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REVIEWS GALORE! | **Five products tested, from antennas to SDR**

THE YAESU FTM-500DE

First details of this keenly awaited dual-band mobile digital transceiver inside

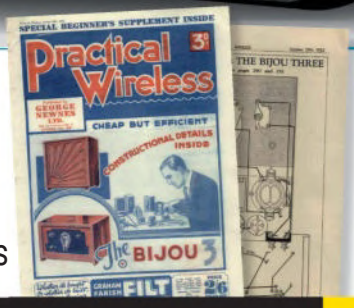
Having Fun in the Sun

DXpeditions aided by record highs in the sunspot count

Classic Wavemeters

Measuring radio frequency before today's digital age

practical LATEST NEWS Wireless



HISTORY **Inside the Bijou Three receiver**

Archive pictures of this 'cheap and efficient' model from the PW vaults

PRACTICAL **Frequency counter & power meter**

Constructing and testing your very own ASCEL Electronic AE20401 kit

GOING DIESEL

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Keylines

Not much radio for me this month, other than chasing 3Y0J (Bouvet Island) and FT8WW (Crozet Island). But I've been pleasantly surprised at the upturn in HF band conditions – this sunspot cycle is looking very promising indeed, so far at least. For example, the 12m (24.9MHz) band has been opening around dawn to the Far East and staying open to most of the USA as late as 9pm. And 10m has been almost as good. Let's hope the trend continues.

One of the reasons for the lack of radio is that I have been training as a Volunteer Guide at Wells Cathedral. About as far from amateur radio as I can get, both in time and in content, but that's probably why I am finding it so fascinating! Mind you, training is one thing – I have yet to be let loose on members of the public!

Past Magazines

For the CDXC (UK DX Foundation) Convention in May I've had my arm well and truly twisted to give a presentation on the subject of UK amateur radio magazines, past and present. Well, the present is easy – *PW* is the only remaining newsstand magazine to cover amateur radio. But, looking back, things were very different. *Short Wave Magazine* will be fondly remembered and for a time was in the same stable as *PW*. Its first issue appeared in March 1937, it stopped for the war years in September 1939 but restarted in March 1946. I'm not sure exactly when publication ceased but the last edition in the worldradiohistory archive is for September 2005. I found a reference to a magazine called *Practical Radio UK*, claiming to cover technology and radio listening, including short wave. It began in January of 1932. But I'm in the dark about whether and when it continued.

Wireless World started as the *Marconigraph* in April 1911 and changed its name in April 1913. It became *Electronics and Wireless World* in September 1984 and *Electronics World* in January 1996. I recall in my early days in the hobby finding some great amateur radio projects in *Wireless World*, albeit usually quite advanced in nature.

The first issue of what became *Amateur Radio* magazine was intended to be a one-off introduction to amateur radio and was published around October 1982. Hence it was not or dated. The response was enthusiastic so Goodhead Publications followed up with issues No. 2 and No. 3 before making it a monthly magazine. The first dated issue was the March 1983 one, and the magazine continued to

November 1990. It was this magazine that got me started with regular amateur radio journalism (although I had previously written for the ISWL magazine *Monitor* and co-edited the RSGB's *DX News Sheet* with **Martin G3ZAY**), and I contributed both an HF DX column (*DX Diary*) and a packet radio column, as well as a number of one-off articles, over a period of years. Another magazine that started in 1983 was *Ham Radio Today*. In due course its HF column (*QRZ*, later *HF Happenings*) was written by **Steve Telenius-Lowe G4JVG**, well-known to *PW* readers although nowadays as PJ4DX. When Steve moved to Papua New Guinea, I took over his column from the March 1991 issue, *Amateur Radio* magazine having just ceased publication so the timing was fortuitous from my point of view! Another regular contributor to *Ham Radio Today* was the late **Chris Lorek G4HCL**, another who wrote for *PW* for many years, and the editor for much of its existence was **Sheila Lorek G8IYA**, Chris's then wife.

While not specifically an amateur radio magazine, *Radio Constructor* was very popular for many years. It started life in August 1947 and appears, in 1954, to have 'absorbed' a magazine called *Radio Amateur*, about which I admit to ignorance! As far as I can tell *Radio Constructor* continued publication through to a combined August-September 1981 issue. I have several bound volumes of *Radio Constructor* and still enjoy looking back, especially at the '*In Your Workshop*' series in which veteran serviceman **Smithy** explains to assistant **Dick** all sorts of useful stuff about theory and practice, am approach that our own **Chris Murphy M0HLS** has followed with his occasional *Lab Tutorial* series.

Which have I forgotten to mention? And what memories do you have? I'd love to hear.

Don Field G3XTT
Editor, *Practical Wireless* Magazine

Contents

12


49


16

Newsdesk

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

New from Moonraker

Produced by the latest technology, the AnyTone ARES II AM/FM/SSB 10m Transceiver features:

FM/AM/SSB mode • Weather Channel 150-170MHz programmable (Optional) • CTCSS/DCS Code(Optional) • PWR, RX RSSI S-Meter • PC programmable • Echo Function • SQ, ASQ Function • RF Gain Adjustment • Mike Gain Adjustment • H/L power • Programmable RB • NB/ANL Function • Offset Function • Beep Voice Prompt • +10KHz Function • TOT Function • HI-CUT Function • Busy channel lock • Monitor • LED Brightness Adjustment • SWR Protection • Voltage Protection

Technical Specifications:

• Frequency Range: 28.000-29.695MHz(Programmable) • Frequency Band: L band: A/B/C/D/E/F H band : A/B/C/D/E/F • Channels: 40channels(programmable)in each band • Frequency Control: Phase-Locked-Loop Synthesizer • Frequency Tolerance: ± 5.0 ppm • Input Voltage: 13.8V • Microphone: with push-to-talk /UP/DN and coiled cord • Dimensions: 287(L)x200(W)x61(H) • Weight 1.75kg • Antenna Connector: UHF, SO239 • Operating Temperature Range: -20℃to +50℃

All for just £169.95

Also New and in stock: A good quality 8-digit RF sensing frequency counter housed in a 3D printed box with a bright green display.
Perfect for any export modified radio such as the SuperStar 3900 and the Anytone ARES II. Key Features/Specifications:
• RF Sensing Frequency Meter, 0.1-60MHz • 2 x SO239 sockets
• 1 x DC socket • Size TBA • The enclosures are 3D printed in dark grey to a nice standard. Small, compact and **just £99.95**

Moonraker also report that, further to continued expansion, they are now having a fourth warehouse under construction off site. The new unit will be for their ever-growing worldwide overseas imports and act as a feeder to their mail order warehouse.
https://moonrakeronline.com

Alano ALK 101 DAB/ FM Radio Kit – Solderless

The elegant-looking Alano ALK/ BEA101/ 103 kit ('Bausatz'), for making your own DAB and FM radio, is a low-cost (€39.95/€ 59.95) easy construction project available via Amazon (Germany). Whereas the Alamo 101 is in Mono, the 103 comes in Stereo with a colour display and a PSU. Rudolf Hoffmann has put a 103 together for Radio Kurier (2/2023: 27). The kit does not require any soldering, just plug, screw and play. There is a USB port for MP3 files, an AUX port, a display brightness control, an alarm, remote control, and an equaliser. This nifty and educational kit comes in green, red, orange, yellow, and blue.

https://tinyurl.com/2jw4dhbn

TUNEIN OFFERS CLICKABLE WORLD MAP:

TuneIn Explorer was announced this week in conjunction with World Radio Day 2023. The TuneIn live-streaming audio service has launched TuneIn Explorer. It is a clickable online map that allows listeners to easily discover live radio content from around the globe. Although similar to the Radio Garden clickable world map, TuneIn Explorer differs by presenting users with genre-specific quick-access buttons such as 'Classical', 'Country', and 'Top 40s' across the top of its map page. As well, the radio broadcasters that are available through TuneIn Explorer are only drawn from TuneIn's catalogue of stations. This being said, TuneIn Explorer is an engaging, easy-to-see, and informative way for radio fans to learn more about the world's astounding array of content formats and broadcast locations. It is worth mentioning on every radio station's website. Quote: "World Radio Day is a celebration of radio's storied history, but also an opportunity to look ahead to a brighter future," said Richard Stern, CEO of TuneIn. "Explorer showcases the tremendous skill of our global broadcast partners and gives listeners a powerful new way to experience everything the world of radio has to offer." TuneIn Explorer has been initially launched on tunein.com. A mobile app is due to come out shortly. TuneIn says that it has more than 75 million monthly active users and distribution across 200 platforms and connected devices. The company made this announcement in conjunction with this week's World Radio Day on Feb. 13.

Publications Panorama

DARC: Radio Amateur Callbook Winter 2023 (Book/ CD)
http://www.darcverlag.de

Analysis and Design of FSL Antennas: A PDF Guide
Calling All Antenna Designers: According to our friends at the SWLing Post, Zoltan Azary has made an extensive theoretical analysis of ferrite sleeve loop antennas available. This article has a very academic flavour, and for those who are interested in antenna design, he welcomes your comments.
https://tinyurl.com/yj58p2bv
https://tinyurl.com/bek9hrkp

CHIME and the Billion-Year-Old Radio Signals: **Martín Butera**, *CQ Amateur Radio*, January 2023: 12.

Ham Radio Tunes in to a New Generation: **The Times**, 28 January 2023
https://tinyurl.com/yc4vhtkp

RADIOWORLD: 'Spectacular Radio Studios 2023' Yearbook
https://tinyurl.com/2h4nzpba

RADIOWORLD Engineering Extra
8 February 2023: 'Hybrid' broadcasting and new radio technology)
https://tinyurl.com/4e8x7j34

RADIOWORLD
1 February 2023 (Clean rooms; farm radio; audio fundamentals; supply chain woes …)
https://tinyurl.com/2ctz456c

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

Sangean WFR-39

As a digital portable internet radio, the WFR-39 offers a generous memory bank for up to 448 station presets and an App that gives the freedom to control your radio from anywhere under the same network. Featuring the weather and financial information, you get to wake up with the weather and financial updates right off the back! The customisable menu and radio preference management are just like the icing on the cake making WFR-39 the radio of your choice!

• FM-RDS/DAB/Internet Radio • ATS (Auto Tuning System) • Station Presets (99 FM/99 DAB/250 iRadio) • Spotify Connect for Music Streaming • Cloud Music (Podcasts/Amazon Music/Deezer/Napster/Qobuz/TIDAL) • Media Centre Supporting UPnP • Mobile App (AirMusic Control) • Built-In High-Quality Speaker • Scheduled Playing • Sleep Timers • NAP Alarm • Adjustable Dimmer • Weather Information • Smart Local Radio Preference Management • Built-In Rechargeable Battery • 9 EQ Modes (Normal/Flat/Jazz/Rock/Soundtracks/Classical/Pop/News/My EQ) • I/O Port: DC-In/Headphone Port/USB Type-C 5V/2.4A

Price around £150 and available from Martin Lynch & Sons (though currently out of stock) and various online sources.

https://tinyurl.com/yckadvd7

Stampfl MWS-1 Standing Wave Barrier

The Stampfl MWS-1 Standing Wave Barrier (***M**antel**W**ellensperre*) is a helpful accessory to improve HF reception in the range from 0.15 to 30MHz. This device is not suitable for sending. The isolator stamps out any interference problems you might encounter from the outer part of your cable at a mere CHF 37.00.

https://tinyurl.com/nhkz4hd3
https://tinyurl.com/5n7ph5eu

G4LZD SK: David G3WGN reports that just before Christmas, Stephen Reading G4LZD (ex-MP4BDV) went Silent Key. Stephen was the prime mover in the restart of Dartmouth and District ARS in 2017 and an avid HF and VHF operator. In the 70s and 80s Stephen published a number of articles on shortwave listening, including one in the November 1982 issue of this magazine.

BLACK COUNTRY RADIO RALLY: The Black Country Radio Rally scheduled for 30 July 2023 has been cancelled.

EXPANSION OF SPECIAL CALLSIGN LIST: Ofcom has recently authorised a further expansion of the list of Special Contest Callsign qualification contests to include two UK and Ireland DX Contests. Full details of how to apply for a Special Contest Callsign, including the complete qualifying criteria, can be found on the RSGB website.

UK METEOR BEACON PROJECT PRESENTATION RELEASED: The RSGB has just released another presentation from its 2022 Convention. Brian Coleman G4NNS talks about The UK Meteor Beacon Project, which is a collaborative project between the amateur radio and radio astronomy communities. The aim is to collect data on meteor events over the UK and Phase I was to establish a transmitting beacon. Phase II is to create a network of receivers to monitor the radio echoes from meteors and to stream data over the internet to support the study of meteor events and their impact on the ionosphere. The Project has received RSGB Legacy Funds to help make this great idea happen. You can see the presentation on the RSGB YouTube channel and you can find out more about the RSGB Legacy Funds on the Society's website at:

www.rsgb.org/legacy

New from Yaesu

Details are emerging of the exciting new Yaesu FTM-500DE 50W, FM, APRS and Digital Voice (C4FM), 144/430MHz Mobile Transceiver, which is due for release this month (March 2023).

The FTM-500DE shares the Yaesu core features, utilising the latest C4FM Digital technology with many new features and improvements. It offers true dual-band operation, i.e. operation with two active receivers simultaneously. Reception of 2 x VHF or 2 x UHF is also possible (V/U, V/V, U/U). 1000 memories help to organise the most popular frequencies and always have them quickly accessible. The receiver operates continuously from 108 to 1000 MHz and thus also enables reception of aeronautical radio (AM) or marine radio (FM).

A special feature of the FTM-500DE is the integrable optional Bluetooth interface BU-2, which enables 'hands-free' operation, i.e. the possibility to make radio calls without an annoying microphone cable and without constantly pressing the PTT button, as is now the rule for mobile operation while driving. Yaesu offers the BH-2A as a headset.

The new FTM-500DE will be available in March 2023. Pricing is yet to be determined. We will bring you more information as and when it becomes available.

News from Martin Lynch

The MyDEL (S)PS-1335 is a high-performing power supply that is small in size and highly efficient. It offers excellent RFI immunity and is very quiet when it comes to RF noise. Additionally, it functions as an uninterruptible power supply, meaning it can continue to power equipment even if the main power source fails, by utilising a connected battery. The supply offers regulated power with low noise, and protection against overvoltage, overcurrent, and short circuits. With the capability of charging a compatible battery at a current of 1.8 amps while connected to the main power source, it can keep the battery ready for use and switch on automatically in case of power failure. Features include: Input voltage...AC 230V/50Hz / Output voltage...Fixed 13.8V DC • Overload Over Voltage Protection / Output Current 30A (max) • Dims 181 x 63 x 190mm Weight 1.52kg. The unit retails at £99.95.

https://tinyurl.com/ykx9fpme

Also, something new at the Martin Lynch & Sons Superstore is starting on 18 March 2023. Martin has decided to open the doors on Ham Radio kit he takes all year around that usually gets traded out – because it's either too old, faulty or just not worth fixing. The mix of kit can be very varied from 40 year old handhelds, even older HF base stations, 2m multimode transceivers, a multitude of accessories and random lengths of cable and plugs. Often the pile of ham radio related gear includes far more modern items but because of lack of components, time to fault find and repair or even physical damage, we usually sell them to traders and don't get involved. It's called 'Tony's Faulty Finds' and will be included in our Discount Day specials throughout one Saturday each month.

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

TRF Sensed Antenna Switch for SDR MFJ-1708B-SDR

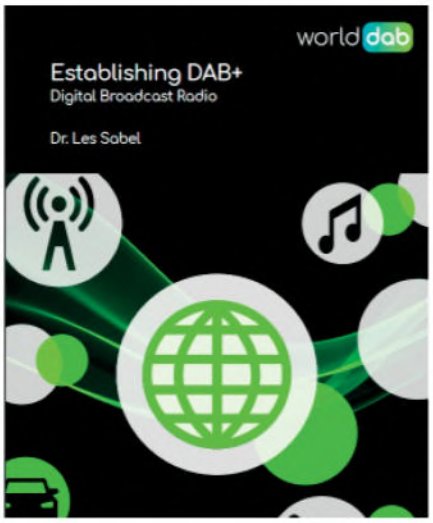
The MFJ-1708B-SDR is produced in three versions: with PL connectors, with N connectors, and with an SMA connector on the SDR side.

This MFJ accessory allows the simultaneous use of the external antenna between your SDR receiver and a transceiver. When transmitting with the transceiver, the switch disconnects the SDR to prevent it from burning out. This is the typical configuration, but you can actually connect a second transceiver to the receiver connector, but the important thing is not to go to transmit. The splitter provides a high level of isolation between the transceiver and SDR receiver input to reduce crosstalk and interference between the two inputs. The dedicated input for the SDR receiver has a prevention circuit to protect against damage due to the transceiver's radio frequency.

The receiver needs to be powered at 12V via the cable that comes in the package, but when not powered, the relay remains connected to the output of the transceiver.

Do not use the MFJ-1708B-SDR with transceivers whose power exceeds 200W or connect it to the output of power amplifiers whose power exceeds 200W. If the MFJ-1708B-SDR is used together with a linear amplifier, mount it between the amplifier and the transceiver.

Available from Martin Lynch & Sons and elsewhere for around £143.



ESTABLISHING DAB+ DIGITAL BROADCAST RADIO: WorldDAB has published a ground-breaking new book, *Establishing DAB+ Digital Broadcast Radio*. It offers a unique, in-depth guide to the regulatory, technical and commercial aspects of establishing a successful DAB digital radio service. The book addresses new adopters, as well as offering advice for countries that have already started the process, and those that are nearing permanent service status. The title covers the complete DAB+ establishment process from initial interest through to analogue switch-off. The topics covered include the seven major stages in establishment: (1) initial interest; (2) technical demonstrations; (3) formal standard adoption and regulation including coverage requirements and frequency planning; (4) systems planning and design, both transmission and multiplexer network design; (5) rollout activities including construction, content, receivers, and launch marketing; (6) operations, including ongoing content development and sustained marketing campaigns; and finally (7) analogue switch-off.

https://tinyurl.com/uj8h3r2d
https://tinyurl.com/mtzbk4ww

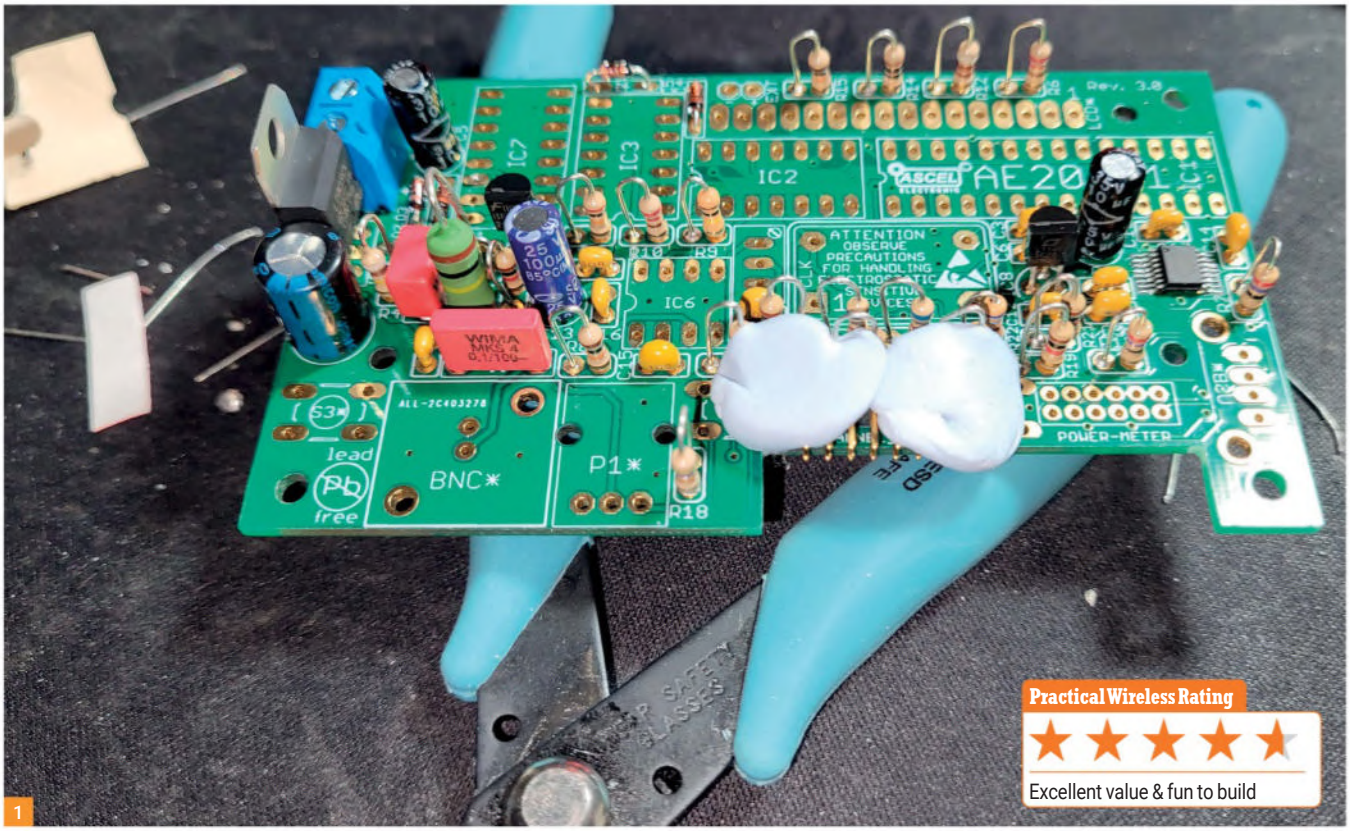
The New Compact Belka Docking Station

The *SWLing Post* and other radio publications have recently showcased a stylish new docking station, made by **Pavel Kraus**. Pavel writes: *"I made a small docking station for the Belka – it has a built-in stereo amplifier, speakers and a battery with a charging circuit and a DC-DC converter for emergency charging of the Belka in the field. The status of the battery is indicated by LEDs. The Belka holder itself is made on a 3D printer."*

https://tinyurl.com/2y94r558

Pavel also makes some very innovative radios:

https://tinyurl.com/yjmnupsz



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Richard White G6NFE
practicalwireless@warnersgroup.co.uk

The ASCEL AE20401

Richard White G6NFE describes building and testing the ASCEL Electronic AE20401 Frequency Counter and Power Meter.

