Erwin), PJ4EVA (Eva), PJ4GR (Gerard), PJ4KY (Bert), PJ4NG (Noah), PJ4NX (Peter), PJ4RF (Rinse), PJ4TEN (special event station), PJ4/DC7MO (Monika), PJ4/DL1COP (Holger). Other PJ4 callsigns may also be active during the month.

Return of the DXpedition?

The coronavirus pandemic caused a halt to all DXpeditioning activity and, although several optimistic operations had been planned and announced for the summer months, all were cancelled as international travel and even portable operation in one's own country became all but impossible. Late July, though, showed early signs of what might turn out to be the beginning of the return of the DXpedition, albeit initially in more modest guise. Well-known

DXpedition operator **Kenneth LA7GIA**, **Fig. 2**, who previously had operated from such exotic locales as Somalia (twice, as 6O6O and 6O7O), Central African Republic (TL8AO) and Equatorial Guinea (3C7A), travelled beyond the Arctic Circle at the end of July to activate two rare IOTAs in his own country, EU-062 and EU-076.

Meanwhile, IZ2AJE was operating as IM0/IZ2AJE from the Maddalena Archipelago, EU-041, which also counts as Sardinia (rather than Italy) for DXCC, in early August. Father and son team OH3BRJ and OH3BRK were active from Market Reef, OJ0, from August 5th to 7th. And three operators from Guadeloupe and French St Martin plan activity as T00Z from Saint Barthélemy ('St Barts', FJ) between September 14th and 17th.

The Rebel DX Group's plans to activate Bouvet Island as 3Y0I are apparently still on. A posting on the group's website on August 11th stated "*The 3Y0I radio expedition is not at risk. We are keep pushing to get a full budget before we set a sail again by end of the year. Our base will be established on the eastern side of the island on the glacier. This part of the island is not exposed to the worst western winds, waves and landslides.*" Further updates will appear on the group's website at:

<https://rebeldxgroup.com/3y0i-update>

No doubt more DXpeditions will be announced as Covid-19 restrictions are eased, though if the feared 'second wave' should occur those plans could be put in jeopardy. We wish good luck to all those planning DXpedition activity but, most importantly, stay safe!

"What's Your Call?"

I have written before about the habit of calling with just two letters of a callsign, but there are other occasions when some operators don't give their callsign. Some readers of this column operate with low power (QRP), either because of EMC (electromagnetic compatibility) issues, which mean higher power can't be used for fear of causing interference, or



simply because they enjoy the additional challenge of operating with low power. QRP operating is a fine pursuit but one or two of its practitioners seem shy about giving their callsign. In a recent SSB contest I often had several stations calling me simultaneously and I responded to those whose callsigns I copied. I heard one station (who actually had quite a good signal) calling "QRP! QRP! QRP!" but I have no idea who it was because there were others who were giving their callsign and who I therefore replied to, while the QRP station did not. After two or three attempts he gave up, presumably thinking I could not hear him, whereas if he had given his callsign instead of saying he was QRP, he would have made the QSO quite easily. I know I'm not alone in responding first and foremost to those who call with their full callsigns. Your callsign is unique to you. Be proud if it – use it!

Readers' News

First up this month is **Etienne Vrebos OS8D/ON8DN** who wrote to say "I'd like to mention a special QSO with 2E0A00/M on July 10th at 1550UTC... He told me he was on his scooter (**Fig. 3**). A great idea and a special guy!" According to his QRZ.com page, **Robert 2E0A00** uses a modified Alinco DX-70TH into an MFJ-1979 full-size quarter-wave vertical on his mobility scooter. Despite that interesting QSO, Etienne felt there was little else to report this month: "...you really do not miss anything, as only some QSOs with Japan and the usual very strong stations, nothing worth mentioning." Etienne also sent in the

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Fig. 1: The Bonaire 10/10/10 Award certificate, designed by yours truly. We hope to issue this to some readers of this column! Fig. 2: Kenneth LA7GIA, Steve PJ4DX, and Hawk SM5AQD at Friedrichshafen in 2018. Fig. 3: Robert 2E0A00/M working mobile from his mobility scooter. Fig. 4: Ethiopian Airlines flies over Etienne's OS8D Hexbeam every morning. Fig. 5: Ranger RCI-2950 transceiver used on 28MHz SSB by Kevin ZB2GI/P. Fig. 6: QSL from Italian special event station I10ICEH.

photo, Fig. 4, of an Ethiopian Airways jet that passes over his Hexbeam at the same time every morning.

Tony Usher G4HZW reported that "things began well with a run of JA stations on the evening of July 13th on 28MHz but shortly after operations were compromised when severe QRM appeared across all bands 24 hours a day. On 7MHz it was S9+20dB! The source was easy to find. We live in a semi and it was coming from next door..." The interference turned out to be from some new LED lights. Fortunately, Tony has very good neighbourly relations and says that he is sure they can work out something that is acceptable to all concerned. He continued, "My total for 28MHz data in 2020 has risen to 104 but some 'easy' ones are still missing. I suspect Covid-19 has stopped people holidaying on semi-rare islands, so progress is now quite slow. As I type this 28MHz is wide open to South America with big signals from PY, LU, CX and CE."

In contrast to Great Britain, **Kevin Hewitt ZB2GI** reported on August 1st that "Gibraltar remains at phase 6 of 6 to ease [Covid-19] restrictions." As a result, Kevin took the opportunity to operate from the Gibraltar Amateur Radio Society club, using its Hexbeam antenna on 14MHz SSB, twice during the month. He also operated on 14 and 28MHz SSB from a portable location at the top of the Rock along with **John King ZB2JK**, on 28MHz using an old Ranger RCI-2950 multimode transceiver, Fig. 5. From his home, Kevin used an Outbacker multiband whip and counterpoise wire clamped to a broom handle stuck out of his window to make hundreds of FT8 QSOs. In all, Kevin made nearly 600 QSOs during the month, well and truly putting ZB2 on the air.

Owen Williams G0PHY says that he "only had two extended periods on the air this month, the latter part of the IARU contest and the IOTA contest. In the IARU contest I managed to have QSOs with stations in Israel, Brazil, Asiatic Russia and Oman. Contacts in the IOTA contest were all within Europe apart from one contact with Cyprus



and a contact with a Brazilian island. There were no new IOTAs to add to my score. I managed to build a quarter-wave inverted-L and squeeze it into the garden and I can now join in the Shefford Club's weekly topband net. I'm getting 5&9 reports from Victor G3JNB!" And now, over to Victor...

Victor Brand G3JNB reckons that "dire conditions prevailed" in July "with only my 'regulars' logged, including **Didier FY5FY** French Guyana, **Jeff TZ4AM** Mali, both on 30m, and **Luis CE2ML** Chile on 20m... The intriguing callsign I10ICEH (Fig. 6) was so weak on 20m but I eventually caught their attention, whereupon I think they swung the beam and came booming in on 20m. Commemorating the tragic sinking of the beautiful ocean liner Andrea Doria in the Atlantic, following a head-on collision in dense fog on July 26th 1956, this is another club who faithfully airs their historic call each year." Victor reports that the poor propagation continued into the first few days of August. "20m was closed with the 'A index' rising to 16 on the 4th and no DX. But on the 6th at 2100UTC, I could just read repeated and faint CQs from CP4BT in Bolivia with few takers. Claus is located high up in the Andes, llama country, and uses dipoles. After my calling for ages, he finally heard my 50W to the SOTAPOLE vertical but struggled with the callsign. Finally, the 6239 mile QSO was accomplished and opened my log for August – at last. However, the SFI rose and improved propagation returned on Saturday 8th in time for the various weekend contests. The heatwave continued and I sat out in the shade with my FT-818 listening to the strong signals from the States clamouring for EU contacts. As always, I was full of admiration for the skill of the 'Big Guns' exchanging their QTC



lists at approaching 40WPM with solid copy, untroubled by the deafening QRM... The contest signals still poured in on Sunday 9th but with sharp QSB seemed to drop in and out. Marginal exchanges were logged with ZD8BG (Ascension Island) on 15m and XQ6CF Chile on 17m before they simply vanished. But ZR2A/4 South Africa grew in strength on 20m so I waited, worked and then sat back in wonder as he worked the world! Then, amazingly, on 40m at 2141UTC, he heard me call again for a second band... The Palos Verdes Sundancers are finally back in business!" [If Victor's final comment leads you to think

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"¿que?" take a look at: **ve1dx.net/Stories** and in particular 'The Sundancers' – **Ed.]**
Bill Ward 2E0BWX sent in a brief report of the stations he had worked during July using 25W of FT8 (see 'Around the Bands').