I purchased the ASCEL Electronic AE20401 Frequency Counter/Power Meter as a kit directly from the manufacturer in Germany in June 2020. Due to an over-indulgence in electronics kit purchases in 2020/21, it remained in storage until 2023, when I rediscovered the kit parts while setting up my radio workshop at home.

I can't remember exactly where I first came across ASCEL Electronics, but I have checked and they are still manufacturing the kit as well as other test instruments in kit form. I will provide further details at the end.

Very briefly, using the manufacturer's own explanation, highlights of its capabilities are as follows:

- The AE20401 combines three different functions:
- A frequency counter measuring up to 5.8GHz with the optional channel B module; in addition it will measure up to 80MHz with the standard channel A capability
- A pulse counter, channel C
- And a power meter, with two choices; AE204015 covering DC to 500MHz at –55dBm to +30 dBm, then the AE204014 covering 10MHz to 8GHz at –55 dBm to –5 dBm.

Further details can be found at the ASCEL Electronic website:
www.ascel-electronic.de

Once you are on the manufacturer's website the AE20401 can be ordered with optional modules depending on your budget and requirements. I ordered the AE204011 1ppm TCXO over the standard 50ppm oscillator, the AE204015 Power Meter module (1Hz to 500MHz, max +30dBm) and the AE204017 5.8GHz channel 'B' frequency counter module. I also added a small AC power adapter and a USB cable for hooking the instrument up to a PC later.

It's worth reiterating that as standard the kit comes with a capability to count up to 80MHz.

My kit came with a small instruction booklet, but you can also download the very latest version from the manufacturer's website. This is probably a good idea as my booklet was rev 3.1 (2015) and the latest guide is rev 3.5 (2019).

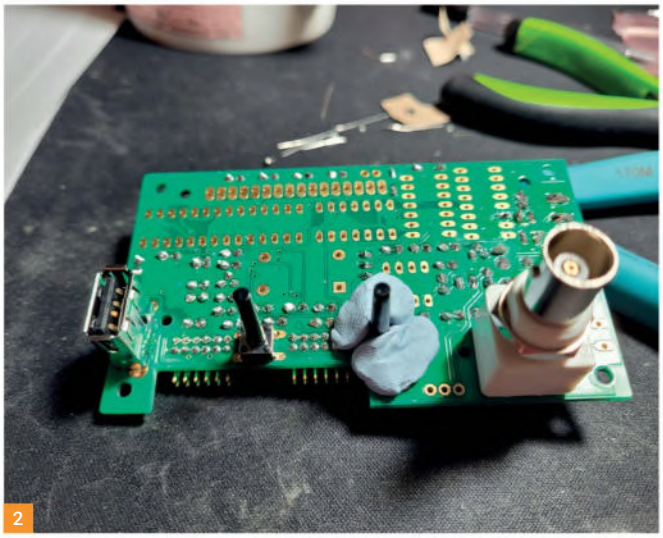
Building the Kit

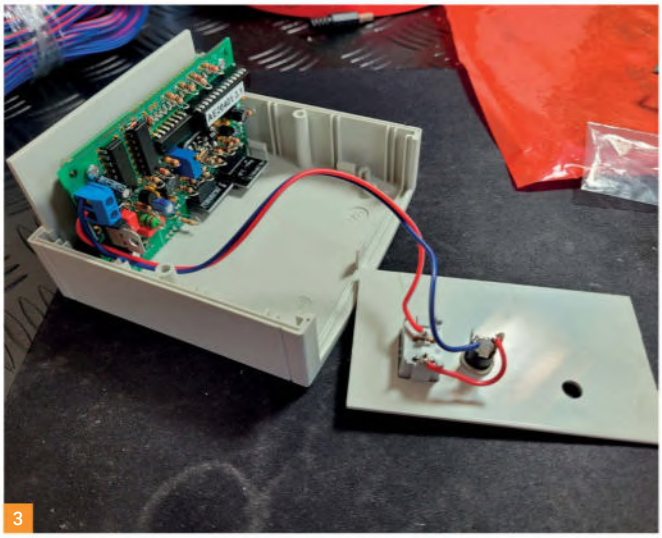
In my opinion the instructions are excellent. I would say they are written for people who are not experienced at electronic assembly. Examples are the sections on correct soldering techniques, component identification, safe handling of ESD sensitive components and correct fitting of certain parts. That said, I still found it invaluable at times to double check the component I was about to fit by viewing web-based videos and articles, and being 100% sure that the ceramic capacitor I was about to install really was 100nF! I also strongly recommend a magnifying glass or the use of your smartphone camera if you struggle to read the characters on smaller components. My eyes are not getting better with age and these techniques really helped!

One thing that did become apparent quite quickly was my woeful lack of soldering iron maintenance. After just a few resistors were soldered in place the solder started 'balling' on the tip of the iron and no amount of emery board cleaning would work. Changing the tip made no difference and a bit of research suggested powdered 'Tip Tinner' and the use of flux.

These saved the day and the combination of a properly tinned tip and very careful application (to the new joint) of flux from a syringe, made a night and day difference to my soldering. How I had got away without using these aids for so long, I don't know.

I started by fitting the non-ESD sensitive





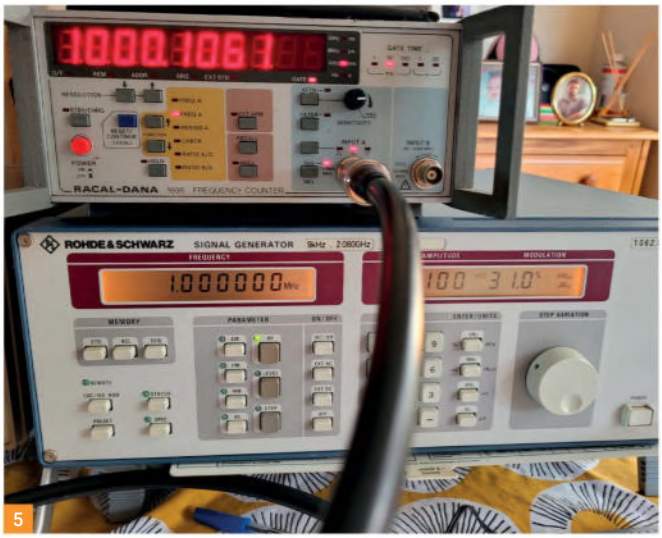


Fig. 1: Starting to populate the PCB.
Fig. 2: Reverse side of board with switches and connectors installed.
Fig. 3: The completed kit mounted in the case.
Fig. 4: The unit springs into life!
Fig. 5: Checking with a Racal frequency counter.
Fig. 6: Yes, the two readings are close.

devices first, keeping all the ESD sensitive semiconductors and ICs mounted on the conductive foam in the anti-static bag they came in. They would be mounted last.

Before I started work on assembly I also wanted to minimise the risk of damage to ESD sensitive components as much as possible. I could not stretch to an anti-static mat and wrist band, but I did have a soldering station that claimed to be 'ESD Safe'. A quick test showed just 2Ω between the outer knurled ring of the soldering iron connector (at the soldering station end) and the copper pipes of the central heating system. All things being equal then, these items were also earth bonded. I made sure I regularly earthed myself every few minutes and prayed this would minimise the risk of zapping sensitive components. I know this is not an acceptable alternative to a wrist strap and mat so, if you can, you should….

The photo, **Fig. 1**, shows the start of board stuffing, with Blu Tack holding an edge connector in place ready for soldering. This proved incredibly useful for preventing movement, but you do need to make sure none is left on the board, as heat from soldering makes it very sticky. I used a spray can of printed circuit board cleaner to remove flux and Blu Tack residue after all the components were fitted, and before sub-assemblies were plugged onto the main board.

The second photo, **Fig. 2**, shows the reverse side of the board with push switches being fitted and the BNC and USB connecter installed.

Assembly proved rapid, albeit I couldn't find two resistors. This is likely to be my fault for moving the kit between storage boxes. The problem was quickly solved by using some spares I had on hand. After building the main board the display was carefully fitted on top and secured with the supplied stand-offs. After this, the two sub assembles, AE204017 and AE204015 were plugged in.

Fig. 3 shows the completed assembly mounted in the case with the switch and DC power connector fitted. At the end of the install I was left with an unused RCA type socket and no place for it to be fitted. I can only guess this is an erroneous part meant for another kit.

Testing and Using

Finally, the moment of truth. Would it power up correctly? With some trepidation power was connected and it did indeed come to life, **Fig. 4**. The combination of a magnifying glass, improved soldering skills and a little more patience with kit building, had paid dividends. Not to mention keeping big volts away from sensitive components!

Being impatient I couldn't resist trying out my new build, even though I had not started final adjustments and calibration procedures yet. The signal generator was set to 1MHz and a comparison made to the readings on a Racal-Dana 1998 Frequency Counter. See **Figs. 5** and

6

7

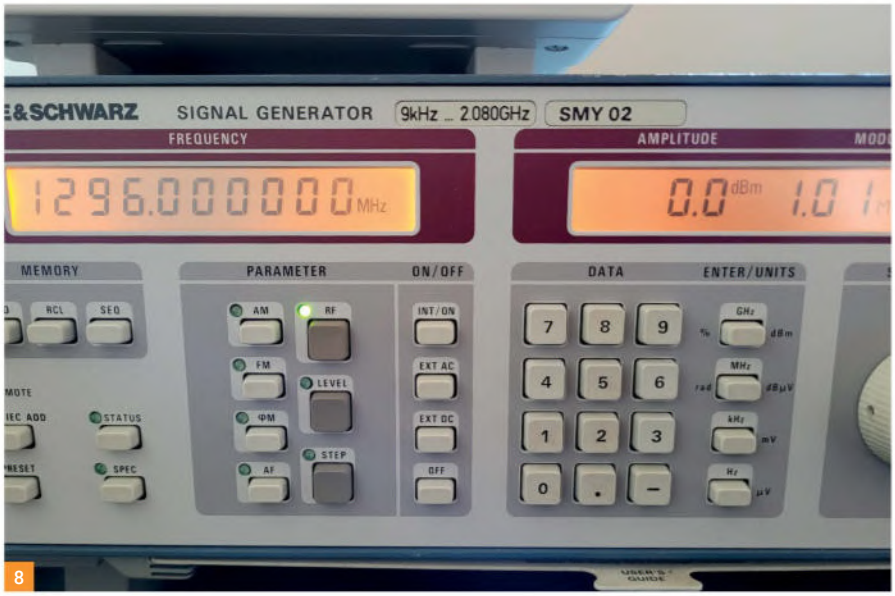
6. Preliminary results seemed acceptable at this stage.

The next stage was adjustment of the input amplifier. This required a signal source producing a sinewave between 10kHz and 1MHz, with an amplitude of approximately 100mV pk-pk. Two methods can be used. The first uses an oscilloscope (preferred method), the second method uses a Multimeter. See Fig. 3 again to get an idea of what's involved. In the centre of the board you can see P2, the blue 200Ω trimmer, with the gold adjustment screw on top. Just slightly below this and to the left is IC6.

I don't think my old Hameg scope was really up to the job, and although I could just about get the probe on to pin 3 of IC 6, the resultant displayed signal was noisy and not particularly useful. After trying for about five minutes I gave up and tried the second method with a Multimeter. This was much more successful and although it requires more than one pair of hands, it did the job and extremely careful adjustment of the trimmer gave a consistent 10mV as required. And with that the first stage of adjustment was completed.

Working through the instructions you will then come across the calibration stages. At first, I found these a little tricky, but once you get the correct combination of button pushes right, everything falls into place.

The first thing was timebase calibration and this was done by connecting a 10MHz signal to channel A (the BNC connector) and following the instructions. Next came the power meter calibration and this was easy to do; just connect the signal generator to the power meter SMA connector and, depending on the module you have chosen, follow the instructions. Frequency measurement is impressive and covered 1MHz all the way to 1,296MHz.



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There is one thing to be aware of when making power measurements. I somehow managed to skim past page 39 in the instructions that quite clearly explains that the logarithmic amplifiers have a 'slight frequency dependence'. This means a correction factor must be applied before you start measuring power. This simply means that before you start measuring RF power you must tell the instrument the frequency range you are working with. For example, if you are inputting a 145MHz signal, you must enter 200MHz into the power measurement module first, by using a combination of push buttons to select the menu item for 200MHz. Similarly, if you are measuring 433MHz (on the AE204015 Module I fitted), you need to select 500MHz in the menu. This may sound a bit of a faff but it's actually quick and easy to do.

From personal experience failure to do this will lead to a lost day when you can't understand the odd power meter readings you are seeing! Once the correction factors are entered the power measurements are very accurate.

Conclusion

For the money the ASCEL Electronic AE20401 must represent excellent value. It is very well documented, the kit parts are of a high standard and it was real fun to build and test it. It can sometimes get a bit 'laggy' and a little slow to respond to button presses, but you have to remember this is not an £8k instrument. I am impressed enough that I now want to purchase the ASCEL LCR meter kit too.

Price of the basic Frequency Counter/Power Meter kit as of 29 Jan 2023, is 61.98 Euros for the basic device, without the optional modules and parts I used in my build. **PW**

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1

Roaming with a 'Gypsy'

Richard Constantine G3UGF reviews a handy portable antenna, suitable for holiday or similar operations.

Richard Constantine G3UGF
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Family holidays, or simply out for the day operating /P, whatever you're up to radio gear always needs an effective antenna. When travelling, antennas may have to pack into a small space among many other mundane items of much less important personal or family luggage. Perhaps there are size limitations on what you can stash or, for a dozen other reasons, weight is at a premium.

Having previously arrived at locations where the brochure photograph hasn't quite lived up to the holiday reality, I soon learned that you need to pack more than one antenna solution. I've discovered, for example, overhead power lines air brushed out of photographs more than once. At one location I intended to strap a vertical mast to a fence post. Arriving at the cottage I found the convenient fence newly replaced by a dry-stone wall. The adjoining empty field and convenient tree on the far side looked ideal for a long wire but was definitely out of bounds. Reeling out the wire I discovered a concrete plinth in the middle of the field…The owner's helipad! Potential disaster and lawsuit averted in the nick of time!

I've long accepted the limitations of a compromised set up and always relish the challenge. What if you could carry a reasonably lightweight, yet full sized multiband antenna that fits into a small space? This would surely be an advantage, another string to the bow. I believe this is what the Gypsy multiband dipole is aiming to provide.

It doesn't arrive with a means of suspending it in the air but paracord is light, inexpensive and readily available. Neither does it come with coaxial cable, which presumably you will already have for your other /P solutions. As I said earlier, I never bank on just one antenna when visiting a location for the first time.

For compact portable operation, what about using mil-spec RG174 mini coax? Provided the length is relatively short, say around 10-12m, likely losses are less than an S point and it will still handle more than 100 watts at 50MHz. It packs into a small space, is lightweight and much less likely to pull the centre feed point of a dipole down when it's suspended end to end, even with an SMA to PL259 adapter.

What's in the Little Green Bag?

Firstly, I quite like the well-sealed, 1:1 stick balun that's rated at 100W PEP. It has a relatively flat frequency response between, 3.5 to 55.0MHz. It has the usual SO239 socket at one end and two captive screw terminals at the other. It weighs around 140 grams and it's a handy thing to have in the /P antenna armoury. (I want one.)

Each of the Gypsy's multiband dipole legs is wound on precision machined, black finish, alloy winders. The winders have the frequency bands, including the WARC bands, etched along the lower edge, just in case you forget. Oh yes… I did forget on one occasion until I spotted the uneven dipole legs up in the air. I had simply mis-counted the bright metal tubular markers, crimped on to the wires at the relevant quarter wavelength points.

The wire itself is quoted as, '18swg Teflon coated, tin-plated copper wire'. Each leg is terminated by a stainless hook that's soldered

Photo 1: The complete kit on arrival.
Photo 2: Wires attached to balun.
Photo 3: Balun close up with RG174.
Photo 4: 20m Dipole on mast.
Photo 5: 20m Dipole in the winter sunset.

to the wire and neatly covered by heat shrink.

18swg is perhaps something of a compromise. For a fixed station antenna, you wouldn't naturally choose to use this type and gauge of wire as most of the effective radiation takes place from the surface area of the radiator. That's why I was taught many years ago that the combined surface areas of multi-stranded wire are best. It also means that if a strand breaks, the whole system doesn't collapse. In this instance, though, a single, very tough wire keeps the weight down and can be reeled in and out many times over with relative impunity.

Here a word of caution, this strong wire kinks quite easily. Wrap the wire around the winder with your hand, at your peril. To protect the investment, you will always need to turn the winder over and over, when unrolling. It will pay to go back and run your hand along the wire to check for any kinks before raising and tensioning.

Total antenna package in the palm of the hand is around 590 grams. That's not bad for a multiband antenna, of around half a kilo and usable from 5 to 50MHz. It comes with a small leaflet thankfully in English, plus a short, 30cm length of paracord with one of those spring-loaded toggles that you find on coat hoods and draw string bags.

The literature says that its purpose is for hanging up the dipole centre or fixing it to a mast but provides no guidance. I must have missed the point as my experience was that you needed three hands for it to be of much use. I found PVC tape a quick and much more effective tool.

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In the Field

The most obvious and immediate choice for this antenna is to use a telescopic mast with the wire in either horizontal or inverted-V configuration. Simple and easy you might think but not quite plain sailing. Many operators already have a 10m fishing pole to hand and it does look to be the obvious choice. Easy up and easy down when changing bands.

That's why I had to try it. Taping the balun two sections down from the thin top sections it looked fine. However, adding the wires placed an unacceptable load on the mast. Not wishing to complicate matters further or break a perfectly good fishing pole, the test mast was substituted for a commercial grade telescopic, for the lower bands. This proved more workable at 7.5m, not the ideal height. The lower the frequency band, the longer the antenna wire and with it the greater drag on the mast.

It was not so easy to keep the centre mast purely vertical, without additional support. Using my 4m metal tripod mast at the centre, it wasn't a problem. The higher frequency bands and shorter lengths worked reasonably well and I could raise the unsupported telescopic a little more.

I indicated at the outset that /P operators have to be flexible in their choice of antenna according to what's available on site. I would also add, 'think outside the box'. This somewhat hackneyed business speak is something of an anachronism, that dictionaries describe as, *"a chronological inconsistency in some arrangement"*.

Here's a resumé of my 'inconsistencies' … I found using the conventional inverted-V acceptable on 14MHz and higher but the combined weights of the coiled wires and metal winder on 7MHz just too problematic without a substantial centre support, which kind of missed the point.

Using only a telescopic mast on lower bands, I ran one leg of the dipole up the full height of the mast and away at 60°+, avoiding a sharp wire bend with the aid of the toggle chord secured with a little PVC tape. This placed the balun nearer to the base, reducing the physical loading. The other leg became a suspended counterpoise to a fence post, making the system more of a lazy-Z than an inverted-L.

Additionally, I experimented with the balun again at the base and running both wires up the mast on 40m and out to each side. It made me think that a likely better bet would be to run some low impedance twin feeder up the mast, plus a homebrew centre spreader with terminals. This would then replicate more of a doublet type feed system, keep the balun at or near the base and use my trusty RG58 coax at ground level, back to the radio.

5

Conventional Dipole

A better solution is to have two end supports. Even one tree and configuration as a sloper would easily work with perhaps less effort. Two supports would obviously be nice, provided you can get the height on lower bands. With this antenna and similar designs there are two main issues:

Firstly, it needs to be raised and lowered to change bands, not forgetting that plenty of extra paracord is needed.