Around the Bands

Etienne OS8D/ON8DN: 7MHz SSB: HB0/HB9HBY/P. **14MHz SSB:** 4L1BB, 4L4NW, A92HK, BD8BM, HB0/HB9HBY/P, JM1ABW, JP1DJV, R0CBA, UN7QF, VU2XO, WA6QDQ/KH6, YB8IBD. **28MHz SSB:** 7V1ND.

Tony G4HZW: 7MHz FT4: GH5DX, TF3IG, ZB2MR. **7MHz FT8:** 9K2OW, CX6VM, SV9RG, YB6HA, YC9AD. **28MHz FT8:** 4Z4DX, 5B60ALX, CE3BC, JA1FNO, JA1SJV, JA8KSF, JF8QNF, JH1ECG, JR1AIB, K1DJ, K4ZO, NA8W, PT2VHF,

PU2RGN, PY2PJA, R9CS, R9VA, TF3VS, VE3FGU, VO2VC, W0ZA, YV5DRN, YY5RPE.

Kevin ZB2GI: 7MHz SSB: EA7JNC/5. **7MHz FT8:** 4X4MF, 9H1AZ, CS8ABF, EA8DHN, GJ0VJP, JH1ECG, VE9UN, VO1LM, W6YTG, WA1NGH, WB9MXG. **14MHz SSB:** 5B4AJG, 5B60AIX, 9K2OD, 9Z4FE, A41NN, D44PM, JA5AQC, KL7HRN, KM4CAX, N9CQB. **14MHz FT8:** 5B60ALJ, 9K2NO, AA7G, BG9NJY, CU3ED, JA1NCZ, JA4DND, JA5BEN, JA9CHI, JE2DZC, JP1NWZ, KC8RP, N4WDE, NR1DX, VE1DBM. **18MHz FT8:** J69DS, JR4OZR, KC2DUX, KR4V, P43A, RA2FKD, W1SS, WB2QJ, WN4N. **28MHz SSB:** PY4BZ + many Europeans. **28MHz FT8:** EA8MU + many Europeans.

Owen G0PHY: 7MHz SSB: R0HQ. **14MHz SSB:** 4X1DX, 5B4KH, A42K, PP5JR



(SA-026). **21MHz SSB:** PY4BZ.

Victor G3JNB: 7MHz CW: D2EB, E7TESLA, ZR2A/4. **10MHz CW:** CX2DK, E7TESLA, FY5FY, TZ4AM. **14MHz CW:** CE2ML, CP4BT, IIOICEH, ZR2A/4. **18MHz CW:** CX2DXK, XQ6CX. **21MHz CW:** ZD8BG.

Bill 2E0BWX: 7MHz FT8: F1UFX. **14MHz FT8:** EB1EB, EC7R, SV3AUW. **18MHz FT8:** IU8EQ. **21MHz FT8:** ZB2IF. **24MHz FT8:** SP2AQP. **28MHz FT8:** EA1A, OK1UYR.

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.

Radio Round-up

SIGNALID: SignalID is a smartphone app to help you identify data modes.

How to use SignalID: Set the frequency and bandwidth properly. Select the frequency range. (0-30MHz/Other) Place the microphone of the telephone near the loudspeaker. (The quieter the environment is around, the fewer errors will occur) Press the big button that dances. Wait five seconds. (Time required for the record) The algorithm is based on frequency – a wrong tuning of your radio/SDR will result in an erroneous detection.

The recording is limited to five seconds, for practical reasons. Recognition of a signal may require several attempts.

STOCKPORT RADIO SOCIETY: Stockport Radio Society was 100 years old in 2020, but unfortunately due to the pandemic, they were unable to celebrate. So, they will be celebrating this in January 2021. They look forward to another 100 years of attracting interest to amateur radio and continuing to offer a warm welcome to all who are interested in learning about amateur radio or taking part in the club.

www.g8srs.co.uk

WELSH RALLY CANCELLED: Due to Covid-19, the organisers regrettably have to cancel this year's Welsh Rally for October 4th 2020. Next year's Rally is on Sunday October 3rd 2021.

BITTERN DX CLUB: Bittern DX Club, like all clubs up and down the UK, have suspended actual meetings for the foreseeable future but like most amateur radio clubs they are running an extra net night instead the meeting. So, to remind all interested parties, they call the net on 145.500MHz at 19:30 on each Thursday, then QSY to 145.400MHz (if the frequency is clear) to have a general chat. This net is open to all licensed radio amateurs whether or not club members. If there is some subject that a member of the net wishes to talk about, they will do their collective best to give an opinion and hopefully an answer. Recent topics have included data and its tricks and fails, and for the interest of SSTVers, which software is being used and how to set it up, and what to expect from the software.

www.bittern-dxers.org.uk

Building Experience

While acknowledging the spirit behind the RSGB Beyond Exams initiative, **Tony Jones G7ETW** offers something of a critique.

Tony Jones G7ETW

Charles.jones125@yahoo.co.uk

This article is about 'Building Experience' (BE), part of the RSGB's 'Beyond Exams' initiative, which comes from the Amateur Radio Development (ARD) committee whose remit is to increase the take-up of and participation in Amateur Radio in the UK (see last month's RSGB feature – **ed.**).

Two points before I start:

Amateur Radio, up to about 30 years ago, had a cachet and an aspirational attraction to a certain kind of person. People – well, largely engineering-types, and mainly men – were excited about radio communications and electronics, but that has gone now. Joe Public has no interest – on the whole – in radio technology, despite using it constantly. So ARD's mission – to make the hobby attractive, positively 'cool' even – is vitally important to us all. I was briefly connected with ARD, but for personal reasons I had to resign. This article is therefore G7ETW writing without an RSGB hat on of any kind.

What is Building Experience?

In short, personal development for primarily new amateurs. People returning to the hobby after a break are encouraged to use it as a refresher, but Foundation licensees are the target audience.

Building Experience is not Training, but there are obviously parallels. The RSGB hopes that by being introduced to radio activities that go deeper into the hobby than Foundation basics new amateurs will continue on a path of learning, have fun and develop skills and confidence.

What does Building Experience offer?

Building Experience has two parts: an individual and a club scheme. The club scheme is the main focus of this article.

Clubs are invited to become accredited (so I guess they must be affiliated?) Building Experience providers. Members of radio clubs can then register on club BE schemes, in which by taking part in 23 activities points can be amassed, which convert to awards



Trying out something new? (ARDF in this case)

BE Ref	QSOs	Band	Mode	Other Stipulations
1	50	VHF/UHF	Any	
2	3	Any	Any	UK only (places with Regional Secondary Locators)
3	50	HF	CW or voice	
4	50	Any	Digital Data	
5	10	Any	SSTV or FSTV	
6	10	Any	Digital Voice	
7	1	Any	Satellite or ISS	

1st Area Activities - Having a Go

at levels from Bronze (3 points) to Diamond (23 points). The RSGB does not say BE-participant new amateurs must be RSGB or even club members, but in practice, not least because of GDPR, I think they will have join their provider clubs.

Clubs, the RSGB envisages, will facilitate these activities, mentoring new amateurs through activities that are educational but have no assessments or tests. The RSGB website says these programs will be free and that activities can be done as and when and over whatever time period member-participants desire.

Activities are broken into five areas:

1st Area: 'Having a Go'

Activities 1 through 6 are for contacts made with unique amateur stations.

I would expect that QSOs can score in more than one category e.g. a QSO on 40m from England to Scotland would count under BE activities 2 and 3. Even so, this is a sizeable number of QSOs for clubs to get participants through, and in some technical areas such as amateur TV and space radio clubs may not have the kit or people with the required expertise.

Read more radio news and reviews at www.radioenthusiast.co.uk/news

BE Ref	QSOs	Band	Mode	Other Stipulations
9	20	Any	Any	Separate WAB squares
10	10	Any	Any	Contest QSOs

2nd Area Activities - Getting Involved

BE Ref		
13	Attend 6 club meetings	
14	Take part in 6 club nets	
15	Undertake regular club role	From tea-making to being committee member
16	Give radio-related presentation at club meeting	
17	Take part in a RAYNET event	
18	Help organise a club activity	

3rd Area Activities - Taking Part

BE Ref		
19	Build a piece of equipment for the shack	Can be something electronic or mechanical
20	Write some radio-related software (for use in the shack) or design a simple website	Purpose of website not specified

4th Area Activities - Making

For clubs that have shacks, 'BE QSO Days' could be put on and over time participants could build logs of their QSOs with club members sitting with them and guiding them on air. This would be a much more meaningful experience than the QSOs in a Foundation course.