Secondly, some fine tuning of lengths is required for best resonance. Here, the makers have to some extent compensated for the lump constant (unused wire and winder) at the end of each wire when placing the band markers.

Of course, the easy way to an acceptable match is to use a radio with a tuner unit. I found the marked wire lengths usually resulted in a basic VSWR of 2.5:1 or better. An auto-matching tuner, internal or external, finished the job easily with little loss while protecting the power amplifier at the same time.

How does it Perform?

Well in my case after all the pleasure of rigging up the system and making use of what was around me, a couple of QSO's and I was happy… as usual.

The Gypsy performed as you might expect of any dipole given the same circumstances. Contacts with 5 watts from a QRP radio were OK. Running 100 watts from an amplifier just added a few more dBs to signal reports on 20m and higher, from a nice low-noise /P location.

Thanks to a brief window of good weather in February and some head scratching, playing out with a 'Gypsy', working the USA on the key in the winter sunset was more than a little rewarding.

Pros and Cons

It's a compact, quick option for portable use, providing choice that I often refer to as 'play value'. The balun is well made and in general the system appears robust. The metal winders are well made and should last a lifetime if a little heavier than perhaps they need to be. When attached to the balun, the hook style, wire connectors stayed in place well, even in breezy conditions at 400m ASL, confounding my initial misgivings that they would work loose.

I'm surprised and a little concerned that when attached to the balun, there's only around 2-3mm of separation between the two halves of the antenna. See **Photo 2**. A simple and likely remedy would to file a flat edge to each hook on the opposite side to the wire connection, thereby increasing the gap. Perhaps it doesn't rain in China (Hancock!) but, don't forget a plastic bag to cover the balun for when the fickle British weather takes a turn for the worse.

Overall, I would rate it at four stars and reasonable value for a 'grab-and-go' asset for your next weekend activity.

My thanks to ML&S for the kind loan of this antenna. Cost at time of press is £71.95. **PW**

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1

The Deepelec Deep SDR 101

Georg Wiessala has had the new Deepelec Deep SDR 101 Software Defined Radio in his shack and has put this surprising little device through its paces on a range of frequency bands and signals.

Georg Wiessala
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Most of you will probably be familiar with the *Deepelec* brand, probably on account of the nanoVNA antenna analysers used by many amateur radio operators, hobbyists, makers and experimenters. The firm behind it is the Chinese manufacturer *Hangzhou Minghong Electronic Technology, Ltd*.

https://deepelec.com/en

I had read about the nanoVNA, and I am interested in smaller SDR receivers, hybrids and general radio innovations, Some time ago, I reviewed the ATS20 and ATS-25 SI4732-chip receivers for *RadioUser* (December 2021; February 2022) and found them very versatile indeed. In terms of those SI4732 receivers, the newer, slim-line, ATS100 mini-SDR appears to be the most comparable radio to the DeepSDR 101, which is under review here.

Therefore, I was curious and took note when I heard that *Deepelec* is also now manufacturing a newer version of a Software-Defined Radio in a small form factor similar to the nanoVNA or the new ATS radios. This is the *DeepElec Deep SDR 101*, **Fig. 1**.

Its first incarnation – as far as I can ascertain – appeared in 2022. You can check out the general manual and quick-Start Guide (*Version FW 1.0.0.*) here:

https://tinyurl.com/3sv75w6p
https://tinyurl.com/3j58ddyz

For the technically-minded experts among you, the manual claims (on page 3) that this little machine's architecture is based on the ultra-low-noise, high-performance, Zero-IF Quadrature Product Detector and Preamplifier by **Dan Tayloe**. The I/Q signal produced after mixing is then channelled to the CODEC and collected by the MCU (Microcontroller Unit); the DSP algorithm in the MCU subsequently completes the demodulation and display of the signal, **Fig. 2**.

https://tinyurl.com/49zwb878

Basic Technical Details

Against this background, the latest version of the *DeepSDR 101* is described, in more general terms, as a *"DSP digital demodulation radio based on SDR technology"*. According to the manual/website, it offers the following basic technical specifications:

- Coverage: 100kHz to 149MHz; Frequency steps: 1, 10, 100Hz; 1, 10, 100kHz; 1 and 10MHz.
- Modes: CW, AM, SSB (LSB & USB), and FM (stereo on earphones), but not N-FM.
- Memory channels: 99, with name, frequency and mode.
- 4.3in, 800x400-resolution, high-brightness IPS (In-Plane Switching) LCD (Liquid Crystal Display); touchscreen (192, 128, or 64kHz FFT [Fast-Fourier Transform] real-time spectrum display.
- Reference crystal: TCXO (Temperature Compensated Crystal Oscillator): 26MHz (±0.5ppm).
- Waterfall and spectrogram functions.
- Aluminium-alloy CNC case; BNC (M) antenna socket.
- Speaker: 3W max, 4Ω; Charging port: USB C, 5.0V/2A; current consumption: ca. 250mA @ 5V.
- Battery capacity: 5,000mAh/3.7V, 18.5Wh (indicated use-time is 10-12 hours, depending on volume and screen brightness adjustments).

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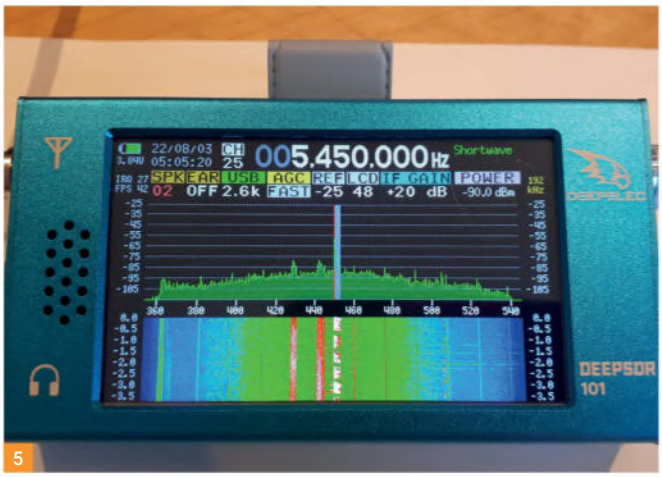

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Fig.1: Out of the box: the *DeepElec Deep SDR 101*. Fig. 2: Block diagram for the *DeepElec Deep SDR 101*. Fig. 3: Tap away here: the frequency direct-input screen. Fig. 4: Enhance the sound by connecting an active speaker. Fig. 5: RAF VOLMET on 5,450kHz coming in on the telescopic.

• Size: 136 x 74 x 22mm (L x W x H) without protrusions (selection/volume dial); weight: ca. 310g.

The manual is quite understandable, with but little 'Chinglish' and encourages buyers to, *"immediately take it to the outdoors, enjoy the natural scenery, and fun of listening anytime, anywhere!"*

Though my natural scenery here in the Ribble Valley is amazing, I must admit that I did not storm out straight away because of the dynamic Lancashire weather. In any case, I wanted to subject this little device to some serious indoor testing first.

Out of the Box and Encoder Options

The item arrived from seller *welwynparts* without delay and special delivery was included in the price. The *DeepSDR* comes with a sturdy little carry case, a quick-start guide, a screen stylus, screen protector film, screen wipes, a foldable stand, a telescopic antenna (700mm, terminated in a male BNC connector), and a USB link cable (USB-A to USB-C type), Fig. 1. There were no earphones. The metal rotary encoder (tuning knob) on the side of the radio is much sturdier than many of those I have seen on many of the SI4732 radios.

By combining the 'pressing' and 'turning' actions, the dial gives you access to these various functionalities:

• Tuning (100kHz – 149MHz) in minimum 1kHz steps; 99 Memory Channels.
• Volume adjustment for both the small speaker and earphones (0-35dB, in 1dB steps).
• Modulation: CW, LSB, USB, AM, WFM, STE (Stereo), and I/Q.
• AGC Setting: off, slow, medium, and fast.
• IF Gain: –12 ~ 67dB, in 1dB steps.
• Spectrum Style: Green Fill/ Green Line/ Blue Fill/ White Line.
• Waterfall Area Settings: 'Waterfall' or 'Waveform' (with x1/ x8/ x64 Amplitude).
• Spectrum Bandwidth: RF (192, 128 and 64kHz) and Audio Spectrum.
• Reference Level (REF): –99 ~ 99dB, in 1dB steps.
• Screen Brightness (LCD): 1-99%.

(Source: *DeepSDR 101 Manual and Quick Start Guide*, V. 1.1.; see URLs above).

After switch-on, you will see (very briefly; blink and you miss it) a home screen with all the technical details, software version and development information. Alternatively, you can access this function by dragging the stylus from the middle of the lower half of the screen to the top of the screen (you may have to try this more than once – tap to exit again). Doing the same (bottom-to-top drag) on the left of the screen brings up the touchpad test panel, on which you can draw to test the screen sensitivity. See **Ermnano**/YouTube: **www.youtube.com/watch?v=J3dgDOlgxoc**

When the radio is on, you can select any setting (above) by depressing the tuning knob and turning it while keeping it depressed. Helpfully, the individual setting you are changing – for example the frequency digit or the dB scales framing the screen – appears in red. Then, let go of the dial if you wish to change that particular setting, and rotating the knob will change it. You will soon get used to this.

The manual makes it all clear and is generally self-explanatory – albeit just about. It is mighty

confused, and confusing, in terms of exact band delineations, for example. The block diagram is in the manual and also reproduced on the reverse of the receiver's casing, **Fig. 2**.

I'd recommend that you do not use the little foldable stand that comes with the radio (at least that is what I think it is). I hope the manufacturers fix a small retractable stand to the back soon. In the meantime, you can use a mobile phone holder or similar device instead (as in my photographs) or 3D-print your own.

Enjoying Music on FM

The DeepSDR 101 offers FM coverage, from 87 to 108MHz. It actually tunes right down, seamlessly, from 87 to 31MHz (oddly, 'VHF Band' shows in the display) before it 'flips over' to 'Shortwave' 30,000kHz. Curiously I found an FM radio station mirror on 31MHz.

Tuning is by the (just) large-enough multi-function dial and directly from the frequency-input screen, **Fig. 3**. Use the included stylus to (lightly) tap in the values you want. The screen is pleasantly sensitive.

The sound from the small loudspeaker was more than adequate. Classical music, for example, is sufficiently enjoyable with this on your desk or during your travels; indoors only, mind you. I found that the inbuilt speaker is still on, at a low, 'background music' level when the SPK value on the screen is set down to '00'. Only the 'OFF' setting will switch it off; there is no 'mute' function.

I would suggest that you may enhance both the volume control and sound by connecting the Deep SDR to an external speaker; this is almost always a good idea with devices of this size. I linked up to both a Sony active speaker (model SRS-XB12, 5V, 0.5A, **Fig. 4**) and my (passive) all-around speaker from bhi. If you have a DSP speaker or any other noise-suppression device, you might further improve the sound quality on HF.

Sound and Display

With a speaker linked up, the sound was certainly enough to fill a room, and you can make use of the full range of volume control on the receiver; the maximum is 35. It's not a PA system but it is more than enough.

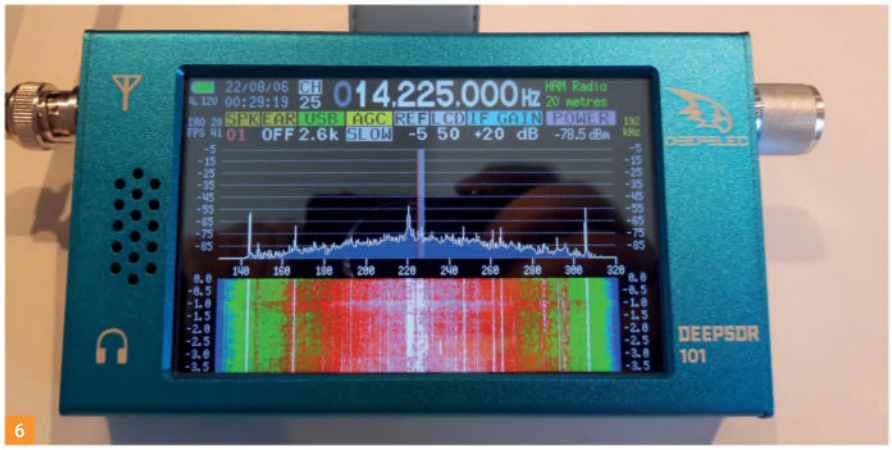
If you keep your external speaker on your right and the Deep SDR – with its internal speaker switched on – at your left (or vice versa) you can, with the right volume settings, achieve a nice little stereo effect. This worked for me at 'SPK10' and 'EAR20' but everyone's hearing is different, naturally.

The 'real' stereo is on the earphones, and it is very pleasant for both speech and music. The '00' setting on 'EAR' was enough for me for comfortable background listening.

In the top half of the display, and in common with other frequency bands, you have a choice of viewing the waveform with or without a 'fill-in' background; the lower part of the display is either a waterfall or three different waveform settings. It is mesmerising just watching this, I find.

For night-time listening, you can dim the screen to a comfortable level. The minimum level (1) makes the screen all but disappear, I found a setting around 50-60 suited me best during daylight hours.

For all but the most dedicated FM DXers, the telescopic antenna will be more than sufficient, but you may always wish to experiment, it can be useful to see even small changes showing on the display.



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HF Broadcast, Voice and Data

I was quite impressed by how well this unit did on Short Wave broadcast transmissions from a range of international HF transmitters, even during the daytime, and, even more so, at dusk and during the night.

The adjustable parameters, such as 'IFGAIN' and 'AGC', allow you to capture many of the main programmes from China Radio International, Radio Romania International, the Voice of Turkey and some others.

I was happy to see some of the religious broadcasters from the US coming in on my side of the Atlantic too (e.g. on 15770kHz). I did not expect that and cannot remember other devices, such as the ATR25, Malahit or Belka delivering this at this level.

Turning to HF Voice, my lynchpin is, as before, the meteorological aviation forecast from RAF VOLMET, on 5,450kHz. Again, to my astonishment, this came in strongly, and with just the telescopic antenna, **Fig. 5**.

I can see this becoming a dedicated monitor

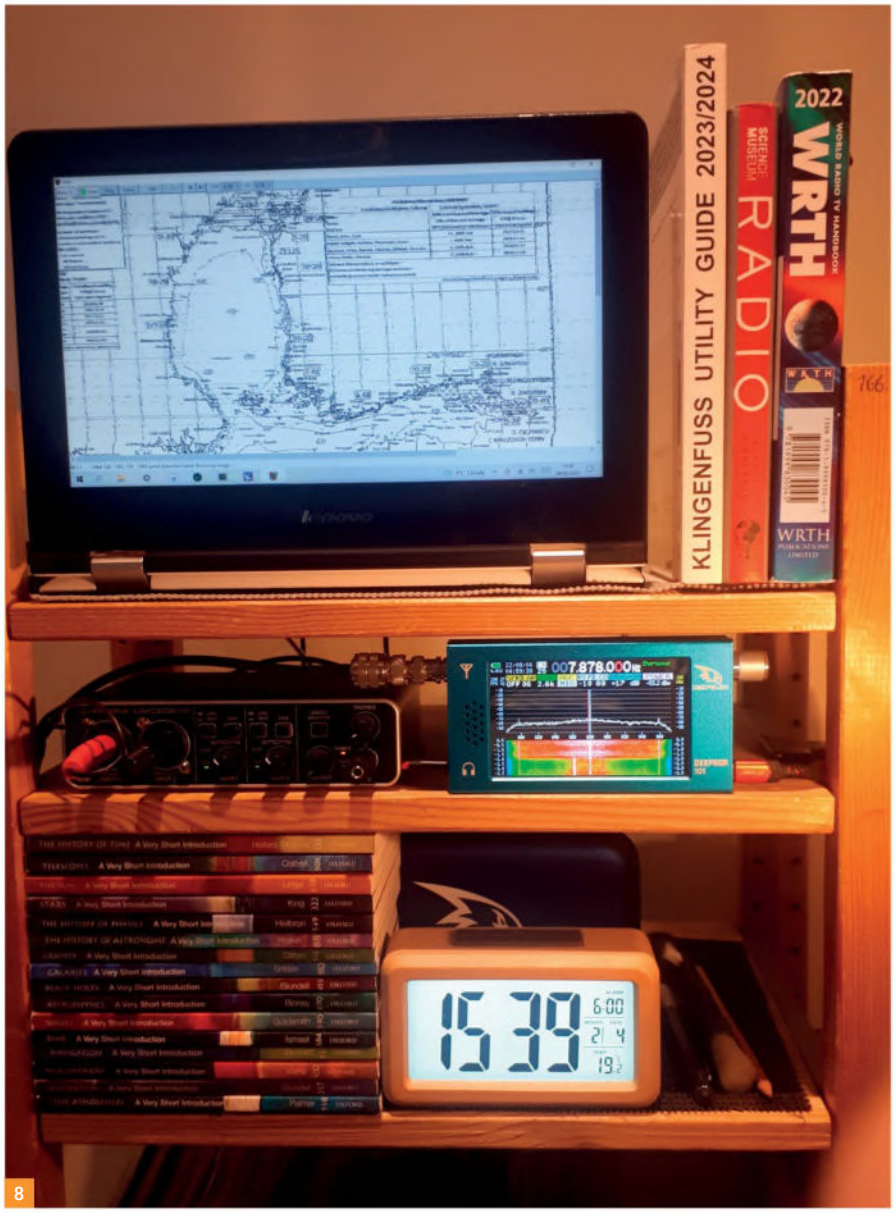

Fig. 6: Amateur radio operators in the 20m band came in loud and clear. Fig. 7: Radio-Teletype reception from the German Weather Service (DWD) a laptop and *Zorns Lemma 11.42*. Fig. 8: A Weather Fax image received with the Deep SDR 101, software and my laptop.

for a few chosen frequencies, or to assess band propagation conditions. The waveform/waterfall displays are very helpful with this, and they just look good too!

I was lucky enough to receive a few amateur radio voice transmissions on, for example, the 20m band, **Fig. 6**.

It is useful to be able to fine-tune with the DeepSDR, but this device does not replace a transceiver. Maybe as a background monitor, while you are waiting for someone or an HF net to come on air?

I then connected the *DeepSDR* to my Wellbrook ALA 1530 external magnetic loop antenna, which it was not fazed by, except on lower frequencies. I went for the (for me here) slightly more challenging targets. Radio Teletype (RTTY) first, from the *Deutscher Wetterdienst* (German Weather Service) in Hamburg. I selected the daytime frequency of 10,100.8kHz (or thereabouts) and had no trouble at all receiving a strong signal.

The marker of quality for any receiver here is whether the receiver can resolve the signal to such a degree that – with the right software – you can see the images of the ships, buoys and stations from which the data originate.

The *DeepSDR* passed that test without issues, **Fig. 7**. I used my go-to weather program here (*Zorns Lemma 11.42*), which offers this functionality. However, the radio also ran very well, indeed, with some other dedicated software, such as one of my favourites: *SeaTTY*.

Was I just having a good day here, with great conditions, or was this radio really quite good?

I now wanted to drive this a little further and tuned to (ca.) 7,880kHz to see whether I could catch a Weather Facsimile (WXFAX). Here, I had to play with the settings on the *DeepSDR* for quite a while but then – hey pronto – one of the most difficult-to-receive (in my experience) images came straight in: the *Finnish Ice Chart*.

Legendary among radio-weather enthusiasts here: you cannot, in my experience, get a more detailed fax image (in Europe). I was very happy with this result, **Fig. 8**. You can adjust the tuning of the DeepSDR right down to the 1Hz level, which makes it interesting and fun to try and fine-tune and be accurate.

I think I will add this little device to my home weather centre, together with my portable NAVTEX receiver (Mörer WIB2D) and weather station. It will come on my travels with me too from now on, for some quick FM and Airband scans.

Long & Medium Wave & Airband

In the lower frequency areas, the included telescopic antenna, and the DeepSDR in general, in my view, come near the end of their useability. Therefore, I'd strongly recommend that, for LW and MW, for example, you attach a different external antenna to the DeepSDR.

I used the *Reuter Active Magnetic RLA3 Indoor Cross-Dipole* and received daytime LW and MW with acceptable-to-good results, for example on the (soon-to-be-closed) 198kHz frequency here (BBC LW, **Fig. 9**).

Finally, it is worth mentioning that, with coverage from 100kHz, this radio also covers 137kHz, and some may even receive stations in the VLF band with the right, more specialist, antennas.

In terms of Airband, the *DeepSDR* does offer the civil section coverage (118-137MHz, not Military Airband), including Satellite Frequencies in the (European) 136-138MHz section. However, you would not buy this as an airband receiver, and it does not offer a scanning facility or a squelch, but it works very well, once again, as a monitor for specific frequencies and areas of interest.

The volume on the speaker can be acceptably reduced so that any background hiss is barely noticeable.