2nd Area: 'Getting Involved'

BE Activity 8 is SOTA Activation. Mountain climbing as a club activity? This would have to be a field trip for many clubs, and given that most mentors are, let's say, not getting any younger, I find it hard to imagine many clubs putting this activity on, valuable as it is.

Plenty of amateurs collect WAB squares, so BE Activity 9 sounds achievable. But BE Activity 10 has issues, I fear. These contest exchanges will not be slick and professional, and serious club testers at each end may lose patience with them.

Maybe a series of 'BE Contests' could be brought into being?

BE Activities 11 and 12 are very practical. New amateurs can get points for helping to set-up or take down a club special event station (Activity 11) and logging or operating during its time on air (Activity 12). This rather assumes special event stations operate in odd locations; I suppose they generally do. For clubs that like special events this will likely be a popular BE component.

3rd Area: 'Taking Part'

Activities in this section are geared around clubs and radio organisations.

Ignoring, for a moment, that some radio amateurs are not very 'clubby' people, I can't help thinking that this is discriminatory to new amateurs who for all kinds of reasons can't get to club meetings.

BE Activity 15 made me chuckle. There is a world of difference between being on kitchen or chairs duty and performing a role on a club committee, for which you usually need to be well known, reliable and capable – a 'good egg', as people used to say.

Undertaking BE Activities 16 and 18 depends a lot on confidence and personality. My club has some meetings in which any member can give a short (20 minute) talk on any radio topic that interests him or her, and some of these talks have been truly excellent. And practical assistance such as when tents are involved or antenna work is being done is always welcome!

To take part in a RAYNET event you need to be a signed-up RAYNET member, covered by RAYNET insurance, so I don't see how Activity 17 is possible. Perhaps a new amateur could attend as an observer – I don't know if even this can be done – but this is hardly 'taking part', is it?

4th Area: 'Making'

Compare these with earlier BE activities; Activities 19 and 20 are noticeably more demanding for new amateurs and mentors alike. Clubs would have to have projects available (which they cannot charge for) and allocate a lot of time to this. I see three basic problems.

- Construction and basic electronics are not

taught until Intermediate so a new amateur may totally lack electronics knowledge and skills.

- Writing software is not a skill people just have. It is not taught at any level. Even a relatively simple Arduino project such as a VSWR meter or shack clock is too complex – for a complete beginner – for a first project.
- These activities need to be strongly led or new amateurs may not up with a working project.

5th Area: 'Promoting amateur radio'

BE Activity 21: Recruit a student for a Foundation course.

The idea behind this must be that a new amateur in a club introduces a new student who studies with the club and gets a licence.

There are issues here as well. The club may not do training, the new student could live too far away for attending a course to be practical and the new student – now practicals are discontinued – could take an online exam with no help from any club.

This highlights an underlying weakness with Building Experience: assessing and verifying that participants have 'achieved' in an activity. Aside from QSOs, little is defined or qualified. True, these are not pass or fail activities as in Training, but for awards to mean anything there surely should be standard minimum achievements for clubs and participant-members to aim at?

BE Activity 22: Attend a rally to promote the club.

For this to work, a club would have to attend a rally (which requires organisation and incurs expense) so new amateurs undertaking BE Activity 22 can regale rally-goers with how their club has implemented the scheme.

Rally organisers justifiably limit the numbers of stand staff, so new amateurs would have to pay to get in, which detracts from the feeling of being 'on duty'.

BE Activity 23: Help run a Training course by teaching, supporting, running practicals or invigilation.

Two, possibly three of these options most Training Leads would probably discount straight away. BE participants are going to be mainly new amateurs, and are unlikely to have the depth of knowledge to teach or (in most cases) run practicals (should they be reinstated).

Invigilation is a sensitive area. Because the RSGB can – and does – make unannounced visits to club exams, Training Leads make every effort to ensure that exams are conducted absolutely properly.

Invigilators consequently tend to be well-known club members of unassailable good character. New amateurs – I mean no disrespect – are unlikely to achieve that status in a short time.

That leaves supporting – providing practical assistance such as tea-making, setting up etc. I see good sense, for both clubs and BE participants, in this. Students take a lot of comfort from chatting with recent Foundation-exam passers.

After the Club Scheme

Alongside the club scheme, there is an 'Individual Scheme', which has 150 components, and it is envisaged by the RSGB that

'graduates' of the club scheme may, if desired, go on to do bits of that. There are no awards, and activities vary very widely in nature – indeed, for some activities no licence is required. I won't go into the individual scheme here but it is interesting.

Conclusion

I had three aims in writing this

To draw attention to Beyond Exams and Building Experience and the club scheme in particular

- To suggest to clubs how elements of the scheme could be put on.
- To show new (and returning) amateurs what there was potentially on offer.

The scheme is, in spirit, a good one and I take my hat off to its inventors, but there are issues and any club intending to participate will need to address these, especially if all 23 activities – which competitive members will want – are to be provided. After all I've said, I sincerely hope clubs do take the scheme up – I think it's a good idea with much to recommend it.

(Editorial comment: This article was written before lockdown and, of course, right now no clubs are doing face-to-face training or exams. Similarly, there are no rallies, club meetings, field days, etc. So, many of the BE activities will, of necessity, have to wait until things start to return to normal.)



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military green	

More Improvements for My Small Station

Joe Chester M1MWD
m1mwd@gmx.com

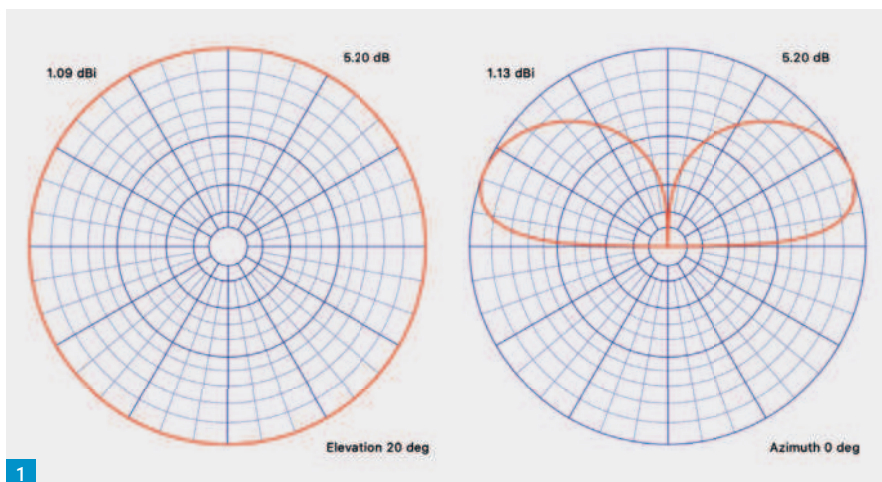
Allow me to introduce you to my nemesis. He hasn't got a name but he is a right pest. I dream of DX hunting, of putting out a strong signal on every available band, of working the World from South Wales. But when I wake up and look out the window, my problem stares back at me. You see, I live in a bungalow with a very small rear garden. So, thoughts of putting up a vertical for 160 or 80m stumble at the first hurdle. A full-sized dipole on 40m won't fit either, even if I could get it up high enough. And as for the higher bands – well, a 10m dish for EME is just a dream (more a nightmare really!).

"Stop moaning", says M, owner of a mountain somewhere up country, on which he grows antenna poles, mast and pylons, all topped with the latest in Yagi and log periodic beams for every conceivable occasion. You could probably see it from space! "You think you're the only one with these issues?", he asks. Just for reference, the 'rear garden' in question is a triangle 9m x 7m, with veg grow boxes and a stone-tiled patio, and with the pointy end taken off for the tool shed. M once suggested sending my XYL (and Accountant!) out shopping, so that we could dig up the patio to lay a field of radials for an 80m vertical. He was barred for a month for that one!

Many of us operate from similar conditions. The rash of books and articles on stealth antennas, for example, is evidence that many others are equally challenged by the lack of real estate. Some are brave enough to relocate. Herself caught me one afternoon reading a section of the *ARRL Antenna Handbook* entitled "Choosing a QTH for DX" (Section 14.3.1 if you're interested). It was cold shoulder for supper for a month after that mistake! So moving house is not on the agenda.

But it's not all bad news. Even those with acres of space have issues – not always too different from those of us small garden dwellers. Lately, I've been making a list of all the possible things I would like to be able to do, working from my small piece of real estate. I call this blue skies thinking. But when I look at this list my brain freezes

Joe Chester M1MWD experiments with a fan vertical as a possible solution to his antenna constraints.



– all that construction work, and the mechanical engineering!

Enter the Fan Vertical

But fortune sometimes favours the desperate. I produced a bit of a rabbit out of a smartphone-shaped hat over dinner a while ago, and received a very nice, heart-warming shrug of indifference in reply. You see, much research has uncovered the fan vertical. This is a multiband antenna, which if properly erected, does not even require an ATU! What I'm talking about is a set of approximately quarter-wave vertical radiators, mounted in parallel up that telescopic pole. My pole has been up for a year now (on and off, the latter when it's very windy). I changed it recently for something more sturdy. This supports my inverted-L (see *PW* April). In effect, it's achieved invisibility status! So, a few more lengths of invisible wire running up that invisible pole will not contravene the 'local' by-laws!

But will it work? Well it's a quarter-wave vertical. So, it should. Put another one parallel to it, and it should work too. But what about switching between them? None needed! Think of a fan dipole, where all the radiating elements are connected together and use the same feeder. It's the same for the fan vertical – a single feeder is connected to all the active elements.

Interaction between the elements, such as induced currents, will have some impact on precise tuning, and I'm told that it takes a bit of effort to get the tuning of the various elements right. The general idea is that the feedpoint impedance of the radiators far from resonance will be so high that the majority of the signal power goes to the resonant radiator.

Any examples? The *ARRL Antenna Book* mentions it (Section 10.4.5, page 10.23). And look on QRZ.com at AJ6O (wow!) and PA1M. Further research establishes that there was a *QST* article way back, and I'm sure there were other papers written even earlier than this. And then there is **Callum MOMCX**, who has championed this type of antenna for years. He is such a fan (pun intended!) that he has designed and manufactured aluminium base plates, and PVC spreaders to make assembly easy for the mechanically challenged (like me!).

Checking the Maths

To check the maths, I decided to model a two-element version, with wires for 20m and 40m. You can see the output in the diagrams – one for a single 20m vertical and one with the two radiators, 20 and 40m, **Figs. 1** and **2**. The 20m on its own is the standard pattern for a ground mounted vertical, with a gain of 1.83dBi at elevation 23°. When the two elements are fed at a

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Fig. 1: Modelling a single vertical for 20m.

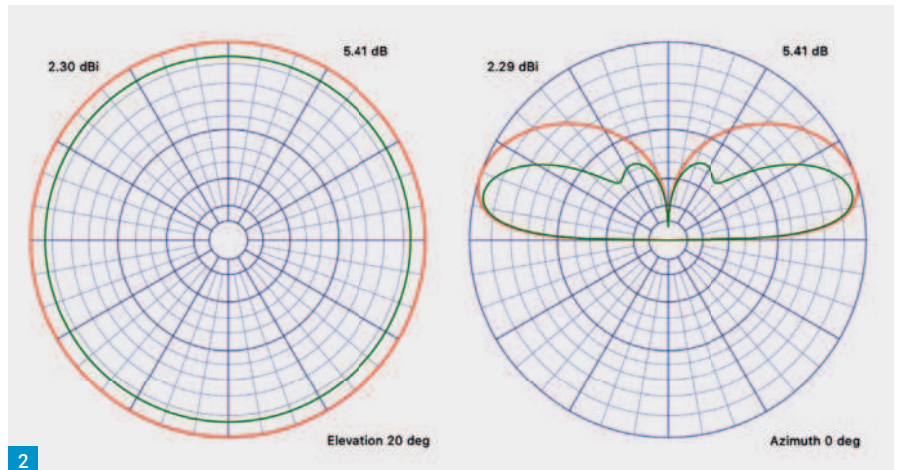
Fig. 2: Modelling the fan vertical for 20 and 40m.

single feedpoint, as in the second diagram, the 20m has roughly the same shape, but is down about 1 dB. The angle of maximum gain has dropped a few degrees while the 40m element gives a slightly deformed pattern, but still gives a 4.55dB gain at 15°. So, in principle, the vertical should give me a lower take-off than either the dipole or inverted-L. There is naturally some coupling between the elements, very much like the resonance you'd get from plucking a single string on a multi-stringed instrument (such as a guitar). With the fan vertical, this coupling creates parasitic induced currents in some of the elements at certain frequencies, and this reduces the absolute performance by, maybe, 1-2dB at times. But this is not even half an S-point. I don't think that in practice you'd notice this. And as always, practical use of the antenna will differ from the theoretical predictions anyway, almost always giving better performance than the mathematical model.

One of the main benefits of the fan vertical is its small footprint, which is especially useful where space is at a premium (like in my small garden). It's basically just a pole, with wire radiators. Calum says he has succeeded in tuning the verticals to avoid having to use an ATU.

Radials

Which brings me to the issue of radials. The performance of any vertical depends crucially on the quality of the ground over which it is mounted. In a later article, I will discuss the question of radials in more depth. It's been the subject of lots of theoretical work and practical experiments. And there is also the issue of using elevated and tuned counterpoise wires. It's a complicated question but I am going to settle on using as many ground radials as I can on my small patch. And this is where



the local management enters the project again. Remember what happened to M! So, it was important to put the radial issue on the agenda for the weekly meeting. I was well prepared, but the decision was taken that the work I suggested would be an 'all hands on deck' day – in other words, I could supervise, but other, 'more careful', workers would be purloined into doing the actual work. This consists of laying down some 30 or so wires, mostly 2.5m long, but a few 4m ones as well, in as close to a radial pattern as we can achieve, under the gravel in the back garden. *"I suppose we could also order an extra load of gravel to increase the coverage if we need it"*, I was told. I agreed. But what I didn't say was that these wires needed to be as near the surface as I can get away with! More than an inch or two down, and the ground losses start to accumulate again.

Giving it a Go

So, I'm convinced that I want to give this a go, but I had no idea that it would lead to a major redesign of my whole station. To start with, I moved the end of the inverted-L out of the tree and put it on a second pole. The constant movement of the tree, pulling on the horizontal wire, kept causing the vertical pole to collapse. This move

also has the benefit of rotating the axis of maximum gain of the inverted-L more into G-land. The next step is to put quarter-wave lengths of wire for 20m and 40m up the first pole, and create a feedpoint for them. The outer of the coax at this point will go to an elevated counterpoise temporarily (laying down radials is hardly what might be called 'essential work' these days – nor are garden parties allowed).

And I have another tweak in mind. Last time I played with verticals was for the *Footsteps* project. With the antennas I built then, I used a large tapped inductance coil (from Buddipole) to bring the system close to resonance. I had an old SG-237 ATU lying unused in the attic junk box. I've dug this out to use at the feedpoint.

I know Callum says his design doesn't need an ATU, but I have one, so might as well see what happens. And rather than drive this with 12V from the shack end, I have a healthy unused 12V car battery lying nearby, which I will tap for a 12V feed. I put it all together one day last week (in the sense that I got some spare wires together – not finished by any means). It worked – the ATU started clicking when low power RF was applied to it. So, it's now time to finish the mechanical engineering work. More next month.

In next month's RadioUser

- Review of the Moonraker MRW125 Antenna (Plus a competition to give away three of them)
- How to Read Propagation Forecasts
- The History of Non-Directional Beacons
- Introduction to CB Radio

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The October issue is on sale on the 24th September 2020



Roger Cooke G3LDI
roger@g3ldi.co.uk

Last time I mentioned that prospective members of CWops should be able demonstrate their ability to hold conversational QSOs at 25wpm. There has been some discussion on this very subject and now the requirements have changed slightly. That particular requirement still exists for FOC membership but for CWops, just a couple of contacts at 25wpm will suffice. In other words working somebody in the CWT activity periods would be fine. Those exchanges are merely a name and membership number or if not a member, the country prefix.

Jim N3JT is the founder of CWops, hence his membership number of 1. We affectionately refer to him locally here in Norwich as Jim One, **Fig. 2**.