In Conclusion

In my opinion, this is a very interesting, quite stylish and versatile independent SDR receiver, which works adequately well for the average and even the more demanding hobbyist.

The *Deepelec Deep SDR 101* generally offers good results on Short Wave (e.g. daytime Saudi Radio International on ca. 21670; **Fig. 10**). Moreover, with a few carefully chosen

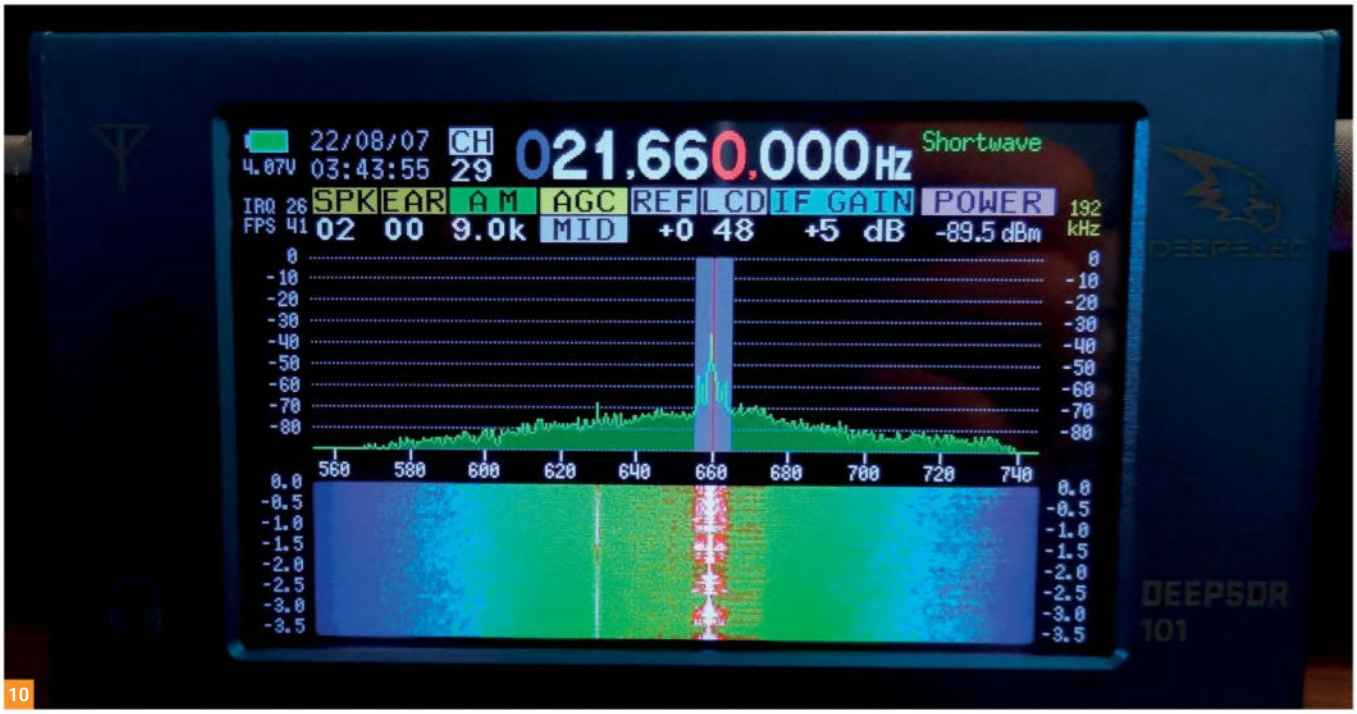

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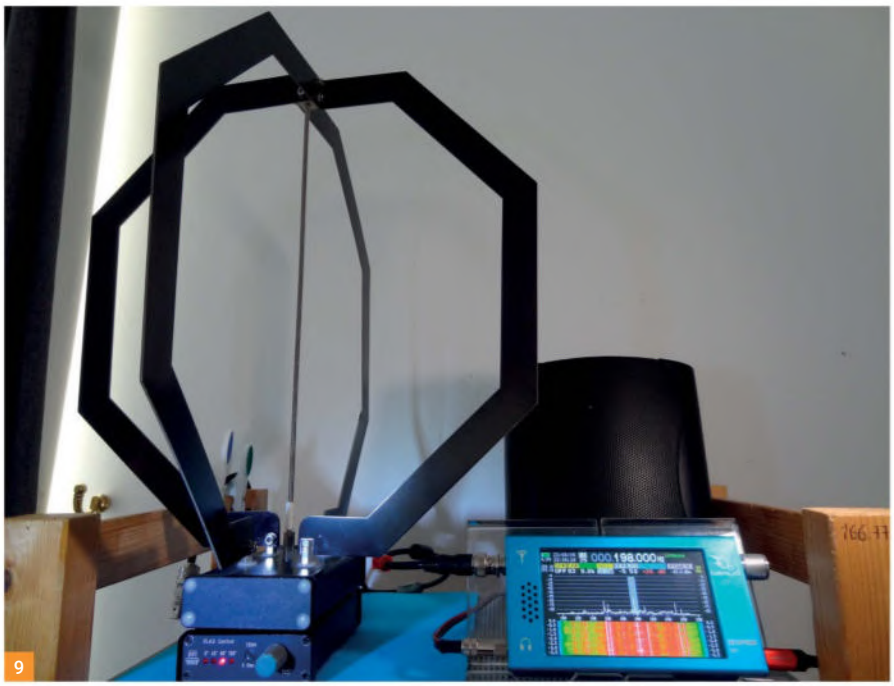
Fig. 9: For how long? BBC Long Wave (LW) service on 198kHz. Fig. 10: Short Wave reception is acceptable; this is Riyadh, during daylight hours here.



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accessories, such as antennas – can be expanded to deliver more on Medium Wave as well.

However, LW reception and below were not overly impressive in the test model, and some reviewers have noted that there are some issues with artefacts and overload in general. Others commented that the BNC connection can come loose after some antenna switching. This did happen to me too. However, it is a matter of a few minutes to just open the case on that side and tighten the large internal nut.

The FM and VHF airband is a nice addition, and the little receiver sounds good, even without an external speaker. This is not a 'DX-machine', clearly, but it will find a home in many radio shacks where operators may wish to monitor single frequencies or band conditions. Use a dedicated Airband antenna if you can.

I liked the tunability down to 1Hz and the – relatively speaking – large and responsive screen, as well as the ease of use and parameters offered. Good to have a solid metal case too. Use the stylus, not your fingernail.

I would have liked to see a scanning function and a squelch added; maybe there is a further development journey here. Plus, in common with other testers, I feel that more could have been made of the relatively large touchscreen. Perhaps future software updates could enable the device to be drag-tuned with the stylus, and full touchscreen control might be added to all functions and areas of this SDR.

However, these are relatively minor niggles at this price, and the compromise between hands-on operation with the dial and touchscreen functionality is more than sound for the average user.

Maybe this small radio may also pave the way for you into the fascinating, wider world of larger, and higher-performing, stand-alone and PC-linked SDRs.

After my tests, I was left quite surprised at what is now technically possible, compared to just, say, ten years ago. The *Deepelec DeepSDR*, in my opinion, compares favourably to the batch of recent SI4732 receivers (see above) or the Malahit, but not, perhaps, the Belka.

I had much fun testing it out, it invites experimentation and handling and offers just enough settings and information on its lovely screen.

I purchased the *Deepelec DeepSDR* for £119 on eBay, and you can find it at some online retailers, such as Ali-Express. The manual has a QR code taking you there.

https://tinyurl.com/56nfzjp9

(All photos are by the author) **PW**

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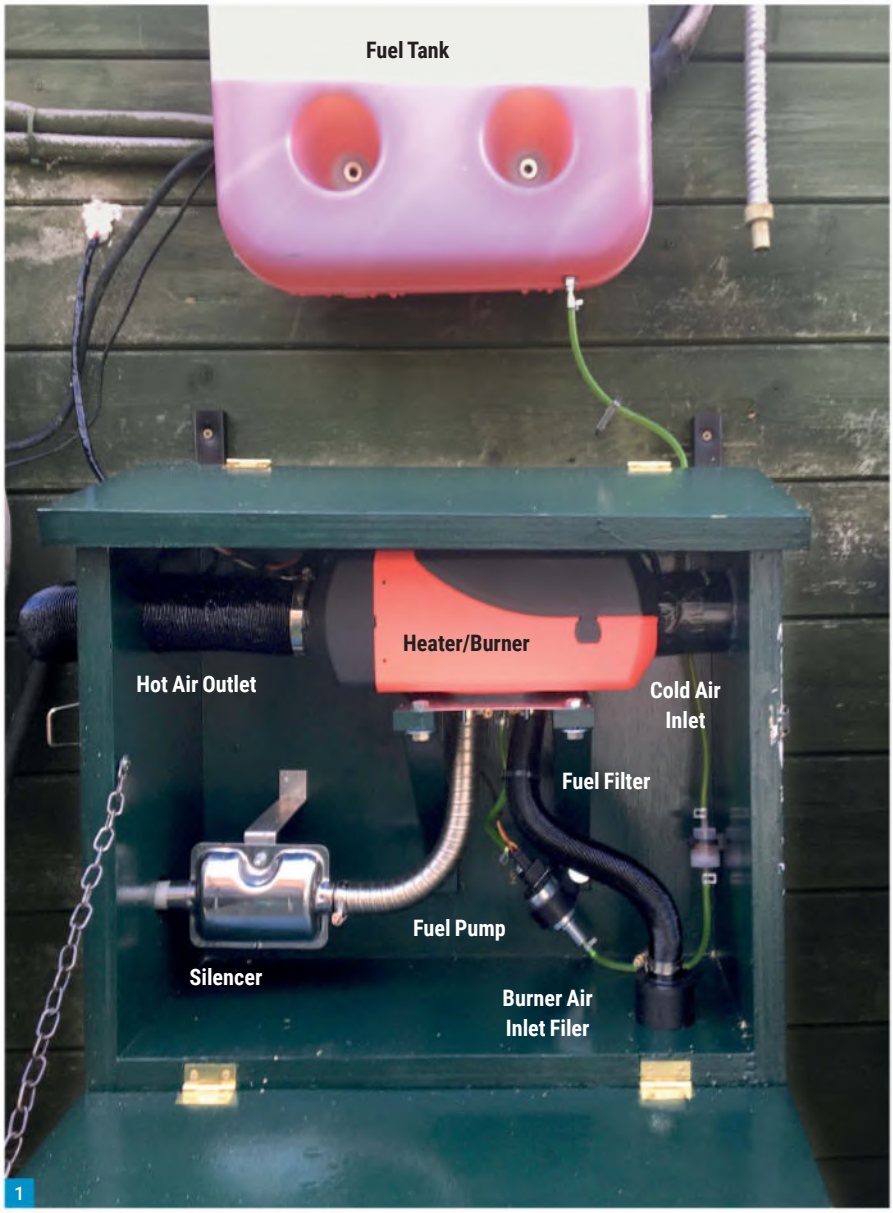

Economical Alternative Heating for the Shack

Mark Tuttle G0TMT decides on a diesel heater to keep the shack warm.

This article might seem a little off topic for a radio enthusiast magazine but I suspect many readers might be in a similar position to me in that their shack is fundamentally a shed in the back garden. My shack roughly measures 12ft by 9ft and although I've insulated the roof and walls with fibre wool and plasterboard it still gets very cold in winter (and ridiculously hot in summer). Until now I've been using a 2kW fan heater to warm it up quickly then switching to a convection heater on low power to keep it at a comfortable temperature. With electricity prices now at an all-time high it looked as though I might either be spending less time in the shack or wearing a coat and fingerless gloves to do my homebrew; neither of which are particularly appealing.

A Diesel Heater?

As you do, I was falling down the rabbit hole that is YouTube when I stumbled on a video review about a Chinese diesel heater being used to heat a workshop. These are designed for use in trucks, camper vans, caravans and the like. They are sold as a complete kit comprising the heater/burner unit, air intake pipe and filter, exhaust pipe and silencer, fuel tank, line and pump and even the flexible ducting to pipe the heat where you want it. In fact, everything you need to fit one of these to your 18 wheeler and the like. I was intrigued.

Let's do the Numbers

At the time of writing a litre of diesel is about £1.90 or so and a kW-hour of electricity on my tariff is £0.35. The diesel heater I was looking at was the 2kW version as I know that's more than enough heat for my modest shack. They also make 5kW and 8kW versions.

The literature claims the diesel usage at full power (I assumed that would be equivalent heat output to my 2kW fan heater) is quoted at 280ml (0.28L) per hour and 100ml/hr at the lowest setting. So that's 53p/hr on high and 19p/hr on low. The fan heater would cost me 2kW-hr x 35p = 70p per hour at full output. That's quite a saving but what about initial outlay though? Well, the cheap copies of these heaters can be bought for around £90 and I figured if I was frugal and used wood offcuts I already had for a cabinet, I could keep additional costs below £20, so for argument's sake let's say outlay would be around £110.

Now, they do take a little electricity as well but it's very low once they're running (about an amp at 12V but around 8A for a two-minute start-up). So, let's overestimate that at about 1p an hour to make the figures easy. That means I'd be saving around 16p an hour and with the outlay at around £110 it should pay for itself in around 687 hours. What's that? One winter in the shack? I really have no idea but I do spend quite a lot of time in here, according to the XYL anyway. Obviously, it won't be running at full heat all the time any more than the fan heater would. Whatever, it's cheaper to run than the fan heater. Let's not overlook the project tinkering satisfaction either. I'll call it an experiment. I bought one.

How do they Work? Yes, I had to Find Out

There is a ton of stuff online about these heaters, particularly on YouTube, so I'll just stick to the basics. In essence it's a small cylindrical combustion chamber surrounded by a very substantial heatsink. Inside the chamber is a tiny glow plug and a mesh injector/atomiser. A small electrical fuel pump squirts fuel into

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Fig. 1: The author's setup.
Fig. 2: Front panel of the control box.
Fig. 3: Internal view of the control box.

the injector, which vaporises it, and when the heater is starting up the glow plug ignites it. Air is supplied into the chamber via a tube and filter and another tube acts as the exhaust, which is fitted with a dinky little silencer. There are no valves. Once the burner has been running a minute or two a sensor detects it has ignited and the glow plug is turned off.

The high internal temperature of the cylinder then keeps the fuel igniting on each squirt from the pump. The heater has quite a few sensors that feed to a processor board and a control box. The wiring harness is all supplied, of course. While this is all going on a fan blows fresh air over the heatsink and on to the outlet providing the hot air that you then duct into the shack. So, as long as you don't put the fresh air inlet anywhere near the exhaust there's no danger of any carbon monoxide getting into the shack. If you're feeling clever, you can actually duct the heating air input from the shack too so that you circulate it.

In theory this should reduce running costs even further. I might do that later.

The Electrical Supply

Remember, these were designed for truck cabs etc, so they need a 12V supply (there's also a 24V version) with quite a bit of initial current capability for the glow plugs at start up. The recommendation is for 10A so I bought a 12A LED lamp switch mode power supply from eBay for around £13. I was a little concerned it might be RF noisy but it's not.

Right, a word of warning here. I've read that if these heaters lose power when they are up and running, the residual heat in the burner, with no fan running, actually melts the sensors and control PCB so the whole thing destroys itself. We do get the occasional power cut here and I was thinking, 'knowing my luck'. So, I fitted a small 7Ah sealed lead acid battery that I wasn't really using and fed it via a couple of paralleled 6A diodes from the power supply. The heater supply then comes from the battery so that should we have a power cut the battery will keep it going long enough for me to shut it down safely. It's probably overkill but it feels a little safer.

Incidentally, the output of these power supplies is easily adjusted to give about 13.4V to trickle charge the battery and the heaters are happy with quite a wide range of voltage inputs too.

My Solution

I've enclosed a picture of my setup, **Fig. 1**. I'm no chippy but I can knock up a wooden box with

a hinged front. A couple of coats of green paint left over from painting the shack door made it waterproof. Note the fuel pump is mounted at around 45°. According to the manual this is very important. The pump uses the diesel to lubricate itself and if you get an air bubble trapped inside it, the pump will wear out. My power supply and battery are mounted in a plastic enclosure, **Figs. 2** and **3**, which I'd actually bought for another project. That's obviously now on hold. This box is mounted on the inside shack wall with the cables routed through a hole in the wall to the heater.

Why did I use a key switch? Because I had it. Well, that and because it can handle 10A at 12V plus I was thinking it won't get knocked and turned off accidentally. I also fitted two indicators. One to show there's mains and another to show the power supply is working so I know it isn't running just on the battery. Incidentally, the heaters come with a little remote control too so I can actually switch it on in the morning from the house. That's handy. I've yet to find out if that's bothered by my radio transmissions though. Fingers crossed.

Conclusions

There are many different types of controllers supplied with these heaters. The translated Chinese instructions that came with my heater leave a lot to be desired.

For instance, it took me some time to figure out that the left arrow means 'UP' and the right arrow means 'DOWN'. That's just backwards! There are six heat levels labelled H1 to H6. You can hear the ticking of the little fuel pump speed up as you raise the level. On H6 it really pumps out the heat and the fan goes like the clappers.

The air is too hot to hold your hand in front of the outlet. On H1 it's both quiet and comfortably warm.

There's a temperature-controlled mode too but from what I've read it's rubbish. It runs the heater full blast until it reaches the set temperature, then switches off until it drops to a lower temperature, then it fires up at full blast again. It's not proportional.

Sources

My heater came from Vevor UK. Delivery was free and it arrived within a week. They are also available on eBay, Ali Express and the like. The price depends on the model and the build quality. A company called Webasto has been making these for years but they are very expensive. A mid-range but good quality version is available from a company called Laverner. The others are obviously copies and I have one of those. I don't expect it to be trouble free but replacement parts are cheap and readily available. It's horses for courses as always.

The 12V 12A LED power supply came from a company called molight-led-store selling on eBay. It cost me £13.19, including UK postage, and also arrived very quickly.

The battery backup I fitted is optional so that's up to you. If you do fit one, be aware that without isolating diodes the power supply will slowly drain your battery.

The supplied stainless pipe for the exhaust was too long for my build but if you cut it down, it no longer fits either the heater or silencer. You could always reshape the ends on a similarly sized tube I suppose but I just bought a short length of 24mm internal diameter flexible stainless exhaust pipe from eBay and cut that to length.

The wood, hinges, screws, paint and the like for my cabinet were all offcuts from my shed. If you don't hoard stuff like me, you'll need to factor in a cost for some sort of cabinet or shelter for your heater. I don't really recommend mounting everything in the shack but some people do and then just route the exhaust outside. This would probably be fine for a garage or workshop, but they are not the quietest of heaters.

And Finally

Some astute readers may notice that I am using red diesel in my heater. I have also researched this and it is perfectly legal to use red diesel for heating of non-commercial premises: **https://tinyurl.com/5e4dfm3u**

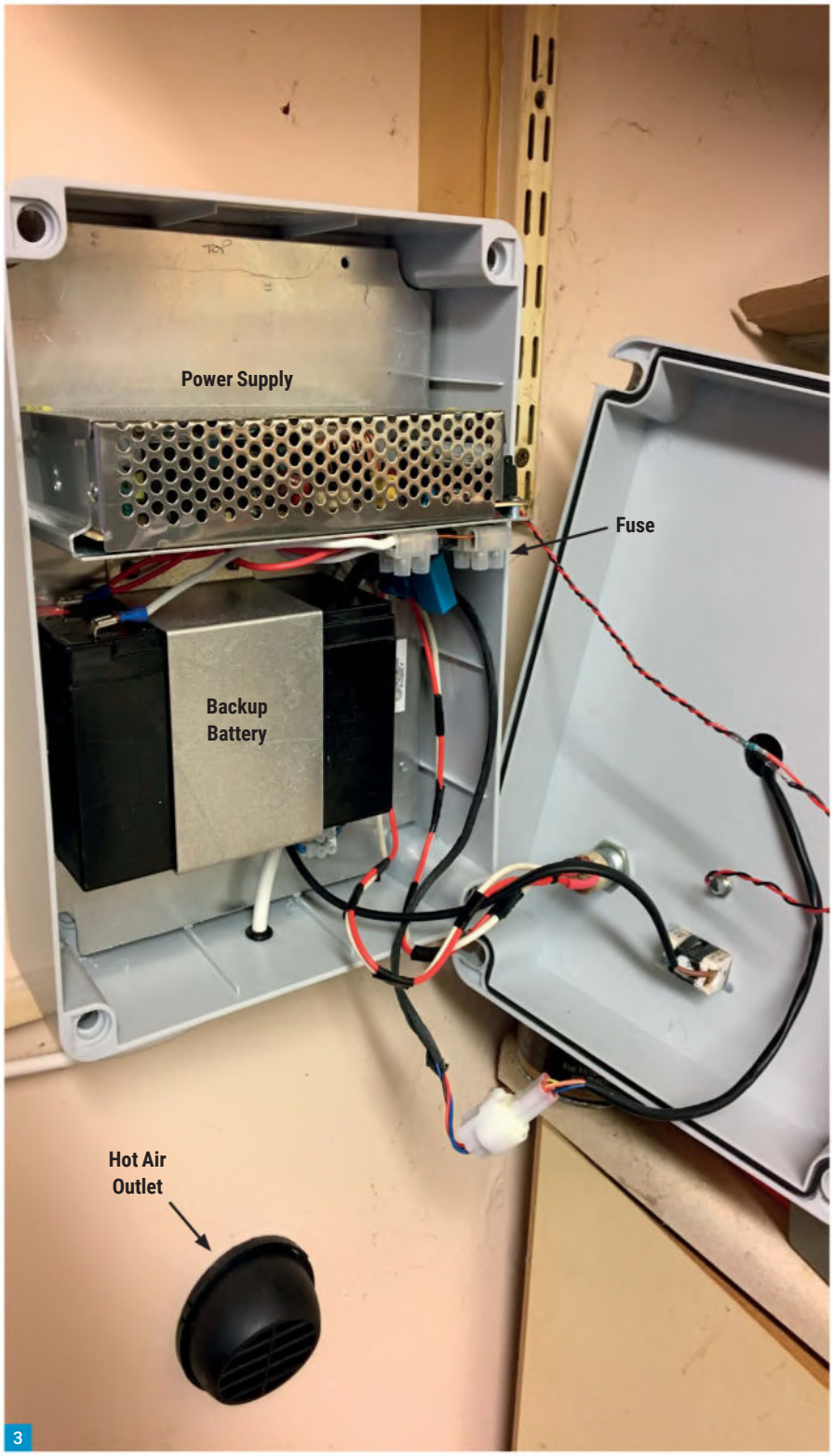
If you also know someone in the farming community prepared to sell you some, then obviously this can save you even more on running costs.