This is what he recently posted about possible nominations:

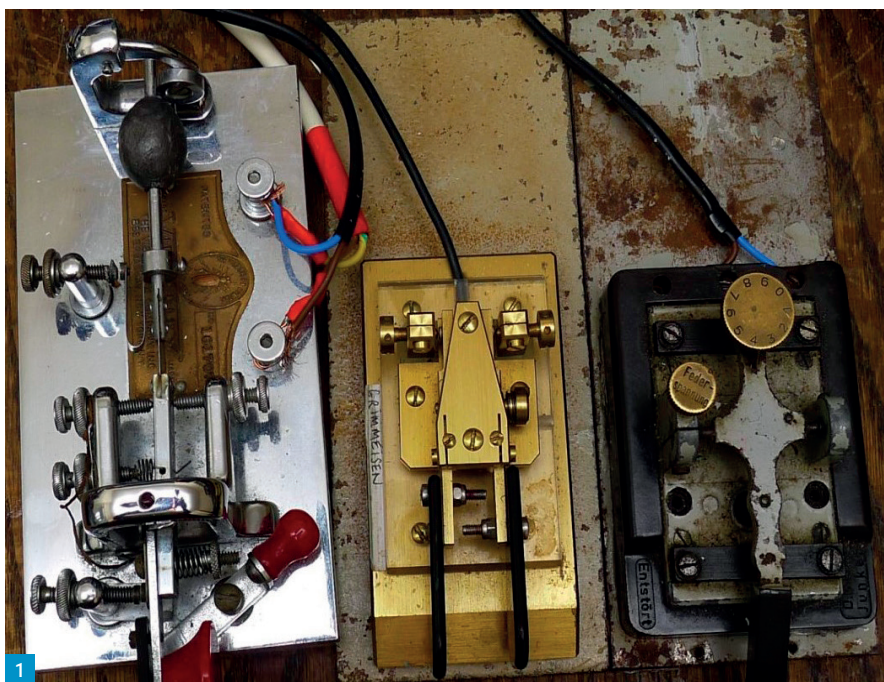
"There are a zillion excellent CW operators out there who have never heard of CWops. Maybe you've had ragchews with some of them. And, of course, in CWT sessions and other contests there are many non-members who demonstrate skill worthy of membership and would be happy to join us if asked. Our new-member nominee list is currently very short, so let me ask: Have you worked guys at least twice in the last year at 25wpm or faster who you think would like to support CW by becoming a CWops member?"

"The reality is that many reading this message have not yet nominated somebody for CWops membership! If you are one of those, might you consider it? Here is the step by step procedure:

1. Identify from your log or memory (egad!) somebody who qualifies, i.e., you've spoken with through two QSOs at 25wpm or faster over the last year. Our rules require being capable of carrying on a conversation in English, but we have finessed that because excellent CW operators often display their excellence in environments where chatting is not involved. In other words, we invite anybody who is a good CW operator, whatever the activity that interests them, and with no language requirement.
2. Go to QRZ.COM (or ask your prospective nominee) for an e-mail address. It is not possible to have a CWops membership without an e-mail address because we are fully online and communicate solely by e-mail. But, truth be told, not every ham has an e-mail address listed on QRZ.

CWops and More

Roger Cooke G3LDI has an update on CWops, some interesting keys and an anecdote relating to Morsum Magnificat.



COM. Sometimes Dr. Google can help. Sometimes not.

3. Drop your prospective nominee a note via e-mail or ask on the air if he or she would like to be a CWops member. Mention that the CW Academy has taught many hundreds of former and new CW operators the fun of CW. We are the only CW club that actively works hard to preserve, indeed expand use of CW in ham radio. Mention that, too. Tell them that we sponsor many on-air activities, like CWO, CWT, and we underwrite many domestic and international CW contest awards sponsored by ARRL and other organizations. Importantly, we issue an annual award for advancing the art of CW. We also give money where needed to support CW training.

We do everything we can think of to support and expand the use of CW. Tell them that, if it fits your writing style. If in response they show an interest, proceed to step 4, below.

4. Go to cwops.org and click on MEMBERSHIP and then click on MEMBERS ONLY. The password is morse8.
5. Find the nomination page and fill

it out. You don't have to give a 500-word justification for your nomination. A few words is enough. Submit it. The nomination will appear on the STATUS page for others to see and support by submitting sponsorship forms.

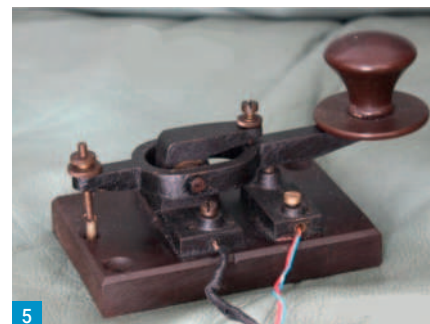
"Note: Before you nominate somebody, check the STATUS page to see if they are already nominated. Where is the STATUS page? Go to www.cwops.org, click on MEMBERSHIP, then click on MEMBERS ONLY. The password is morse8. Scroll down until you see the link that says "To check the nominees click here" and you will see who is currently nominated and now many sponsors there are. Only four are needed (nominator plus three sponsors). Oh, and make sure your prospective nominee is not already a member! Click on ROSTER on the MEMBERSHIP page. (I have invited a few guys who are already members so now I am sure to check both the ROSTER and STATUS pages first!)

"If you would like to sponsor somebody already nominated, the process is the same as for nomination except you pick the sponsorship page per step 5, above.

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Fig. 1 : G3ZRJ's key collection. Fig. 2: Jim N3JT.
Fig. 3: CWops medallions ready for posting.
Fig. 4: Tony G3ZRJ. Fig. 5: GORDO's mystery key.



"How about it? Look through your logs, your memory, too! New members are needed!"

Obviously this all applies to CWops members, but if you are a keen CW operator, you would enjoy participating in the Wednesday sessions I am sure. Operators in England would use (NAME) G as the exchange. Take part in a number of these and you will find yourself being nominated.

As a member, if you take part in the Wednesday sessions, you get a point for a basic ten QSOs in each session, 1300, 1900 and 0300UTC. You could get three points each week, depending how good you are at rising at 0300UTC, but at least two points are easy peasy. At the end of the year adding up all the points will entitle you to a medallion, bronze 36, silver 60 or gold 90.

The photo, **Fig. 3**, shows the pile of medallions before mailing them from the USA.

Where does this Key originate?

John GORDO owns this key, **Fig. 5**, and wonders if anybody can shed any life on its origin.

Base is $4\frac{1}{4}$ by $2\frac{7}{8}$ in (110mm x 73mm) so quite a large key.

Threads = BA, and knob & skirt very British.

If you can identify it or know anything about it please e-mail John direct: johnsnell599@gmail.com

Morsum Magnificat

Following on from my recent reference to *Morsum Magnificat* (MM), I received this e-mail from **Albert G3ZHE**:

"Three members of the Warrington ARC took MM. I have 36, 46, 47, 58 and from 85 to 89. About three years ago Serendipity Books in Australia had a book called *Coming Round The Bend* and other Verse by **Frank Spruhan** (SPRU). The poem was in issue 58 of MM. I bought the book and when I opened it SPRU had signed it with Christmas wishes in 1955. I am 85 and think this small book will end up in a skip before long. It might be good to get it into a museum. Spru was not an amateur but spent his working life as a Morse operator using wires, sounders and radio. These days I sometimes give points away in CW contests and have fun on QRP. Thanks for your article I think it will be well received. 73 Albert."

And More Keys

Tony G3ZRJ, **Fig. 4**, is a keen ragchewer and belongs to FISTS. He has a nice selection of keys as shown in **Fig. 1**.

Tony says: "Thought you might like to see the keys with which I work you. The Junker is ex German Navy from WW2. Got it

in this condition about 15 years ago, works very well.

"The Twin Paddle is a Grimmeisen, a late version of the Schurr paddle designed to fit into ETM twin paddle bodies. I put finger pieces from a Katsumi 150 keyer onto the beastie as it had very flexible clear plastic jobs and not too good.

"The Vibroplex Original Deluxe was missing the dot contact and a weight, so not too expensive. I found a suitable contact on a relay; I keep meaning to spruce it up. However, it always seems there is something else to do. The weight is of course intended for fishing".

If you have any interesting keys and would like to share them, please e-mail photos to me, roger@g3ldi.co.uk

If you have a key you would like to find out more about, same thing applies. 73 and May the Morse be with you!



Resistors and Resistance

Eric Edwards GW8LJJ goes back to basics with resistors and their uses.

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There are many types of resistors that will affect the flow of current through a circuit. They can be used in controlling the speed of a motor, the pitch of a musical tone and the amplification of a signal. They can also be used for dividing voltages when some components in part of a circuit need to work at a lower voltage than the supplied input voltage by connecting resistors in series and tapping off at the junctions. As resistors can get hot because an electric current is passing through them, an advantage can be taken of this by using them in appliances that need heat. They are used in room heaters, toasters, electric cookers and many more heating appliances. Another well-known component is an incandescent light bulb. The metal filament glows white-hot due to the very high temperature produced from the resistance when current is passed through it. Resistors are used in series with LEDs and in transistor circuits for base bias, emitter and collector circuits. And a use for a large resistor close to home for radio amateurs is for a transmitter dummy load.

Resistor values range from a fraction of

an ohm to tens of millions of ohms (meg-ohms) and resistors are made from a variety of substances, including carbon, or more correctly a carbon composition, metal oxide and metal film. Higher wattage resistors are generally made from wire wound on a ceramic former.

The wire-wound resistors are inductive as they are, in effect, coils. The wattage rating is the amount of power that the resistor can handle without burning up! A one-watt resistor will be required to allow a current flow of 0.08 amp (near approximate) with a potential difference of 12 volts. What that means is, if a resistor of 150 ohms is used to drop 12 volts for a supply requirement of say 6 volts from a supply of 18 volts then the wattage that the resistor is expected to handle is found from the equation: 12 (volts) divided by 150 (ohms) which is 0.08 (amps). To convert this to wattage we must multiply 12 (the voltage) by 0.08 (the current worked out by the equation), which is 0.96 (Watt) almost 1W. If a ¼ Watt resistor were used in this location, it would burn up, reinforcing that resistor wattage is as important as resistor values.

Always replace faulty components with the same overall value (resistance and wattage) to maintain reliability.

Types of Resistors

There are two main types of resistors, linear and non-linear. Fixed (resistance value) resistors have a specific value and these values cannot be changed. There are several types of these as mentioned above, along with surface-mount types. The values of non-linear resistors change according to the temperature and voltage applied. Types of non-linear resistors include thermistors, varistors and light-dependent photo types.

Variable Resistors

Variable resistors do not have a specific fixed value and can be changed with the help of a control knob. These resistors find applications in radio receivers for controlling volume and tone. Rheostats are large power types for adjusting voltage or current usually in high power test circuits. Trimmers are those found in circuits we are more familiar with and are used to set a desired voltage or current in low power circuits.

Variable resistors fall into two groups, linear and logarithmic. Looking through component catalogues you will see values such as 10k lin. and 10k log. This, although it may be confusing to start with, will soon be understood when you realise that our own hearing is logarithmic (cramped on one end). If someone was to increase the volume of sound in a linear manner, it would not be detected in the same way in our ears as we would hear no difference at the start, then it would get louder but not at the same rate as the actual rising level. Sound level on an audio amplifier must be increased non-linearly (logarithmically) to correspond to our hearing, giving the impression of a smooth increase in volume. In contrast, our sight is linear. If a light bulb is connected to a variable power supply, our perception of brightness would match the increase in voltage. What all that means is, for audio a logarithmic (log) pot (potentiometer) is used and for video, voltage or current increase, a linear (lin) pot would fit the bill.

Resistor Colour Coding

Resistors are colour coded to identify their resistance and tolerance and reliability. Not all resistors will have this full information but they will all have the resistor value in resistance displayed as coloured bands. The reason for using coloured bands as opposed to the resistance value printed on the body in digits (numbers) is because the numbers can be erased by overheating of the resistor. The individual colours are painted all around the body so if any part has been obliterated the colours can still be seen somewhere on the body. The older

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high wattage carbon types used a coding that was referred to as 'body, tip, spot'. The body of the resistor was in one colour, one end of the resistor had another colour and there was a coloured 'spot' on the centre of the body, **Fig. 1**. The body represents the first significant figure (resistance value) and the tip, the second significant figure with the spot as the number of noughts (zeros), also called multipliers. As an example, the large resistor shown at the back in the photo has a brown body, green tip and a yellow spot. This shows the value as 150,000. The 'Brown' is the value one and is the first significant figure, 'Green' is represented as five and is the second significant figure and the 'Spot' is the multiplier (number of noughts), which is four. The resistor value as shown by the colours, is ONE, FIVE and FOUR zeros which is $150000\Omega = 150k\Omega$. It is not often you will come across these resistors unless restoring vintage domestic electronic equipment. Most wire-wound resistors are as shown in **Fig. 2**. Modern resistors have coloured bands that are printed around the body and can be three, four, five or even more bands. There is an exception where the component is a surface-mount type. These use numbers printed on their body although there are some tubular (MELF) types that have the coloured bands. Component suppliers will show a complete range of resistors and provide the necessary information about them.

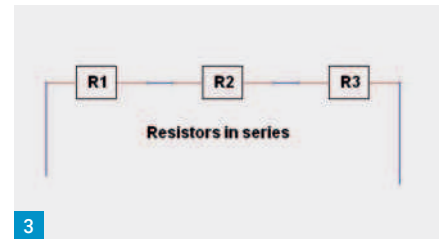
The Colour Code

There are many ways of learning the code and it's not only resistors that use these because the code is universal. Brown will always mean ONE whether it's for resistors, capacitors, coils or wire looms, so it is worth learning this code. There are only ten num-

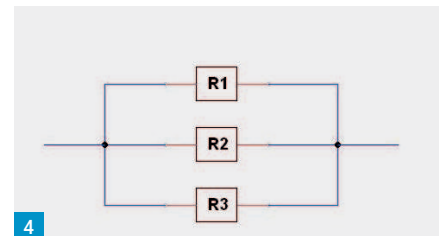
bers (well, nine plus zero, which is coloured black). It is better to learn the colours as you see them rather than use any rhyming or mnemonics. How did you learn the days of the week or names of the months? It was simply by remembering and using them and no other names or colours were substituted for them. Learn the colours as you see then and soon they will become second nature and there will be no need to think about each individual colour and as soon as you see, say, yellow on a resistor, capacitor or any other component or wire you will know it as the number four. You have already learned that and you have not even started yet! The colours are as shown in **Table 1**. It will not take long before you will be able to look at a 22k Ω resistor (RED, RED, ORANGE) and know its resistance value without thinking about the colours. A single black band on a resistor designates a zero-ohm resistor and is a wire link used to connect tracks on a printed circuit board (PCB). It has the same format as a resistor and looks neater than a wire link.

Tolerance and Reliability

All resistors and indeed other components have a tolerance. In other words, the value marked (or coloured) on the component will not always be an exact value. A 10k Ω (BROWN, BLACK, ORANGE) resistor may have a value as low as 9.5k Ω or as high as 10.5k Ω . This is known as a $\pm 5\%$ resistor. The black ring can be used as a multiplier or as a decimal. If the colours are BLACK, BROWN, BLACK, the resistor value is 010 Ω which is 0.1 Ω . The zero before the one represents a decimal point and the zero after the one represents no multiplier or noughts. Better or close tolerance resistors are 1% or even 0.1% and it will depend how important it is



3



4

$$\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} = \frac{1}{R_{total}}$$

5

Fig. 1: Old-style resistors.

Fig. 2: Wire-wound resistors.

Fig. 3: Resistors in series.

Fig. 4: Resistors in parallel.

Fig. 5: Formula for calculating overall resistance of resistors in parallel.

to have the actual value (or very close) in the circuit. For amateur radio use, 5% is acceptable although as the cost of 1% is now affordable it can be useful to stock and use those.

The tolerance or % difference is also indicated with some of the same colours. Brown as we know is one so that will be 1%, Red is two and is 2%. Other colours used are GOLD for 5% and SILVER for 10%. These are four band resistors with the first three used for the resistance and the fourth for the tolerance. With some high voltage resistors, to prevent contaminations getting in the coating, the gold and silver bands are often replaced with yellow and grey bands. Resistors produced with military specifications will often include a band that indicates reliability and is specifically for failure rate.

More Bands

Early resistors were three colour band types but then came along four, five and six bands. The four band has the first three as the resistance value with the fourth band as the tolerance. The five band type has a third significant resistance value with the fourth being the multiplier and the fifth as the tolerance. The six band type has the first three as

the resistance values, the fourth as the multiplier, with the fifth as the tolerance and a sixth band indicating the temperature coefficient. The number of bands and hence the range of resistor values are allocated as 'E' types with E3 being the most limited in resistance values. These have values that will be used with circuits not requiring critical values of close tolerance. The E3, as the term suggests, have three values and they are 1.0, 2.2 and 4.7. These are the values used but the range is not just Ohms but can be multiples of the base numbers. 1.0 can be 1Ω, 10Ω, 100Ω, 1000Ω etc and 2.2Ω can also have the multiplier to provide 22Ω, 220Ω etc. So, it still has a useful range of values.

The next range is E6 and again the term suggests the number of base values which are 1.0, 1.5, 2.2, 3.3, 4.7 and 6.6. As with the E3 series the multipliers extend the resistors values. These resistors are $\pm 1\%$ and $\pm 5\%$ types. Others such as E12 are close % tolerances and have resistor base values slotted in between the ones of the E6 types. Yet more are E24 and E96, which I tend to stock as they have come down in price and are readily available. There is E192, which has a very large range as will be appreciated, and with a 0.5% tolerance. There are many places to look online along with component suppliers to see the full range of resistor values and tolerances. Another important point about choosing resistors is the voltage it will be used with.

Resistors in Series and Parallel

Resistors are said to be in series when the current flowing through all the resistors is the same. These resistors are connected from head to tail in series, **Fig. 3**. The overall resistance of the circuit is equal to the sum of individual resistance values. If we were to connect three 100Ω resistors in series the total resistance will be 300Ω. The total resistor value in a series arrangement is always greater than the largest resistor.