My research also produced lots of information published by people who have hacked the ECU and built better Arduino controller units of their own. A guy selling his Afterburner product looks particularly interesting. I'm going to leave dabbling with mine for another day though. It's just nice to be cosy and warm in the shack for now.

Be aware that the exhaust gets pretty hot so keep things away from that, especially the supplied melty plastic fuel line, or you're liable to get lots of really smelly smoke filling your cabinet, getting drawn into the fresh air intake and then being blown into your shack.

Would I make that mistake? Of course not …. ahem.

Oh, and if you don't already know, diesel stinks. Wear gloves. **PW**



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The Orlando HamCation

Joe Chester M1MWD resumes his travels with a trip to Florida.

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If it's Saturday it must be….in this case Orlando, Florida. At the HamCation. Not just Hamfest anymore. Why does that word just seem so appropriate here, yet jars a bit back home? The New World. Of new language. And perhaps it's an appropriate term. Orlando is another word for theme park. A holiday destination. And HamCation is huge – just enormous. Acres of space, four large indoor spaces, and the outside acres covered in radio equipped RVs and camper vans. It's a 15-minute walk to get from the halls to the presentation space.

This is the third in an occasional series. It started in Newark, before Covid, then Friedrichshafen last year, and now Orlando. Leave the big one (Dayton) for another trip. And the first thing to say about Orlando is that its 25°C here, thank you very much. And if Friedrichshafen was a family playground, then this place is the bees knees, with Disneyland down the road, not to mention the firework gang over on the Cape. What more could you ask?

A new interference free transceiver? A new physics defying antenna? A 500W solid-state amplifier for less than a grand? Or maybe a portable moonbounce kit, for the same money? Or a new microphone, or ATU, perhaps? And, of course, all available in the UK, without enormous import charges. OK, let's see what I can do for you.

First Things First

But first, as every TV programme and broadcast radio station over here says, a word from our sponsors! Well not quite, but something about how I got here. Of course, I didn't drive, like to Germany last year. I flew here. From Washington DC, where I had a great time in the Smithsonian museums, and at a National Science Academy meeting about Arctic ice. But this is boring stuff for you? However maybe less that you think, as you may discover elsewhere *(next month all being well – Ed.)*. So back to the HamCation.

First up is **Mark MW0POA** for the first overseas meeting of NRCnet operators. Just the two of us this year, but I'm sure it will grow in popularity. Did I mention the temperature, and the rocket launching? Oh, yes, this is a playground alright, but for adults too. We met at the back of the AMSAT presentation. He told me that the presenter was asking people what they wanted AMSAT to build. He suggested another Oscar100.

And speaking of satellite working, I met **Bob W2CYK**, the 'inventor' of the RFinder, the cellphone with a V/UHF radio inside. I did a review of this interesting device in a previous *PW* (September 2022), in fact after my visit to Friedrichshafen last year. I bought one then and used it quite a bit as my mobile transceiver of choice. It not only had direct access to a database of repeaters worldwide, but it is also set up for DMR. Bob grabbed my RFinder from me and was disgusted to discover that I had not kept up with his software updates. Which he then proceeded to install for me, while at the same time carrying on a very funny dialogue with several potential customers.


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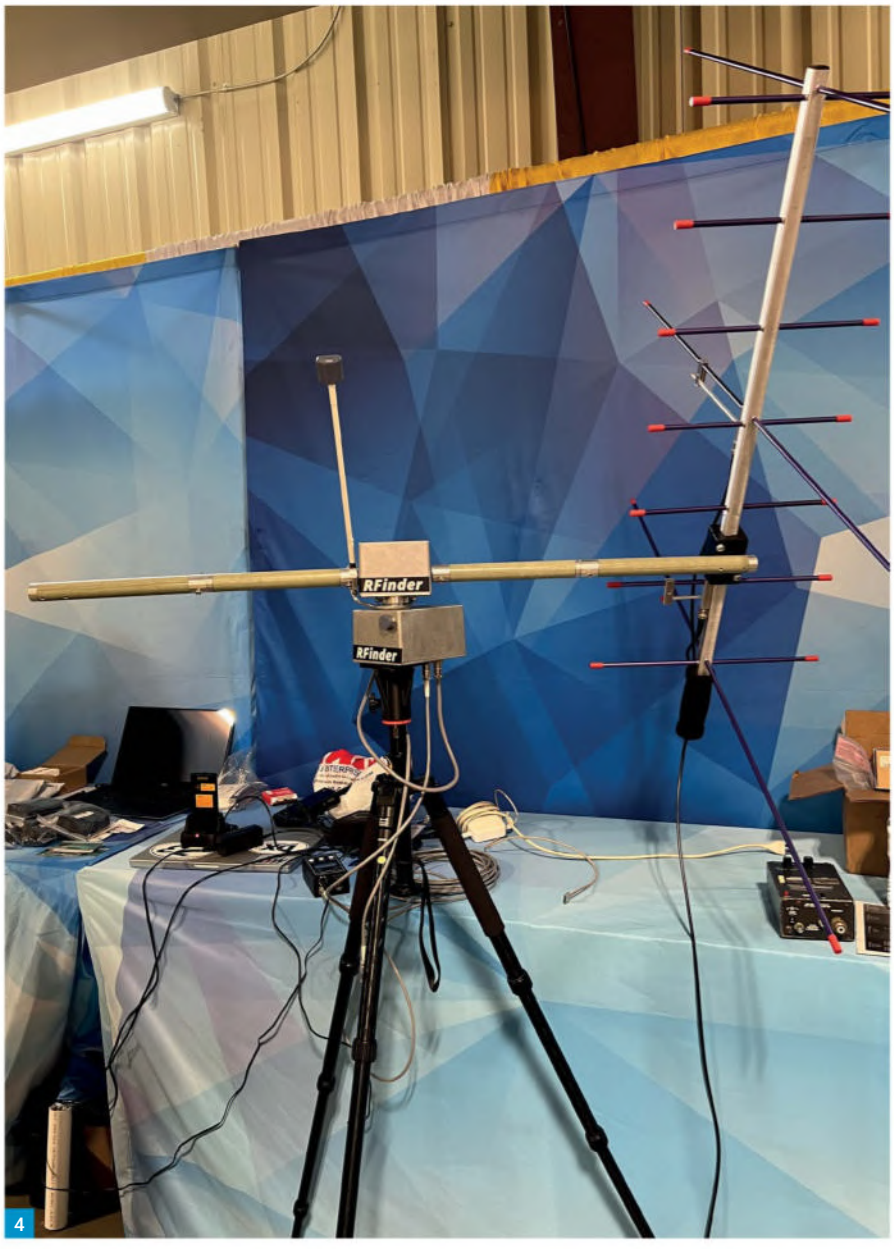

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Photo 1: Mark MW0POA and Joe.
Photo 2: Radio Scouts.
Photo 3: RVs galore.
Photo 4: The RFinder stand.
Photo 5: Backpack mobile.
Photo 6: Begali keys in proud lineup!

One of whom was **Will W3UWU**, who was sporting his 'pedestrian mobile' kit – basically a rucksack with a pole-mounted 2m/70cm antenna. *"I sometimes put a larger battery and an amplifier in the rucksack"*, he told me. *"I use it in places where cellphone service is not good"*, he said. Well judge for yourself. But I do understand the cellphone issue, I discovered it myself on several occasions in the two months I have been in the USA. It's a vast country, and mobile phone operators don't necessarily invest in coverage in areas with limited numbers of customers.

But back to Bob's latest idea. The RFinder being basically a software device, gives the opportunity to load new features easily. The next upgrade will be very interesting, because the RFinder B1 will have the ability to control a portable FM satellite station. Bob demonstrated the prototype to me. He selected a satellite in the database, the RFinder split frequencies were set up correctly, and the 2m/70cm antennas, sitting on a tripod base, moved to start tracking the satellite. Brilliant! I want one! It will easily fit in the boot of the car and assemble in a few minutes. Drive somewhere with good horizon views, set up and play with satellites. Availability? Later this year, probably through the RFinder UK distributor, currently Moonraker.

But generally speaking, this was the only innovation I found. For the rest, yes Buddipole had a full display of their range of equipment on show. I was very taken with their version of the Hexbeam, mounted on a heavy-duty tripod. I could imagine that in the boot of the car, but

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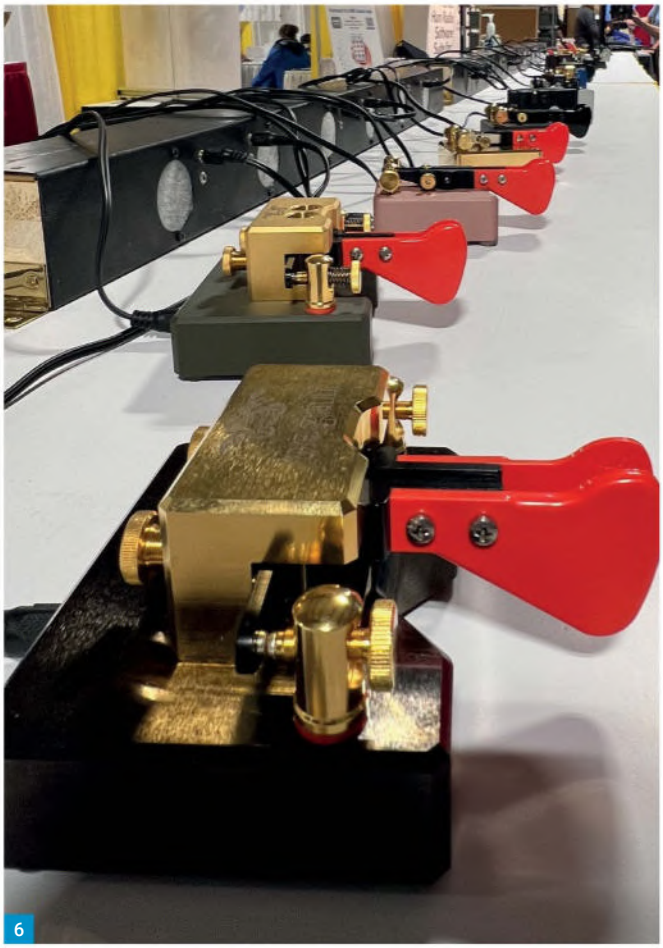
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probably won't actually buy one. In fact, my Buddipole kit hasn't found much (any?) use in the past year. Note to self!

And I also very much liked the shack-in-a-box idea from **James WX4TV**. The one on display included an Icom IC-7300 with an LDG tuner, but he can build one with any equipment. The issue for UK operators would be the shipping costs and related issues. I couldn't resist taking a picture of the line-up of Begali Morse keys, like a dance troop, getting ready for a quickstep! The display of Ameritron amplifiers was also intriguing, all of them with the covers off. Not powered up, but I did spend a little while looking at them, or rather into them. You don't get a chance to do that very often. And the Snap Circuits kits looked interesting, at least from a school science lab perspective, although they would also make good presents for the junior operator in the family. And there was a group of Radio Scouts being taught on one stand, and the special event station had a young operator at the microphone too. Good to see these efforts to get more young people involved in our hobby.

Outside was too vast for a detailed examination, so I wandered around aimlessly. It's just too big. One thing I noticed was that one part of the huge space had campers, almost all of them with end-feds on push-up poles. I wasn't able to see if anyone was actually operating inside any of these, but I suspect there was. So, in effect, an attempt on the Guinness world record for the number of amateur radio stations on air at the same time? Who knows?

It's Big

But to go back to what I said earlier. It's big, the Orlando amateur radio event, whatever you want to call it. And there were lots of people there, although several vendors complained, when I asked about numbers. *"It's the economy, nobody's buying"*, and even *"where is everybody?"* were the constant refrains. And I would have to agree that the aisles did not seem to be as busy as Friedrichshafen even. But maybe everyone was outdoors, enjoying the 25° of wall-to-wall sunshine?

All that said, I do wonder what the point is anymore. Are people buying new gear? Yes, the big vendors are here – Icom and Yaesu, but not Kenwood – with their full range of transceivers powered up for inspection. And many other suppliers too, such as Buddipole and DX Engineering, for example. But realistically, how many trays of PL259s do you need to see in one lifetime? And it was a surprise to see an Elecraft stand with no transceivers – did I miss something?

Or is it about meeting up with old friends, or perhaps a family holiday, with Disneyland on the doorstep? Is the cost better spent on gear, online? In the old days, getting 'all' amateur radio together in one place probably made sense. Exotic technologies, from far and wide. Today, I can order anything I want online. Reviews, in this magazine and elsewhere, are comprehensive. Yes, there is still the idea that you can you drive that new rig and try to work out if you can handle the interface easily. But I think that many operators today just accept the defaults from the manufacturer. And fundamentally, the discount era is gone. Yes, there were special show prices around, on some gear, but nothing like in the past, where major vendors would offer substantial discounts.

Did I have a good time? Do you care? OK too harsh. I don't think I would recommend it as just a radio show. There would need to be something else to justify the cost involved. In my case it is a rocket launch. Space X is sending four more astronauts up to the ISS in a week or so. Dayton? I'm told it's even bigger, and more fun, and better. And I suppose the urge to complete the set will see me there, eventually. But only if there is some really interesting new radio innovation to see. **PW**

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1

Power Distribution

Daimon Tilley G4USI sets about reorganising power distribution in his shack.

Staying with the construction theme this month I thought I would explain how I have recently implemented 13.8V power distribution in the shack.

For the last few years my shack has been located on the ground floor of the house in a compact 'snug' type area off our sitting room. Given it was compact, most of the rig wiring and other accessories that use 13.8V went directly to the rear of one of two PSUs where, using crimped and soldered ring terminals, they were attached to the rear binding posts.

There were a couple of issues with this. If you wanted to remove a power lead, you had to delicately pull the PSU forward, often under cable tension, and remove just about everything to get at the lead you wanted (invariably the one underneath all the others, according to the law of Sod!) The other issue was that as more equipment was added, the bulk of connectors at the rear became a mess and I was concerned something might come adrift and cause a short circuit.

Immediately before Christmas I moved the shack lock, stock and barrel to the opposite end of the house and to an upstairs bedroom. This was no mean feat and took me a full week of work. The bedroom in question used to be the office my wife and I used when we were running our business. Along one wall I had previously installed a full 4.5m long (15ft) wooden worktop and a great number of mains sockets in trunking underneath, so it was well prepared.

A (happy) consequence of this layout was that I had space to have all of my equipment permanently set up in a dedicated place, but being spread over such a distance meant I needed to consider how to distribute my 13.8V supplies. One obvious step was to place the two supplies at opposite ends of the worktop, but that still led to a significant distance between them and potential voltage drop on long leads as well as an unnecessary tangle of wires from individual gear to the PSUs.

I therefore set my sights on addressing this and began a trawl of the internet. I soon came across Andersen PowerPoles, which seem quite popular and you can purchase a variety of ready assembled or kit versions of PowerPole distribution boards, but these are quite expensive. One such option is from UK based SOTABEAMS (URL below) who offer a six-way kit for £36 or the same kit ready built for £56.

https://tinyurl.com/3fwt64x8

I already knew that I wanted three distribution boards, so was facing a cost of between £108 - £168 depending on the version I chose. On top of this I would need to buy about 20 PowerPole connectors to put on the end of each piece of equipment. That's another £22 for 30A connectors – getting close to £200 in total. This was becoming more expensive than buying another couple of PSUs!

Seeking an Alternative

Regular readers will by now realise that I like to build rather than buy, and this is a series about *Amateur Radio on a Budget* after all, so it will come as no surprise that I chose this option. Now, in the last 12 months or so, my youngest son and I had begun to learn to fly model aircraft and had to purchase a number of LiPo batteries. These come with the option of a variety of connectors, but the convention at my local club seemed to be the use of XT60 connectors, **Fig. 1**. If you have not heard of these before, they are a connector in a hard nylon fireproof case, they cannot be accidentally connected reverse polarity, and the gold-plated brass pins are easily soldered and accept wire up to 12AWG. Capable of handling 30A continuous at 500V, they make a superb solid connection.

Thinking about this further, I realised that by moving to XT60 connectors as a shack standard would allow me to use my model aircraft batteries for portable power too. I also discovered a number of radio amateurs were using these connectors.

One of the benefits of the XT60 is that they are ubiquitous and cheap, and I obtained 40 connectors (20 male and 20 female) with supplied heatshrink for £14. I then sourced some 12AWG wire and chose silicone, which although more expensive, is very flexible. This is often sold in individual red and black wires, but I sourced some that was twin-lead and 5m long for £20.

So, I had spent £34 so far, but had nothing in which to place the connectors. Having a 3d printer is a real asset to a radio shack and I decided to press this into service, but you could make something similar using other materials.

While it is fun to design things from scratch for 3d printing, I don't believe in re-inventing the wheel so I turned to the Thingiverse website, where makers from around the world post their 3d designs for others to download and use free of charge. There were several XT60 distribution designs, but I chose the one that suited me best, and in CAD I added some flanges to the base to allow the blocks to be screwed down.

Once printed it was important to use the correct connectors in the correct place. XT60 connectors come in male and female versions, and convention is to use female connectors on the battery or power supply side, and male connectors on the appliance side. This minimises the risk of a short circuit of a loose battery or powered connector. Already a tight pressure fit in the case, I then used super glue to secure each of the five female connectors into place in the box, **Figs 2** and **3**.

Using 14-gauge copper wire, I then soldered across the positive and negative pins on the underside of the connectors to create bus-bars. By butting that wire up against the underside of the 3d printed case lid, additional security of the plugs was achieved, **Fig. 4**. The final step was to solder the silicone wire into place and add ring terminals for connection to the PSU. In total I made three of these distribution boxes, giving a total of 15 outputs. My larger, 50A PSU drives two that are daisy chained, and my 30A PSU drives the third.

The End Result

One of the finished boxes is shown in **Fig. 5**, with an in-situ box with connections labelled in **Fig. 6**. I should add a note here about fusing. I did not include fusing in my distribution boards, although it would certainly be possible to do so. The reason

Fig. 1: An XT60 connector. Fig. 2: Male plugs glued in place. Fig. 3: Top view of glued connectors. Fig. 4: Completed daisy chained board. Fig. 5: A completed box. Fig. 6: The completed box with labelled connections. Fig. 7: The end result in the author's shack.

for this was to keep complexity down and also because the majority of my equipment's power leads have inline fuses, rendering it unnecessary.