If we were to put them in parallel (resistors are said to be in parallel when the terminals of resistors are connected to the same two nodes) they share the same voltage at their terminals and the final resistance value will be very much lower, **Fig. 4**.

The total resistance in a parallel arrangement is always smaller than the smallest resistor. If the resistor values were 10 ohms in parallel with 15 ohms and another 20 ohms in parallel, the total value will be less than 10 ohms (the smallest resistor). The formula, **Fig. 5**, is 1 divided by the result of 1 divided by 10 and 1 divided by 15 along with 1 divid-

ed by 20 which is $0.1 + 0.066 + 0.05 = 0.216$ divided into 1 = 4.63 ohms to the nearest decimal place. If each of the three resistors had been the same value, the total resistance value could have easily been found by simply dividing the number of resistors into one value. If the three resistors are 15 ohms each, then by dividing 15 (one resistor value) by 3 (the number of resistors) the total resistance is 5 ohms. This only applies for a network when all resistors are the same value and works for any number of resistors.

Increased Wattage

One advantage of this method of using many same value resistors is to replace a single lower value wattage one when a higher wattage resistor is required and is not available or is expensive as a single resistor. If three one-Watt resistors are used in the above example, the total wattage capability of the total resistance is 3 Watts. This is true because the current flow is shared equally among the three resistors. If the three resistors in parallel are 150 ohms each and the voltage across the circuit (Potential Difference) is 12 Volts, the current through the combined resistance is 12 divided by $(150 \times 3) = 0.24$ Amps (240mA). The total wattage dissipation is $12 \times 0.24 = 2.88$ watts, but the wattage dissipated through each individual resistor is calculated by multiplying the current $(12 \times 150 = 0.08 \text{ amp.})$ by the potential difference (PD) 12 which is 0.96 Watt, a third of the combined total wattage of 2.88 W. Although the total wattage dissipation is of the whole resistance circuit, each resistor only dissipated a third of the power. This is only true, however, for resistors of equal value. Having the same value resistors to increase the power dissipation is used by radio amateurs when making a dummy load for measuring or setting up their transmitters. Using ten 10-watt resistors in parallel of 500 ohms each will allow testing the output of the transmitter at 50 Ohms impedance to a power dissipation of 100 watts. The only other way is to obtain a 100 watt 50 ohm resistor! A dummy load is a non-radiating substitute for the transmitting antenna, or it should be, and is composed of carbon, non-inductive resistors placed in an RF-sealed metal box, which may be filled with oil (to increase the power rating even further by cooling).

In other parallel resistor circuits where all the resistors are not of the same value the wattage dissipated by each resistor will be determined by its own resistor value. Placing equal value resistors in series also increases the overall wattage rating.

Colour Value

Black	0	Green	5
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Grey	8
Yellow	4	White	9

Table 1: resistor colour codes

However, this is only advisable if the resistors are exactly the same value because each resistor will pass the same current but will have different voltages across their terminals. Let's take an example. Three resistors of 10Ω are placed in series so the total resistance is 30Ω. If we placed 24V across this total resistance, the current through all three is equal and is 0.8A. (Remember Ohm's law?). The total power dissipated in heat is $(24 \times 0.8) 19.2\text{W}$. The voltage across each of the 10Ω resistors is 8V and as the current is the same though all three resistors the power dissipation of a 10Ω resistor (8×0.8) is 6.4W. This, in theory, means that three lower wattage resistors can be used to replace one larger wattage resistor. However, it is not good practice (for safety reasons) but it is explained here to complete the theory of resistors in series and parallel. Remember when replacing a component in a circuit, the correct replacement type must be used.

Other Arrangements

Where several of the same value resistors are used in a circuit, sometimes resistor networks are used. These multiple resistor networks can be used for pull-ups where it is an advantage to use them on gates of integrated circuits (IC) to hold them at a slightly positive potential until a signal comes along to reduce them to a low potential. This in digital terms is, the IC gate is held at logic one (high) until it is required to go to logic zero (low). The advantage of having these SILs (single-in-line) resistor networks is the saving of space in a complex printed circuit layout where size is all-important. Other resistor packages are In-Line Isolated resistors where there are four independent resistors in an 8-pin package, for example, similar to the SILs, and there are also Dual-In-Line Isolated resistors that are packaged in a 16-pin arrangement, two sets of 8 pins opposite each other as a standard 16-pin integrated circuit configuration. These resistors are manufactured from a thick film material and consequently can be made very small (thin).

My thanks to **Ray G7BHQ** (retired college lecturer) for checking and advising on some of the points made.

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A Welcome Return

Dear Don,

I started getting back into amateur radio at the beginning of this year, and being from the UK originally, my first stop was *Practical Wireless*. My daughter's boyfriend, **Niklas SA6CCZ**, can take some of the blame.

I start reading *PW* in the school library when I was about 13, so *PW* has always been there and I was delighted to find that not only was *PW* still very much alive, but it had a lively interesting sister magazine, and through PocketMags I could subscribe to both and get access to new issues immediately here in Canada.

Since being allocated my new Canadian callsign, VE2XPM, in January I have been devouring *PW*, so keep up the good work.

Coming back into the hobby is interesting because everything that I could use before is still there, but now there are even more modes to explore, and the availability of so much software makes it really easy to try things, see how they work, and then move on to something else. So, I am like a kid in a toy shop at the moment.

On the hardware front, I used to enjoy Ten-Tec transceivers, but they seem to be pretty much dead now, so I have settled on an Icom IC-7300 as an easy way that will allow me to explore, and an SDR too. Living in an apartment, the antenna is a compromise and needs more work, but I

am on the air, and that's the main thing.

Clearly the new digital modes such as FT4, FT8 and JS8 are contentious, but then I remember when repeaters were in the same position on 2m, and I also remember the whole uproar around CB in the UK. Eventually these will just be part of the landscape, and those who enjoy working using the modes will be a community that will continue to use them. The interesting aspect for me is how the Facebook groups have grown. Every transceiver, mode and band has its own group, and in some cases there is more activity in Facebook than on bands using the mode in which they are interested.

One concern is how diluted activity has become as a result of there being so many options, and there is a challenge for the IARU and all national societies to retain our allocations and the privileges that we have. They deserve our support, thanks, and membership fees.

QSLing has been transformed by eQSL and LoTW, and using WSJT-X and DXKeeper I have automated the process, but I was still pleased and surprised to receive a paper QSL through the post from **George W2GLH**, which prompted an order for QSL cards, so that I can return the compliment, and QSL those who do not choose to use eQSL or LoTW!

Another surprise is how much freeware

and proprietary software persists in the amateur radio world. Of course, this is the choice of the author of the software but there seems to be a lot of software out there that is still being used but not being maintained. Generally, I try to avoid this type of software and prefer to use open source software with a vibrant community around it. I can take this attitude professionally, but seemingly not for amateur radio. If anyone reading this has written some software, and you are still maintaining it yourself, you may want to consider open-sourcing the software and build a community to share the load, and ensure the software develops even if you cannot continue to support it yourself.

On VHF and UHF, DMR is something that initially attracted me, but it is surprising how little traffic is around, and that should be disappointing for the investment in infrastructure needed to support the mode.

I still find something satisfying about a relaxed QSO and getting a sense of the person on the other end, entering the details into a logbook and sending a QSL card, but if the other station wants to do something more data-centric then I am OK with that too.

Anyway, I find amateur radio as captivating as I ever did, and I will look forward to having QSOs with anyone using any mode, and welcoming SWL reports too.

Keep going, *PW*. I look forward to getting the e-mail every month telling me that I can now read the new issue in PocketMags!
David Bainbridge VE2XPM (ex-G8LKU, G0EPM, SM0XPM)
Montreal

Electron Flow

Dear Don,

I have just read **Eric Edwards'** article *Applied theory* in the August 2020 issue and I felt I had to question his treatment of what electric current is.

Conductors are defined as materials that have free electrons, not free protons.

Protons are single particles (before the days of Quarks) of positive charge, bound very tightly together in the nucleus of atoms and it takes monstrous energy – 'atomic energy' – to split them out.

Electrons are much lighter (1/2000 a protonic mass) negatively charged particles. Nowadays we would talk about

electrons as probability fields but the point is, electrons don't come from the nucleus and are easy to detach from atoms. A Potential Difference applied across a conductor is enough to do that.

Eric does address this a couple of paragraphs later, introducing 'conventional current', but the notion of moving protons

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making a current is, I regret to say, just wrong. Protons, barring thermonuclear interventions, don't play a part.