The end result is shown in **Fig. 7**, my newly completed shack, where the red arrows indicate the location of my two power supplies and the yellow arrows indicate the location of the completed distribution boards. The left-hand side of the room is the main HF operating position for QRP/QRO, with a vintage/homebrew/receiver/VHF and UHF section in the middle, and the workbench and test gear to the right (with its own lab PSU). So far I am very pleased with the results and in total it cost me £34 plus a pound of so for the 3d printing filament, and a few hours of my time. Join me next time when we will construct another useful (and often expensive) shack accessory. **PW**


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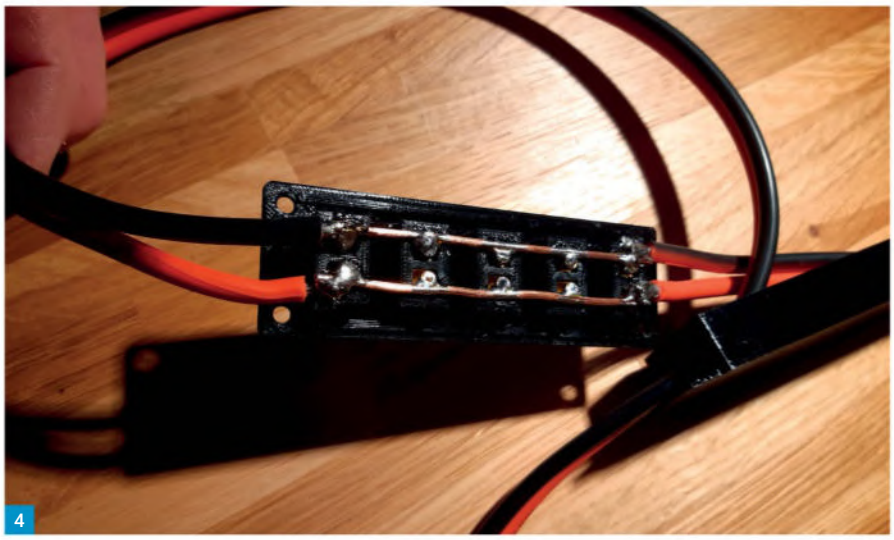
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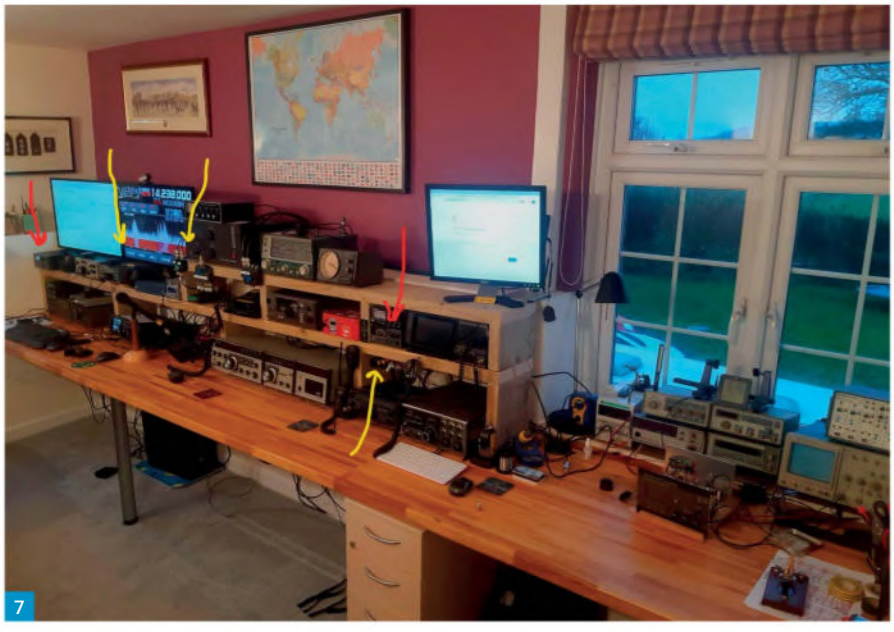
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David Harris
mydogisfinn@gmail.com

Short Wave Guides and a BBC Memoir

David Harris looks at some recent publications from Klingenfuss and a memoir from a long-time BBC broadcaster.

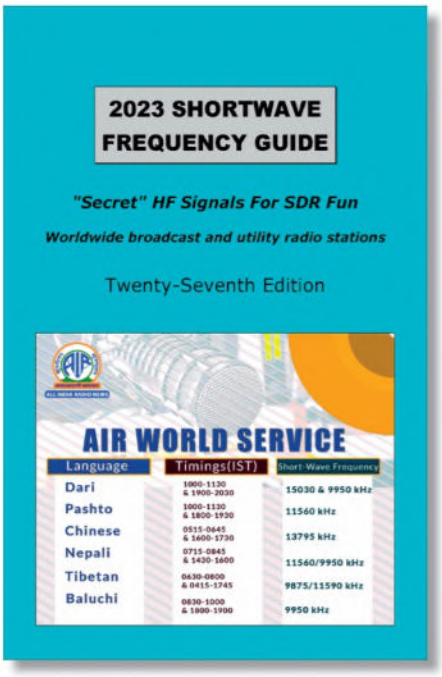
For 55 years Klingenfuss have been publishing professional frequency guides that are widely used by intelligence agencies, armed forces and regulatory bodies as well as radio hobbyists. The editor makes the point that amateur and broadcasting services only make up 22% of the shortwave spectrum, which leaves 77% for professional utility services. Furthermore there has been a huge increase in the amount of data traffic on the utility bands that can be decoded using a communications receiver/SDR and the appropriate software. Signals can be received from aircraft, ships, embassies, military, press, government agencies, NGOs and United Nations organisations. Klingenfuss makes a strong point in the introduction to his publications that shortwave communications offers greater resilience than internet, mobile phone, landline, cable or satellite communications.

2023/2024 Guide to Utility Radio Stations

The flagship book is *Guide to Utility Stations*, which starts with a 45-page introduction to utility monitoring in which he looks at the main categories of stations: aeronautical, fixed and maritime. He discusses the use of SDRs and direction finding using remote Kiwi-SDRs. We then arrive at the main body of the book, which comprises almost 9,000 entries for utility stations transmitting from 20kHz - 27870kHz. The format follows agreed international frequency allocations, e.g. 11175 – 11275 is allocated for aeronautical mobile (off route military use). The directory then lists each 3kHz channel together with stations that have been monitored using that frequency along with the transmission mode. e.g. 11214.0 callsign AFA USAF Andrews base, USA. SSB.

After 240 pages of frequency listings we get an alphabetical listing of all countries together with the utility stations listed in the main body of the text, e.g. for Guinea the air traffic frequencies of 3452, 6535, 13357 and 17955kHz are listed. The book then continues with a full list of international callsigns for each country. The next section of the book is a 25-page directory of meteorological radiofax, radio telex and Navtex services. The ability to receive maps showing ice forecasts, wave heights and surface pressure is of great use to seafarers and those with an interest in climate. Navtex is used for maritime safety and navigational warnings.

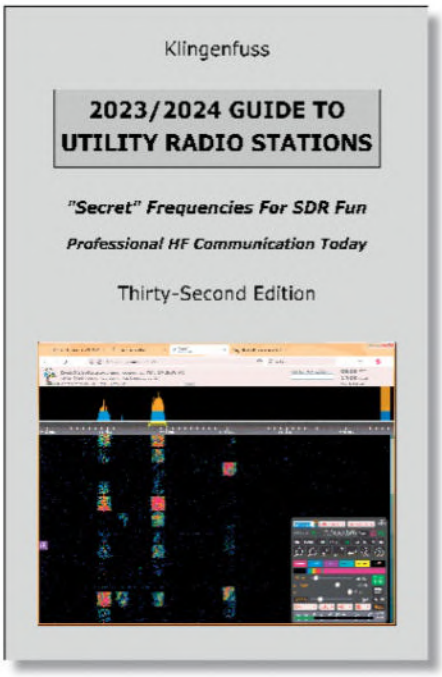
If you want to know what data decodes look like on screen, then there are 94 pages of screenshots from aircraft, military, maritime and government services from around the world. The book ends with a full list of all Q and Z codes, together with abbreviations and a list of terms and definitions.



2023 Shortwave Frequency Guide (27th ed)
344 pp, Pbk. 45 Euros + 12 Euros postage.
ISBN 9783941040731

2023 Shortwave Frequency Guide

Shortwave Frequency Guide is great value for the radio monitor as it comprises two books in one. The first part is a stripped-down version of *Guide to Utility Radio Stations* (see above). All 9,000 utility listings are there but with slightly less detail. The second part is a 68-page listing of over 4,100 SW broadcast stations from Shortwave Australia 2310kHz, which is on the air from 0400 –1200UTC, to World Music Radio, Denmark on 25800kHz, which broadcasts 24/7. The guide lists the name of the station, frequency, transmitter location, ITU country code, start and end times of broadcasting, languages used and target area. The listings are based on the latest B22 HFCC allocations, which cover the period November 2022 – March 2023. The frequency listings are followed by a 40-page alphabetical listing of stations by country. e.g. for Angola we find that the only SW broadcast station active is Radio Nacional de Angola, which broadcasts 24 hours a day on 4949.7kHz in Portuguese. Klingenfuss books do not include FM, DAB, LW or MW broadcast stations or amateur radio beacons. Klingenfuss also excludes number stations, pirate broadcasters and other unverifiable stations.



2023/2024 Guide to Utility Radio Stations (32nd ed)
Editor: Joerg Klingenfuss. Klingenfuss Publications, Germany. 2022. 544 pp. Pbk.
55 Euros + 12 Euros postage.
ISBN 9783941040236

Super Frequency List on CD

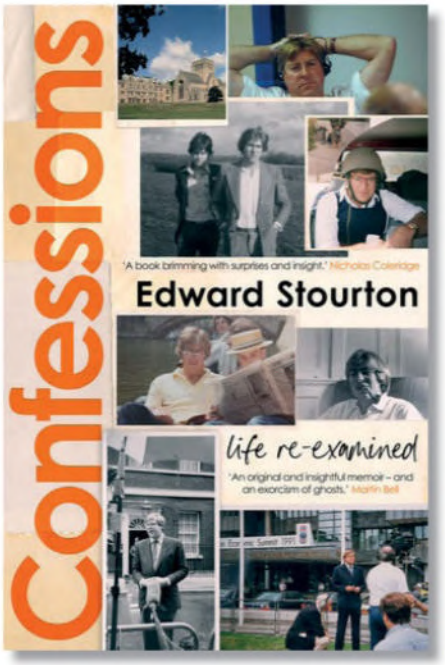
Super Frequency List on CD combines the utility and broadcast station listings in the above publications in CD format with full search facilities. This means that you can enter a country, frequency, station name, etc and get a full listing instantly. The CD also contains over 1000 full colour screenshots of data decodes.

Whichever Klingenfuss publication you choose they will provide a unique gateway to exploring the full SW radio spectrum.

Super Frequency List on CD. (29th ed)
CD format only. 30 Euros + 5 Euros postage

These publications are available direct from the publisher in Germany or from the UK distributor Radioworld (URL below). These books are not sold on Amazon or through local bookshops.
www.klingenfuss.org
www.radioworld.co.uk

Confessions



Confessions. Life Re-examined
by Edward Stourton.
Doubleday. 2023.
296 pp. Hbk. £20.
ISBN 9780857528339

Edward Stourton (b.1957) is a broadcaster and writer who currently presents the Radio 4 programme, *Sunday*. His motivation in writing this book came from him being diagnosed with prostate cancer, which has caused him to look back on his life. The book is not a full autobiography but is both a memoir and a reflection upon his Roman Catholic faith. He has written several books, including *Aunties War (2017),* which is a study of the BBC during the Second World War. (*I reviewed this book for RadioUser August 2018.)* He has also written three books about religion.

Stourton can trace his ancestry back to the 15th century when the first Baron Stourton was created. He comes from a long line of English Catholics and his Catholic faith and identity are a key element of this book. His background and first 20 years are very similar to many establishment figures. He was born in Africa where his father worked for a multinational company. In 1966 he was despatched to a Catholic prep school and then to public school at Ampleforth, which was run by Benedictine monks. He then studied English at Cambridge where he was president of the Cambridge Union and became involved in student journalism. He saw Cambridge in the 1970s as being a very conservative place full of snobbery and tradition. In fact, not really much different from his experience at public school.

He gets what he sees as a very lucky break in being taken on by ITN as a graduate trainee in 1979. He attributes this to the fact that this organisation only recruited trainees from Oxbridge. He does well at ITN and in 1982 becomes part of the team that sets up the news programme for the newly established television station, Channel 4. He works as a foreign correspondent and was posted to Beirut to cover the civil war in Lebanon. He moves to the BBC in 1988 to become the Paris correspondent, goes back to ITV in 1990 but rejoins the BBC in 1993 where he has remained.

The book does not follow a strict chronology and we are given selected insights into his career. He has worked in Washington and covered a military coup in Haiti. He was also the main presenter of BBC *One O'Clock News* for many years. He was in Russia in 1989 shortly before the collapse of Communism and in South Africa in 1990 when **Nelson Mandela** was released. His career also took him to Sarajevo during the Bosnian civil war of 1992.

The book is divided up into 22 short chapters, the most moving of which is about a television programme he made on **Sean Sellers**, a condemned triple murderer in the USA who was about to be executed. What made Sellers case unusual was that he was only 16 when he committed the murders. Stourton provides a detailed account of his last few days and was the last person to interview Sellers before his execution in 1999.

From 1999 to 2009 Stourton was one of the main presenters for BBC Radio 4's flagship programme, *Today,* which is broadcast from 0600–0900 from Monday – Saturday. Stourton was unceremoniously moved from this programme and he only found out about it from another journalist. The BBC kept him on and he has subsequently presented *The World at One* on Radio 4 before settling into his regular slot as presenter of *Sunday*.

Stourton has certainly led an interesting life having spent his whole career in broadcasting for BBC, ITN and Channel 4. He has travelled the world and reported from many combat zones and been there at key moments of modern history. In addition to his reflections on his Catholic faith there is also a strand of entitlement going through the book. He came from a wealthy background, went to public school, Cambridge and then straight into a prestigious career in television. He was sometimes referred to by the press as 'Posh Ed' due to his accent and aristocratic background. He is a big name in broadcasting and perhaps an example of the metropolitan elite that are seen to dominate the media.

We don't learn much about Stourton's life outside of the newsroom. There is a brief mention that he married young, had children, divorced and remarried. I would like to have known more about Stourton as a person rather than a journalist. In the latter part of the book several chapters are given to his thoughts about the sexual abuse scandal that was discovered at Ampleforth College in 2005 when a monk was prosecuted for numerous cases of abuse. It later transpired that several other abusers had worked at the college. Stourton was not aware of this when he was a student but is clearly troubled by what happened, although this does not challenge his faith in Roman Catholicism.

In summary this is quite an uneven book. He could have written a conventional autobiography, which would have been of more interest. Another route would have been a chronological memoir of his career in broadcasting. I feel that he wanted to say more about his very real Catholic faith and how it has shaped his life but this would be best accommodated within a separate volume. Stourton is a good writer with potentially a lot more to say. Perhaps we will see more books from him over the next few years.
www.penguin.co.uk

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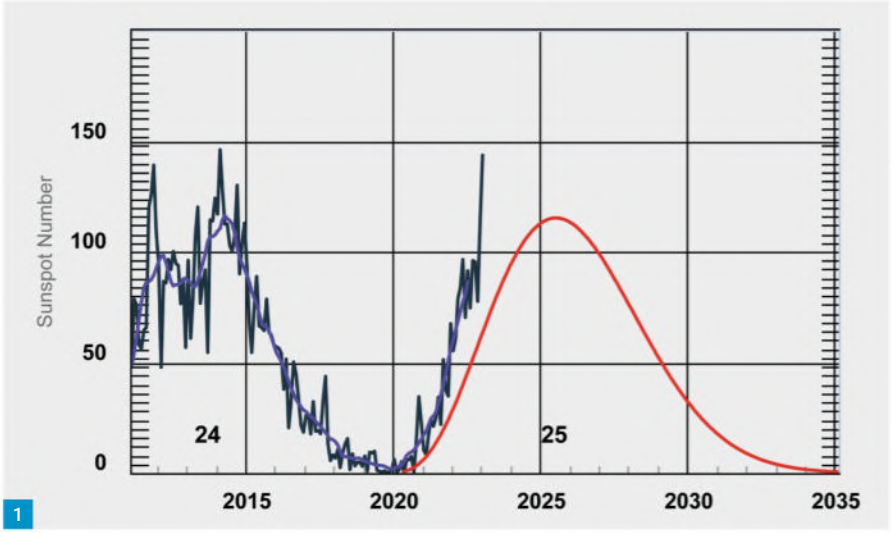

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Sunspots and DXpeditions

Steve Telenius-Lowe PJ4DX reports a new high in the sunspot count, fortuitously coinciding with plenty of DXpedition activity.

Welcome to the April *HF Highlights*. On 16 January the solar flux peaked at 234 sfu and on 20 January the sunspot number was briefly as high as 207. These are the sort of figures that, if sustained, can provide worldwide and long-path openings on 28MHz and F2 propagation on 50MHz. Unfortunately, both measures decreased quite rapidly and by 3 February were only at 134 and 54 respectively. Nevertheless, on 2 February the Spaceweather website reported that the monthly sunspot count in January had been at a nine-year high, very close indeed to the peak of the previous solar cycle in 2014. **Fig. 1**, from the US National Oceanic and Atmospheric Administration, NOAA, shows that the number of sunspots recorded continues to be well above the predicted values for the current Cycle 25. This cycle is not expected to peak until next year or 2025, so we should be in for a sustained period of good propagation on the higher HF bands for a few years yet.

https://spaceweather.com

The 28MHz beacon report for January was compiled by **Neil Clarke G0CAS**: Sporadic E continued throughout the month with openings taking place on many days. Openings occurred during mid-evening on the 10th, 12th and 19th on what appeared to be a dead band with no other activity taking place. IT9EJW 28225 and IQ8CZ 28230 are excellent indicators for Sporadic E in that direction and were heard on 22 and 17 days respectively. There were openings to the Pacific with VK6RBP 28200 heard on 19 days and VK8VF 28268 on 16 days. ZL3TEN 28228 was logged on five days although ZL6B on 28200 was not heard. Openings to South Africa and South America took place almost daily. Listen out for ZS6DN, LU4AA, OA4B and YV5B, all on the 28200kHz world-wide beacon network. 75 beacons were heard from the USA from all ten call areas. The W7 area was the last one to be heard, with WG7I 28231 and W7SWL 28232. Beacons in the W4 area were logged every day while the W6 area was logged on 17 days. Three of the most heard beacons from Canada were VE3KAH 28168 on 22 days, VA3SRC 28185 on 16 days and VE3TEN 28175 on 28 days.

Table 1 on page 38 is a list of the most frequently-heard 28MHz beacons from each of the 10 USA call districts, as compiled by G0CAS.

The Month on the Air

After around 21,000 QSOs **Thierry F6CUK**, operating as **FT8WW** from Crozet Island, closed down on HF when his time-limited operating permission expired on 14 January. He applied for an extension to the permit and this was granted on 10 February, allowing him to operate on HF for a further three weeks, though only on frequencies of 14MHz and higher.

The Czech TN8K DXpedition from the Republic of Congo closed down on 20 January with a very impressive 163,000 QSOs in their log. In addition to the usual CW, SSB, FT8 and FT4 modes, TN8K also used RTTY and even FM on 29MHz.

The CQ 160m CW contest took place from 2200UTC on Friday 27 January for 48 hours and by all accounts conditions were good on topband. CW is not my forte but I worked 33 US States/Canadian Provinces and 29 DXCC entities, including several in Europe plus Hawaii.

7P8WW was a one-man DXpedition to Lesotho by **Yuris YL2GM**. He was only active for a week, from 28 January to 3 February, yet made over 10,000 QSOs on CW and FT8. The following day 9U4WX and 9U5R appeared on the bands from Burundi.

The long-anticipated 3Y0J DXpedition to Bouvet Island started on 6 February but, due to the hostile terrain and weather, it was a much smaller operation than that originally planned. They were reduced to using 100W to wire antennas on 30m to 12m only, with two stations on the air during the day and one at night. As a result signals were weak, especially in the North America-Caribbean area, leading to much frustration, pirate activity, and more deliberate QRM to the DXpedition than has been witnessed in a long time. Unfortunate and very sad.

April DXpeditions

A group of Belgian operators will be active as 5P5FI from the Danish island of Fanø (IOTA EU-125) from 22 to 29 April, **Fig. 2**. They will have two HF stations using a Hexbeam, dipoles, verticals and an end-fed on SSB, CW, FT8 and possibly SSTV. In addition to the main operation the team is planning portable operations from various WWFF sites and from the island's beach using a kite antenna. QSL information is via **Eddy ON6EF**. Thanks to **Joris Vermost ON7VM** for this information.

www.hamradioexpedition.com

Mentioned in this column last month, CY0S from the DXCC entity of Sable Island (IOTA NA-063) is scheduled for 20 to 30 March, which is after the publication date of the April issue of *PW*. This should be a relatively easy DXpedition to work from the UK.

Bernhard DL2GAC has been travelling to the Solomon Islands almost every year since 1990. He is planning to operate as **H44MS**, **Fig. 3**, from mid-February until the end of April. This time, Bernhard will be on Malaita Island, IOTA OC-047.

Readers' News

First up this month is **Etienne Vrebos OS8D** who actually sent in two reports this month. First Etienne explained a bit more about his new hobby within amateur radio: that of activating some of the 2700 castles and fortresses in Belgium, **Fig. 4**. *"It's a great new opportunity for me, as I was a bit tired of chasing from home [although] I still work from home when the weather is too bad. But being the activator gives me a 'kick' from the moment that I have been spotted on the Cluster... I'm using my Super Antenna MP1, bought in the UK some years ago... I'm mostly on 40m in the morning to reach Europeans chasing castles for the BCA/WCA*

2

award... Till today I activated 16 castles, that's nearly one every second day since 1 January... I'm actually second in Belgium of the activators... One of my first activations was the Palais Royal in Brussels, the King was home and I was not allowed to take pictures and had some 'discrete' invigilators around my car. At least they knew what HF radio was."

Later Etienne added that he made about 950 QSOs this month, about 80% of which were portable, sitting in his car, **Fig. 5**, using a new Yaesu FT-710 (*"really a great rig!"*, he says) to the MP1 antenna on 7MHz. He also worked some good DX from home, as can be seen in 'Band Highlights' below.

Last month **Victor Brand G3JNB** reported that he was taking a step back from his CW DX activities. Instead, he has been concentrating on the new digital mode VarAC and reports having a two-way QRP keyboard chat for 38 minutes with OH2MH, as well as receiving VarAC beacons from VK3FBB, ZL2TNB and ZL1RD. Nevertheless, Victor has also still been active on CW (see 'Band Highlights').

Jim Bovill PA3FDR wrote that *"The Gods of propagation ensured a good start to the New Year, with often good openings to Asia, especially Japan, North and South America and less often into central Africa. Noteworthy were several QSOs with operators in western US, Canada and western South America, including California (K6VV) and Washington state (W8TJM and KG7V), the Canadian province of Alberta (VE6WQ), and Ecuador (HC1HC). Among the other highlights were the UK Base in Cyprus (ZC4GR), for the second time in less than two months Equatorial Guinea (3C3CA) and three new DXCC entities Malawi (7Q7EMH), Angola (D2UY) and Fiji (3D2USA). And then there was the one that got away, Reunion (FR8UA). This small island in the Indian Ocean is, as suggested by the callsign, an overseas department and region of France. After many tries, I finally received a reply but unfortunately this never proceeded to an RR73 so cannot be considered a valid QSO. Perhaps better luck next time we meet on the airwaves."*

Carl Gorse 2E0HPI sent in a list of stations worked while he was operating portable using

3

a Yaesu FT-891 at 50W to a Chameleon MPAS 2.0 vertical by the water's edge, see **Fig. 6**. Carl said *"I've been activating Parks on the Air and the bands have been fantastic into the USA"* but he also worked plenty of other DX on 21MHz SSB.

Once again, **Tim Kirby GW4VXE**, operating as **GW4MM**, has been concentrating on the higher bands. He commented that *"although the solar flux has been fairly high, it's been surprising that some days when the flux was very high conditions haven't seemed that good. The flux took a bit of a dive for a week or so but, at the time of writing, seems to be heading up again now. The WRTC 2023 event,* **Fig. 7**, *in January was great fun and gave an interesting illustration of propagation from day-to-day."* Tim added: *"On 15m, the period just after sunset has often been fruitful for some nice QSOs into the western USA and the 1900UTC CWT session on a Wednesday has proven that the band can be surprisingly good to North America as late as 2000UTC. During the 1900UTC CWT session on 8 February, although the west coast was audible, signals were fluttery and much harder to work. A look at the geomagnetic data, overlaid on the Simon's World Map program quickly showed why, with the band of geomagnetic activity coming well south and affecting much of the path."* Tim also spent a little time during the RSGB SSB AFS working a few familiar callsigns on 80 and 40m. The 80m dipole is cut for the SSB portion of the band and he noticed an interesting EMC effect as he worked a few stations higher in the phone segment: the smart speaker in the shack started playing music, unbidden!

Owen Williams G0PHY was also chasing the


4


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Fig. 1: Sunspot numbers in solar cycle 24 and progression in cycle 25 (image: Space Weather Prediction Center, NOAA). Fig. 2: Belgian 5P5FI DXpedition logo. Fig. 3: Bernhard DL2GAC operating as H44MS during an earlier operation from the Solomon Islands. Fig. 4: Ribeaucourt Castle in Belgium, as activated by Etienne OS8D/P. Fig. 5: Etienne OS8D/P activating a Belgian castle. Fig. 6: Sunset at 2E0HPI/P at GFF-0348 near Hartlepool. Fig. 7: WRTC 2023 certificate awarded to Tim GW4MM. Fig. 8: John ZB2JK operating from Coaling Island with a 10m backpack. Fig. 9: The KW Atlanta transceiver: a British success story from the late 1960s.

WRTC stations: *"The main focus this month was on the WRTC SES with a break to try and work the Czech DXpedition to the Congo. The bulk of the WRTC stations were in Europe but contacts were made with N0W, N1W, N5W, N7W, N9W, EF8WRTC, VE2WRTC, HZ1WRTC, UP7WRTC and PY5WRTC. Non-WRTC contacts included TN8K and ZL4RMF. Conditions on 28MHz continued to be good with stations in the USA being very strong in the afternoons. One afternoon a W in Phoenix, Arizona, was heard at S9 working VK3EE: the VK was also audible here at S3. TN8K was a bit of a challenge but I managed two new band slots during the final days of the DXpedition."*

My wife **Eva PJ4EVA** and I share the same station (an Icom IC-7300 and Acom amplifier to a Hexbeam on 6 – 20m, verticals on 30 and 80m, an inverted-V on 40m and an inverted-L for 160m, which also happens to work very well on 60m). While I am active on SSB, CW and FT8/FT4, Eva concentrates almost exclusively on

Beacon	Frequency	State
AA1SU	28243	VT
WW2BSA	28241	NJ
W3APL	28296	MD
K4PAR	28218	GA
K5AB	28280	TX
K6FRC	28300	CA
W7SWL	28232	AZ
KG8CO	28205	MI
N9TNY	28285	IL
N2UHC/0	28209	KS

Table 1: The most frequently-heard 28MHz beacons in the 10 USA call districts.

FT8 and FT4. She was the first to try out our new 160m antenna which we put up in January with the help of **Bert PJ4KY** and the first station worked was ZS1LS, a new DXCC for her on topband! Eva enjoys working Asian stations as it is a difficult path from here and was particularly active this month, making over 1100 QSOs. Her DX highlights are listed below.

Carl Mason GW0VSW said *"Not much to report this month as I have been making changes to my shack and antennas."* He used 1 watt of CW from a Xiegu G90 transceiver to an *"inverted G5RV"* to work the stations listed in the 'Band Highlights'.

This month **Kevin Hewitt ZB2GI** worked **John King ZB2JK** operating from Thailand as **HS0ZIQ** and later also operated with John from Coaling Island in Gibraltar, **Fig. 8**. In addition to the more usual SSB and FT8, Kev also used both FM and AM to work 'across the pond' on 29MHz. One highlight he mentioned was contacting special event station GB8KW, where operator **Steve G3ZPS** from the Cray Valley club was using a KW Atlanta transceiver, **Fig. 9**. The Atlanta was manufactured by KW in Dartford, Kent, between 1968 and 1973.

Band Highlights

Etienne OS8D: 14MHz SSB: VK3OCD. **21MHz SSB:** TN8K, VK3OCD, XV1X. **24MHz SSB:** 9N7AA, BD7BM, CX7SS, FM5DN, JA3AOP, JR1JGA, TN8K, UK8OM, ZL1BMW. **28MHz SSB:** 4L4GB, BX5AA, C5YK, CX1AV, FM8QR, FY4JI, KP4WQ, LU9DA, PJ2ND, TI5VMJ, UK8CCH, VR2XZL, XE1XR, ZC4GR, ZF2OO, ZF2PG.

Victor G3JNB: 10MHz CW: VK9DX. **18MHz CW:** PJ2ND, TN9K. **21MHz CW:** TO1A. **24MHz CW:** TN9K, TZ4AM, V31XX.

Jim PA3FDR 10MHz FT8: JA8DKJ. **14MHz FT4:** K6VV, KP4AH, VK5PO. **14MHz FT8:** 3D2USU, ZS6HBE. **18MHz FT4:** AA8WZ. **18MHz FT8:** 7L4VYK, HC1HC, JA7UKM, JR1NHD, UA0FO, VK4SE, WA0CSL. **21MHz FT4:** 3C3CA, AA8IA, BX9AA, JE5JHZ, JR3UPT, KG7V, RA0WHE, YD2ULK. **21MHz FT8:** 4L4DX, BD4STG, BG2CX, D2UY, EK/RX3DPK, HC2AO, JA7ZF, JF1MVF, VR25XMT, ZL1VAH. **24MHz FT4:** RA0CGY, UN8PC, VE6WQ. **24MHz FT8:** BG2ASC, BG5FCH,

6

JA2KVB, K6EID, K7WE, RC0JD. **28MHz FT4:** BG0BBB. **28MHz FT8:** 4J3DJ, 7Q7EMH, 7Z1IS, BG7SFE, UA0SU, VK6AL, VK6KR, VU2FGQ.

Carl 2E0HPI/P: 21MHz SSB: 6Y5HM, 8Z3FD, E20HQT, HI8MAK, HS1HJT, VP2EIH, PY2FSR, VA7KXK, YB0JVZ, YV1GIY, W6BYN.

Tim GW4VXE / GW4MM: 21MHz CW: 4K6FO, 8B0RARI, AB7LK (WA), CO8NMN, FG/F5HRY, FM/F6BWJ, N6W (CA), PJ2/K5PI, TN8K. **28MHz CW:** 9K2NO, 9N7AA, A61Q, AA6AA, CO8NMN, OX3XR, PJ2/KB7Q, V31XX, VP5/DK6AS, VR2ZQZ.

Owen G0PHY: 7MHz SSB: UP7WRTC. **14MHz SSB:** HZ1WRTC, PY5WRTC, VE2WRTC, N7W, TN8K, ZL4RMF. **18MHz SSB:** TN8K. **28MHz SSB:** N0W.

Eva PJ4EVA: 1.8MHz FT8: ZS1LS. **5MHz FT8:** 9K2NO, TN8K, YB0SAS. **7MHz FT8:** 7K4PTY, XV1X, YG3AJY. **7MHz FT4:** TN8K. **10MHz FT8:** 4W/JH2EUV, 9M2MRS, HS4OFE, VK7GS, YB8XOB. **10MHz FT4:** TN8K. **14MHz FT8:** 5V7JA, 7Q7EMH, FK8GM, P29DT. **14MHz FT4:** 5Z4VJ, TN8K, VK2PAA. **18MHz FT8:** BA6KC, VK4RF, ZL3DMH. **21MHz FT8:** 9U5R, many JAs, YB1AR. **24MHz FT8:** 7P8WW, ET3AA, many JAs, ZL3IO. **24MHz FT4:** many JAs, NL7S. **28MHz FT8:** ET3AA, FR5DZ, many JAs, YB8XOB. **28MHz FT4:** many JAs, TN8K.

Carl GW0VSW: 10MHz CW: LX1NO. **14MHz CW:** LY1923KK, Z3151GOCE. **18MHz CW:** EA6BB. **21MHz CW:** E77DX. **24MHz CW:** EA8CN. **28MHz CW:** TC100TC.

Kev ZB2GI: 5MHz FT8: D44TWO, VE2BJG, W1NG. **7MHz FT8:** JA5JFB. **14MHz SSB:** HS0ZIQ, N0W, VK3XXY. **18MHz FT8:** 7M4HOA,

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HL3DE, JA0QVJ, JA1AFR, JA2LCP, JA3APV, JA7XBG, JA9GLW, JR6FC, VK2IR. **21MHz SSB:** 6Y5HM, K0FCL, KP4JFR, WP3AV. **21MHz FT8:** KB9NHZ, VE3EY. **24MHz SSB:** KD2FWC, VE3KG. **24MHz FT8:** AA6VB, N6WS, VE4VT, W7ZR. **28MHz SSB:** AI5BK, K9NW, KP4DO, KV0Q, TZ4AM, VE7SNC, WP4HSZ. **28MHz FT8:** 9K2OD, 9K5MO, AC0DA, AD7J, K7ZV, PY7AN, TI3ATS, VA7RY, W6DX, XE2YWH. **29MHz FM:** KQ2H (repeater), NG4C. **29MHz AM:** WB8KRY.

Signing Off

Thanks to all contributors. Please send all input for this column to teleniuslowe@gmail.com by the 11th of each month. For the June issue the deadline is 11 April. 73, Steve PJ4DX. **PW**

IMPORTANT Ham Radio ANNOUNCEMENT!

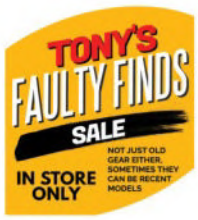
March 18th is "Tony's Discount Day"

Or **DD** for short, starting March 2023, we're introducing our new ***Discount Day*** for in-store purchases only.

Why instore? Several reasons. At the top is having the largest & best stocked showroom probably in the world, (visiting customers words not ours) followed very closely by Tony and his Saturday team offering discounts and special offers for walk-in visitors.

Remember Covid stopping us visiting stores in 2020/2021? In 2023 we want to encourage even more people back into our 6000sqft building full of Ham Radio goodies. It would be such a waste otherwise, and with an air filtration & air conditioning in our showroom, catching any airborne bugs should be slightly reduced. You know about our legendary Tea & Coffee already!

It's also an ideal opportunity to bring in those part exchanges and outright purchases. Throw them in the boot, drag them in to the store and get a super deal that'll guarantee to put a smile on your face.



There will also be a "**Faulty Finds**", sold only for spare parts sale in store only too. "Item faulty & sold for spare parts only" will be detailed on the invoice where we get older gear that's faulty or not worth fixing. Not just old gear either, sometimes they can be recent models but the cost to put right is beyond the value of repair, or "BER". If you've the hours and experience to fix (and find parts that maybe required) you may just get a real gem at a bargain price. On the other hand, you might not… This will be the first time we're giving access to kit usually reserved for the trade that doesn't meet the high standards of used product we sell.

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MyDEL JPC-7 (Dipole Version) covers 40-6m, 100W PEP. All contained in a small carry case for ideal portable use. Beautifully manufactured to a very high standard.

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See MLandS.tv for our full video review of this antenna.

See HamRadio.co.uk/JPC

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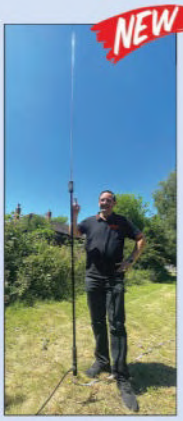

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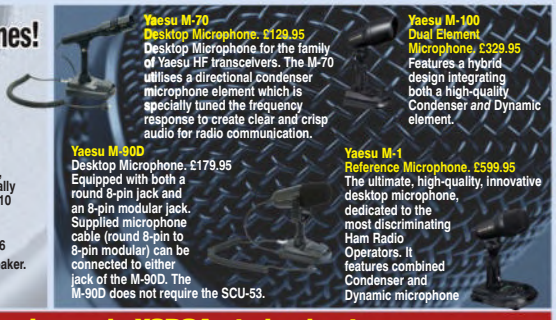

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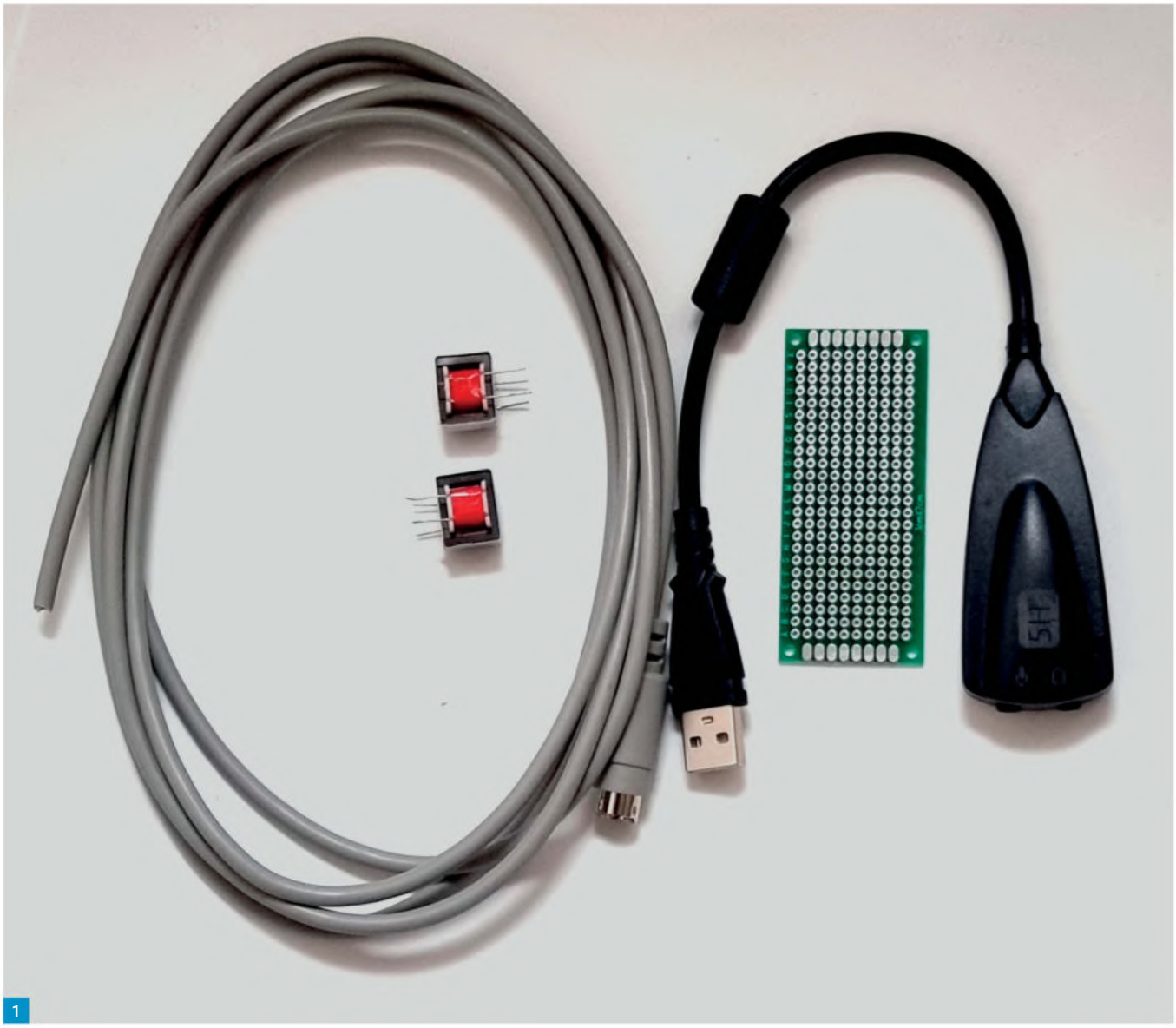


1

Billy McFarland GM6DX
gm6dx@outlook.com

Discover the Data

Billy McFarland GM6DX describes building a soundcard interface for a transceiver that comes without one.