Tony Jones G7ETW
Ruislip

Letter from Elwood Downey re: DSB

Dear Don,

Regarding the letter from **Elwood Downey** (*Letters*, September) on the legality of DSB transmissions, QRPGuys and 'Editor' are correct that DSB is a legal mode.

Elwood's assertion that "the lower sideband cannot be decoded" should come as rather a surprise to physics as well as the many QRP homebrewers who build DSB radios, not limited to but including such notables and QRP hall of famers as the sorely missed **Rev. George Dobbs**, the extant **Bill Meara N2CQR**, **Pete Juliano N6QW**, **Peter VK3YE** and many others.

Perhaps a little study on his part might be in order?

Clint Sharp MOUAW
Altrincham

Contests

Dear Don,

Firstly, as ever, a very big thank you for a wonderful magazine. I have been a reader on and off for nearly as many years as the magazine has been going but this is the first time I have contacted you.

Can I return to that perennial debate about contests? Firstly, let me say that while I am not a contester I have no problems with contests. Over the years I have seen all the arguments in favour of contests and agree with many of them. I agree that if you listen to many of the bands an hour before a contest there are but a few signals. Come the start time of the contest you struggle to find a frequency to operate on and even then it is often futile as you very quickly get crowded out.

Having said all that I have to complain about the number of contests that are being held, especially at weekends. It seems that not a weekend goes by when there isn't a contest on the CW end of the band at least. I am a keen CW operator and have been since getting my G4 call. I can send and receive at a reasonable rate though could never compete with the speeds I hear used in contests. I do often wonder just how many of the stations can actually read at that speed without some form of computer help. I notice that all the reports are 599 even when they have to repeat details

several times and so why bother to give a report at all. I mentioned getting crowded out earlier. I have on many occasions tried to operate on both 20 and 40m when there has been a contest on but find that shortly after calling CQ a contest station will come onto a very adjacent frequency and it seems that if I persevere they gradually move closer and closer until they are on my frequency and I have to go QRT.

We in the hobby are constantly bemoaning the lack of people, especially young and middle-aged people, coming into the hobby. If they would like to operate and have to work during the week, then the weekend is often the only time they have but on most weekends they cannot get on any of the bands except the three 'new' bands but often at least two of these are not open. I have noticed that now there are so many contests at weekends they are also starting to become regular mid-week activities.

As mentioned earlier I am not anti contests but I do think the time is rapidly approaching when there should be either some limit to the number of weekends when they can take place or a strict regulation to just how much of any band can be used for contest working. At the moment the whole of the CW section is used with no consideration to the QRP or QRS sections. I am sure that there could be portions of each band that are free of all contest stations and the organisers of the contest arrange monitoring stations to police this and disqualify those who don't abide by the rules. Is it not possible to combine several contests onto the same weekend?

I am sure that there will be quite a few who disagree with me as well as those who agree but I do believe that if we are serious about getting people into the hobby we should give them the opportunity to get on the bands and actually learn their operating skills.

John Pullen G4TGE
Barton upon Humber

(Editor's comment: Thanks for your e-mail John. Even though I am a keen contester, I agree that it has got completely out of hand. However, unfortunately the baby is well and truly out with the bathwater in that if a weekend becomes free, some new contest will take its place and there is actually no one who can prevent that from happening, because most new contests are run 'privately' as against by national societies. Thank goodness the WARC bands remain contest free but I realise, as you mention,

that's only a partial solution. The good news is that most contests, even at weekends, are of limited duration and don't attract a large number of participants, so there is usually free space on the bands. Thanks for your kind comments about the magazine!)

Do Transistors Wear Out?

Dear Don,

In response to **Jim Carter's** letter, *Do Transistors Wear Out?* (*Letters*, September) some thoughts. Firstly, everything wears out eventually (except eternity?). The original belief that unlike valves, they would last has proved untrue. There are several failure modes known to me. Note, I am not a specialist in this matter but I have repaired many equipments over many years.

Firstly, as they suffer thermal cycling, this causes strain both within the chip, and between it and the connections. One may assume there is both thermal and magnetic vibration also due to the signal current. In high power RF transistors failure was caused by aluminium atoms being able to wander off, weakening the wire bond to the chip. The answer to that was to use gold. It must be remembered the chip is exceedingly small so the current density can be very large.

Poisoning can occur due to imperfect seals of the case; hence why the Military insist on ceramic not plastic packages in some cases, or metal not plastic.

I learned when still at school, repairing a friend's HiFi, that transistors can go intermittent. It appeared a driver had gone, but on ringing the maker, an engineer told me that the likely cause was an intermittent open circuit in the output device, that when I measured it, the ohm-meter's voltage had temporarily cured it, but it would fail again, and advised its replacement, and I didn't need to order the Japanese original, but TIP41/2C would do fine (a transistor I have found uses for long after then). I had a duff transistor in my Marconi spectrum analyser: but when I checked on my Peak-Atlas semiconductor analyser, it was fine. I tacked it back in, and it worked: for a couple of minutes. Another case was a C-Audio RA 3000 amplifier: 625 watts/channel. It had a short on one side of the output complementary pairs but as I checked for shorts with each output transistor, they all seemed OK, so I had to laboriously remove and check. Again, I used the very useful Peak-Atlas and as I went along these N-channel enhancement MOSFETs, one came back as depletion-mode. How it managed to change I cannot imagine, but

that was the fault. To my knowledge power-MOSFETs are not made in depletion mode.

The Mullard OC44/45 is infamous for shorts developing between the earthed metal can and the chip. How conductive crystals grow in the apparently inert silicone grease they are filled with, is unclear. Usually one can get away with cutting the earth wire from the can, if there is only one short. I have met at least one with two! A frankly better solution as these are now a silly price, is to change one of the bias resistors and use a silicon device instead. Long ago, by the way, I repaired another friend's HiFi with germanium output transistors by using silicon and changing the lower bias resistor for a silicon diode.

I had a very strange triac. It was used to turn on a turntable in a disco. This one didn't. On examination with a 'scope, the waveform was flat topped on one half cycle, which effectively passed DC through the motor, which it won't take. Again, I cannot understand how that could be the case, but replacing it cured the problem.

To end with, I worked for Rascal-S&S for a time. We had receivers, RA1795, with poor noise performance in the third, 1.4MHz IF unit. This was eventually traced to the BC109 emitter-follower output transistor, when we borrowed Development's 18GHz spectrum analyser. It was oscillating at 1.2GHz! A change from Motorola to another make cured that.

To conclude: all components can fail, and in many and varied ways, semiconductors not excluded.

Phil Moss
Surbiton

Morse Paddles

Dear Don,
I have nothing against Bengali apart from the price! But perhaps you could give a UK manufacturer a mention? I am the proud owner of a gold-plated Chevron paddle, with magnet points etc. I previously used an N2DAN paddle that I sold on.

Paul Kalas G3VCN
Plymouth

(Editor's comment: Thanks Paul. Morse paddles are very personal – what works for one, doesn't necessarily work for another. I moved from a Bencher to a Begali – mechanical mechanism to a magnetic one – and am very happy (and I won my Begali so it didn't cost me anything!). But the Chevron keys, by Kevin MOAGA certainly have a great reputation:

www.chevronmorsekeys.com)

Various

Dear Don,
The link below connects to a free online Foundation licence course from Billy

GM6DX. In view of our lockdown this could be the ideal time for SWLs to study for the exam over the next weeks/months. This course was created over 48 hours and is continually being updated. It was specifically designed for people to use during the corona crisis. The only problem I've had is that when I signed up I was required to tick 'I accept T&Cs' but there were none so I ticked the box anyway and proceeded. This initiative could stimulate the growth of amateur radio:

gm6dx.thinkific.com

I've spoken a lot about websites with stunning content then Verulam ARC has a 'library' of radio-related articles by **John Welsh G0NVZ** (SK). Not only was he a most knowledgeable engineer, he also knew how to connect with beginners. New content is being uploaded weekly at:

tinyurl.com/john-g0nvz

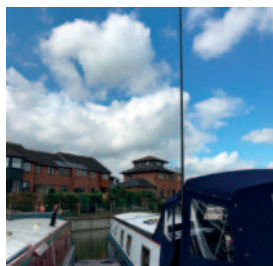
Finally, heard on the Verulam ARC 80m net: "My XYL station manager is copying your LSB conversation OM." There was no fault on his transmission, it was just too near and powerful for her landline telephone to cope with. Suffice to say that it is imperative we always behave in a professional manner as we go about our amateur radio. Just when you thought it was safe to key down... Use caution. Homebrew Telephone Line RFI filters at:

tinyurl.com/homebrewfilters

Bob Houlston G4PVB
St Albans

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