My friend **Paul VK6EMD** had recently purchased a Yaesu FT-891 for mobile and portable use. He gave me a call and we started to talk about the connections for CAT control and for doing data modulation. It was at this point I released that Yaesu installed a USB-B connection purely for CAT control and that there was no in-built sound card, which is needed for data mode modulation. With such a modern rig I personally felt this was a let down by Yaesu but nonetheless I wanted to help Paul so that he could enjoy data modes. I looked at the available connections from the manual and constructed a simple soundcard interface using the following parts:

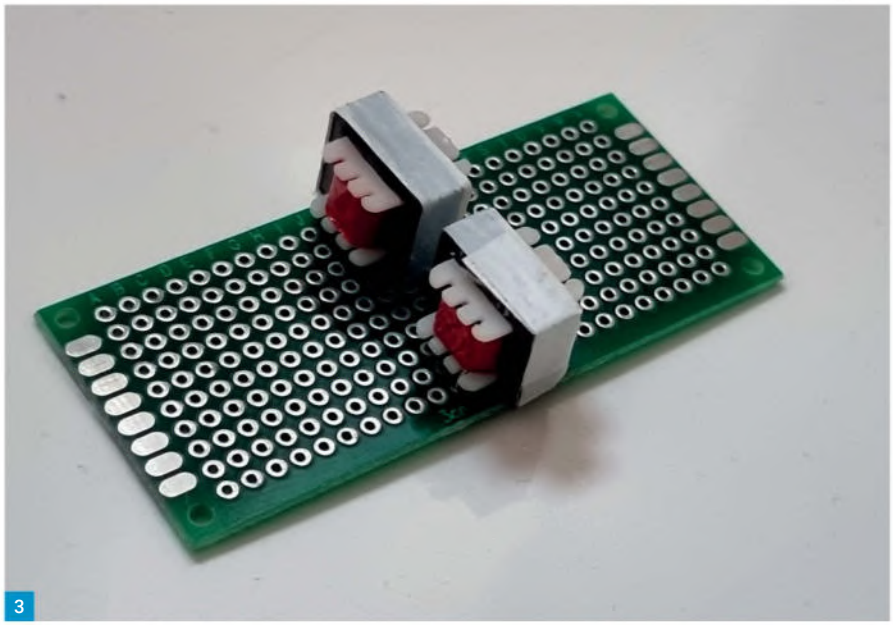
- 1 x USB 7.1 soundcard
- 1 x prototype board
- 2 x 600Ω audio transformers
- 1 x 6 pin mini-DIN with wire
- Some hot glue and heatshrink

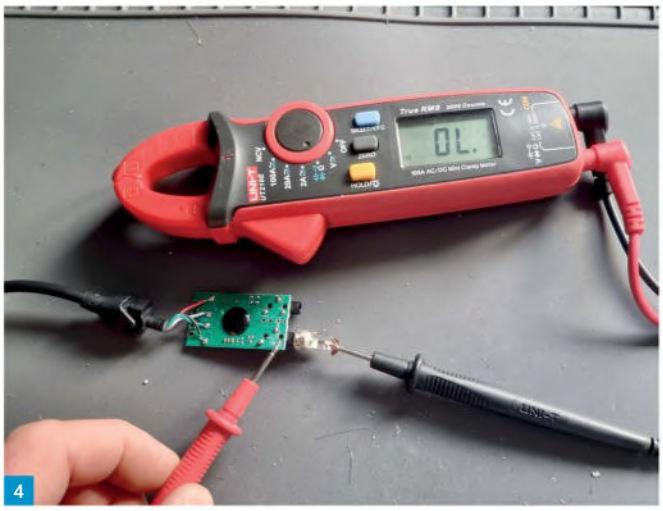
The photo, **Fig. 1**, shows the parts needed to complete this project.

Starting the Build

The first stage was to strip down the USB soundcard. At this point it is important to mark or look at the sockets so that you know the difference between microphone and speaker connections. If you are lucky enough, your soundcard might have a green and yellow socket to differentiate them both. The ones that I used were black meaning I had to mark on the PCB which one was the microphone socket and which one was the speaker socket. Open or separate the plastic enclosure to reveal the soundcard PCB as seen in **Fig. 2** and mark the PCB if needed. Now take your prototype board and place the two audio transformers. Solder the underside just to hold the transformers on the board and ensure there is sufficient room either side of the transformer for wire connections as seen in **Fig. 3**.

Take a 3.5mm stereo jack and remove the hood of the connector. Fit the 3.5mm jack into each connection socket (mic and speakers). Take a multimeter, put it on 'buzz' mode





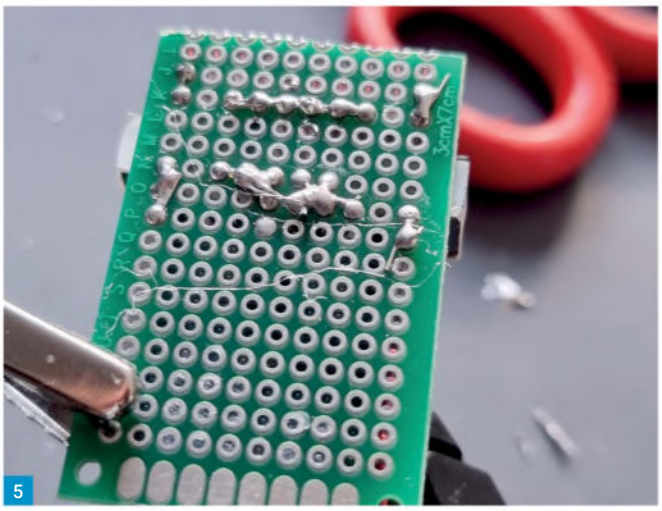


Fig. 1: The parts needed for the project. Fig. 2: Open up the soundcard PCB. Fig. 3: The transformers in place on the board. Fig. 4: Identifying the solder points on the soundcard. Fig. 5: Underside of board. Fig. 6: Connections on top of board. Fig. 7: Attaching the wires for the speaker. Fig. 8: Pin connections for the min-DIN. Fig. 9: The three connections as described in the text. Fig. 10: The completed project.

(continuity) and using one of the multimeter prongs touch the tip solder lug of the jack. Using the other prong find the solder point on the PCB that makes the 'buzz' noise when touched. Now you have identified the electrical connection point on the PCB of the speaker (or mic) tip connection. Follow this process for both speaker and mic, tip and ring connections. **Fig. 4** shows the process of identifying solder points of the soundcard PCB.

Put the PCB to the side for one minute and take four short pieces of wire making sure these are different colours. Solder these to the connection points (all on the same side) of the audio transformers on your prototype board. These wires will be the MIC, MIC GND, SPEAKER and SPEAKER GND. When it comes to these audio transformers I like to connect the grounds to the middle connection points. These connections can be seen in **Figs 5** and **6**. Take your soundcard PCB and apply a small bit of hot glue to the underside. Once the glue is applied, stick it to your prototype board. This will prevent the PCB from moving during soldering. Using the four wires you have just soldered to the transformers, take the ground wire connection and attach it to the speaker ground wire connection of the PCB. Now take the speaker connection wire from the transformer and attach it to the speaker connection of the PCB (green wire ground and red wire speaker in **Fig. 7**). Now do the same for the other audio transformer. This time it is the mic and mic ground connection on the PCB that is needed.

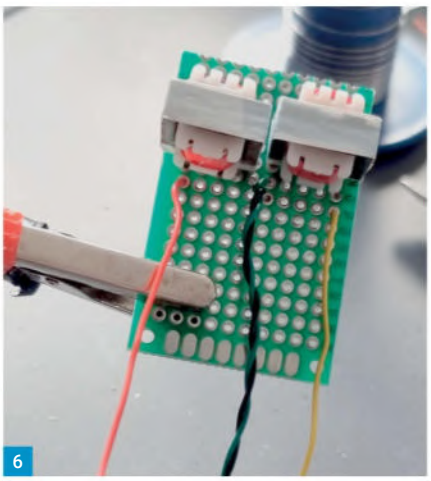


Fig. 7 shows these connections being made.

At this stage you have connected four wires coming from the USB soundcard PCB to one side of the two audio transformers. The next stage is to connect wires from the 6-pin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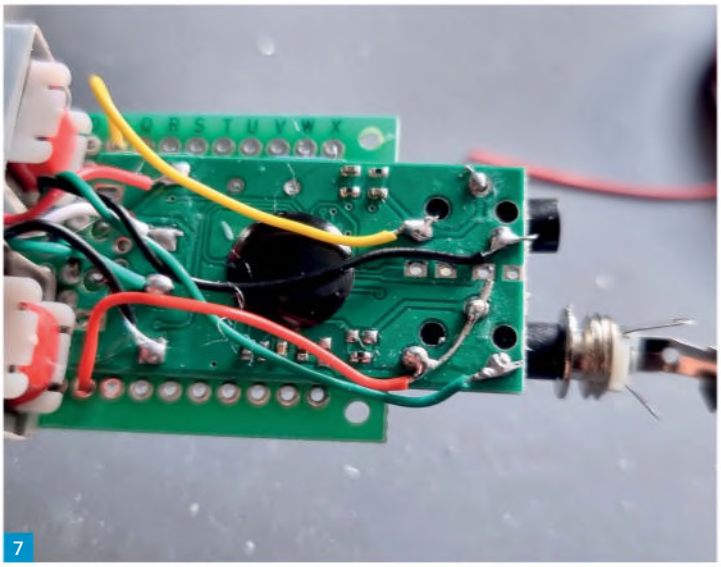
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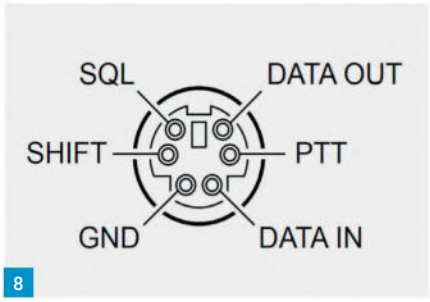

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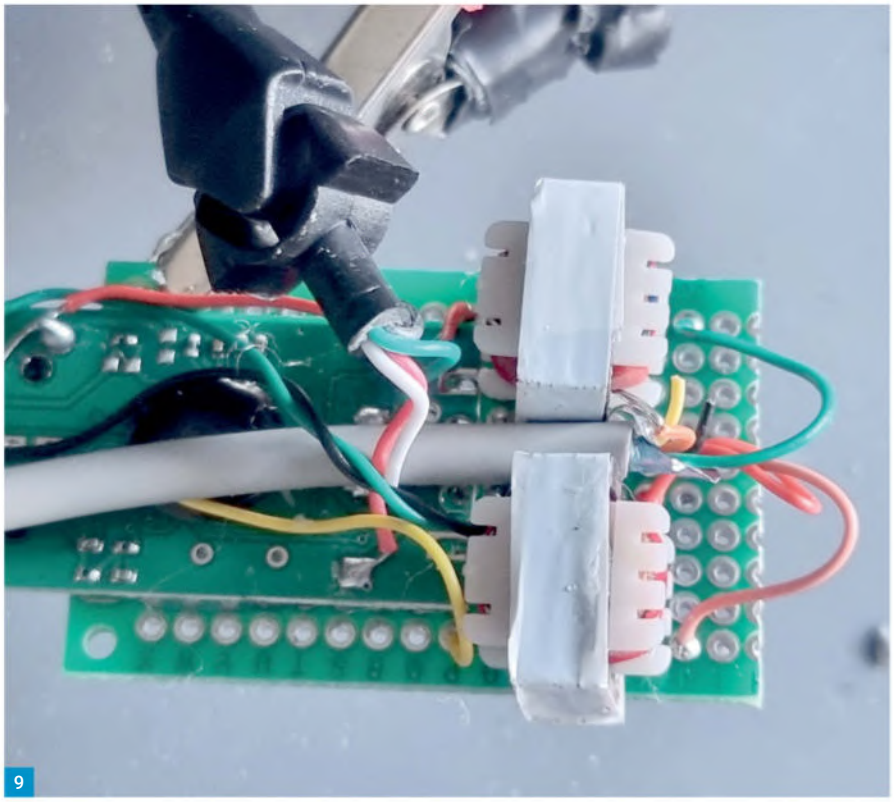
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mini-DIN to the remaining side of the audio transformers. Before we go any further we will need to look at the pinout of the manual for the Yaesu. **Fig. 8** shows the pin-out of the 6-pin mini-DIN. The view shown in Fig. 8 is the view of you looking into the transceiver's socket so please remember this for when you are trying to figure out which pin is which. Take your 6-pin mini-DIN cable and strip back the internal wires. Now with your multimeter again on continuity mode touch the end of the stripped wire with one prong and use the remaining prong to touch one of the pins on the mini-DIN plug. Do this with all wire colours and write down on a piece of paper which wire colour relates to which pin. If it helps, take the plug and lift it up to the computer screen or manual showing the pin-out picture, and motion as if you are going to actually plug it in. This will allow you to double check which pin on the plug corresponds to each connection point of the rig. Once you have the wires identified to each connection point, we only require three wires – ground, data in and data out. The connections will be:

GND > GND, MIC > DATA OUT, SPEAKER > DATA IN

Take the two ground connections of the audio transformers and solder them together (on the underside of the prototype board). Then attach the ground wire from the mini-DIN cable to this same connection point. Now move onto the data-in and data-out connections. Take the data-in wire from the mini-DIN cable and solder onto the audio transformer that is connected to the speaker connection. Take the data-out wire from the mini-DIN cable and solder onto the audio transformer that is connected to the mic connection. These three connections can be seen to the right-hand side of the prototype board in **Fig. 9**.

Completing the Project

That is all the soldering complete. To finish the project off you need to position the wires onto the PCB/prototype board and hot glue everything in place. You can never use too much hot glue. Put some heatshrink over the full project to give you the completed item as seen in **Fig. 10**.

Plug the USB connector into your PC and select the USB soundcard in the relevant data modes software (such as WSJT-X). Take the mini-DIN and install it into the data port of the transceiver and that is the physical connections complete. This project can be constructed for well under £20 and will allow your FT-891 (or FT-857/FT-897 etc) to be connected for data mode modulation. As always, any questions drop me an email at

gm6dx@outlook.com

8m Without a Licence?

Roger Lapthorn G3XBM advocates using the ISM band for 40MHz experiments.

Roger Lapthorn G3XBM
practicalwireless@warnersgroup.co.uk

It is pretty clear that both in the UK and the USA, OFCOM and the FCC are dead against giving access to 8m as a band in the Amateur Radio Service. They even seem reluctant in the USA to grant permits to carry out genuine research. Approvals have to be vetted by the military and they want to keep access to these frequencies as clear as possible perhaps? The Official Secrets Act or its equivalent in the USA is preventing the whole truth being made clear to those who want to know.

It is not just that authorities are neutral: the distinct impression is they are dead set against even a tiny, narrow, digital only, secondary, amateur band despite the case being overwhelming. No doubt those who know are frightened of infringing state secrets and being prosecuted!

However, the 8m ISM band internationally goes from 40.66 to 40.70MHz. Most beaconing activity is centred on 40.68MHz. ISM stands for Industrial Scientific and Medical. These bands allow users to have access to internationally shared spectrum without a licence, but they must not cause interference and must accept interference. Users are not protected. If the intention is to put a product on the market, gear must be type approved and suitably marked. Examples are key fobs, microwave ovens and automatic garage doors.

Recent correspondence with the UK's OFCOM has convinced people that anyone in the UK may legally transmit with beacons in the 8m ISM band without a licence as long as they comply with the technical requirements and the interface requirements shown in IR 2030.

Rules in different countries vary. In the USA, access is controlled by the FCC, whereas in the UK this is controlled by OFCOM. Operation is under ISM rules and is not the Amateur Radio Service, although arguably it is true 'amateur' radio.

At 8m (40 MHz), this means 10mW ERP maximum 40.66-40.70MHz in the UK, which at first sight doesn't look much. Tests were carried out locally to find out how effective just 10mW ERP might be. A modified FT-817ND (to cover the 8m band) was used plus a 20dB attenuator (using standard values – there are lots of calculators on the internet) right on the output to avoid any cable radiation. The antenna was just a low 8m wire dipole. Incidentally, WSPR at microwatts on 10m has spanned Europe.

The equipment used for the tests.

Not being a legal expert, it is up to people to convince themselves of the legality in their own country.

Tests

At first, the modified FT-817ND was used with a 40.68MHz low wire dipole at 1W with WSPR using the call **G3XBM** and reports gathered. Under the terms of 8m T&I permits here in the UK, this was quite legal. On the following day, a 20dB attenuator was added right on the output of the FT-817ND and transmissions with just 10mW ERP WSPR were carried out using the callsign **8M3ISM**. Callsigns are not legally needed for ISM beacons here in the UK.

Other stations have been carrying local 10mW WSPR ISM band tests with 8m antennas at both ends. Over 25km has been covered and certainly further is possible.

Results

As would be expected, fewer local stations spotted the 10mW ERP signal, but two stations at about 17km plus one closer were able to decode the WSPR signals. See **Table 1**. They did this on many occasions. Not a single station used a 40MHz antenna as far as is known. One local spotted the 10mW ERP 8m WSPR beacon even though he was using a 6m band vertical antenna. The 8m dipole here is horizontal! His station is about 10km away. If he had been using an 8m antenna horizontally, signals would have been far stronger!

Timestamp	Call	MHz	SNR	Drift	Grid	Pwr	Reporter	RGrid
2022-11-22 14:32	8M3ISM	40.681512	-22	0	JO02	0.01	G4BAO	JO02cg
2022-11-22 13:34	8M3ISM	40.681558	-22	0	JO02	0.01	MORSU	JO02ai
2022-11-22 12:18	8M3ISM	40.681551	-30	0	JO02	0.01	G4AWP	JO02ah

Table 1: Results of early tests.

Conclusions

From these tests, 10mW ERP WSPR at 8m should be really useful. With proper 8m antennas, even better results are probably to be expected. With good Es propagation stations about 1500km away should copy this. Without the need for a licence in the UK and probably elsewhere, many more people could access the 8m ISM band for beacons perfectly legally. To ensure harmonics do not cause any chance of interference, a very simple external lowpass filter is recommended to ensure compliance with IR 2030. Signal reports suggest even FT8 would work on some paths. QRSS could be better too, of course.

Imagine if several stations were able to send WSPR on the 8m ISM band without a licence. WSPR only needs 6Hz of spectrum. It is clearly advisable to use the 200Hz wide WSPR slot wisely so signals are not on top of others.

On many days 8m WSPR signals could be copied from far away. In all probability, other ISM bands could also be used without a licence for beaconing.

As mentioned before, this is not the Amateur Radio Service but most definitely is amateur radio – self training and research. Two-way communication is not the intention, whereas true research is.

Acknowledgements

Members of the Cambridge and District Amateur Radio Club (CDARC) and other locals took part in these tests. All had my permission. These tests would not have been possible without this help. (The views expressed are those of the author)

References

OFCOM:
www.ofcom.org.uk/home
FCC:
www.fcc.gov
IR 2030:
https://tinyurl.com/3e4pye3n

1

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Castles on the Air

Colin Redwood G6MXL welcomes a new resource for Foundation Training and looks at two Castles on the Air awards programmes that complement each other.

It is a long time since I've seen a new approach to training for the Foundation Exam. **John Hislop G7OHO** has produced an excellent training manual aimed at an audience of 12-year-olds and above, **Fig. 2**. John originally intended the book for a girls' STEM club, and he developed it in conjunction with his STEAMettes. They call themselves the STEAMettes because they like science, technology, engineering, art and mathematics. The book contains 56 activities and over 200 open (not multiple choice) questions and nine mind-maps. It can be found on the Hilderstone Radio Society's website at:

www.g0hrs.org/g7oho-training-manuals

I think the best way to illustrate how different John's approach is, is to quote an example from the book. I happened to land on the introduction to matching on page 35. This uses several non-radio examples of oscillating waves going from one medium to another. "*Before you were born, your mother saw you inside her womb using ultrasound. To enable the ultrasound waves to penetrate the skin, the nurse applied some gel. Without the gel, the waves would have just reflected back.*" There follows an activity to follow this up. "*Two slinkies of different material, such as one plastic and one steel. Connect them in series, with pieces of wire, so you have one long slinky. Send a pulse along the plastic slinky. The wave will reflect with little energy continuing along the steel one.*"

I can see this book being a real asset for tutors delivering a Foundation course in a classroom. The open questions can be used to help tutors get a feel how well students have grasped a particular topic. The book could also be used in a blended approach to offer an alternative to the usual PowerPoints to get over a particular area that students are struggling with. I must really congratulate John for coming up with a new approach to training that I have no doubt will be well received by the training community.

Exam Fees

While on the subject of exams, the fee for sitting the exams is increasing. From 1 April 2023, the Foundation exam will be £32.50, Intermediate £36.00, Full £42.00. The new Direct to Full exam remains at £95.00. Note that these are the fees charged by the RSGB, and that if you elect to sit your exam at a local club, the club may also make a charge to cover its expenses.

Castles on the Air

Over the years I have covered a number of award schemes, including Worked All Britain (WAB), Summits on the Air (SOTA), HUMPS/HEMA, World-Wide Fauna and Flora (WWFF) and Parks on the Air (POTA. This month I am looking at a couple of complementing award schemes based on castles.

What Is a Castle?

For the purpose of the rules of the two awards, besides what most people would recognise as a castle, hill forts, earth dykes, and some stately homes, fortified bridges (and, perhaps surprisingly, some ecclesiastical sites) also count.

World Castles

The World Castles Awards (WCA) cover many countries across the globe. It has an active website at:

http://wcagroup.org

I'd suggest going to the WCA list and downloading it:

http://wcagroup.org/FORMS/WCALIST.xls

There is a separate tab on the spreadsheet for each DXCC entity covered by the WCA, and there is no shortage of eligible 'castles' with six on the Isle of Man, over 110 in Northern Ireland, six on Jersey, over 540 in Scotland, 29 on Guernsey and Alderney, and over 1000 in Wales, **Fig. 1**. While over 430 English castles are listed, I'd suggest looking at the English Castles on the Air award scheme (see below), which lists over eight times as many English castles as the WCA list. For the World Castles Awards, QSOs from 1 January 1995 count towards their awards.

England

Associated with the WCA scheme, there are the English Castle Awards (ECA):

https://englishcastlesawards.uk

Essentially the ECA has the same rules as WCA,

Fig. 1: Conway Castle (GW-00007) is one of over 1000 castles in Wales listed on the Worked All Castles spreadsheet. Fig. 2: The front cover of John Hislop's excellent Foundation Training Manual. Fig. 3: A car park immediately outside the main entrance to Edinburgh Castle (GM-00086) in Scotland. Fig. 4: The WCA e-Log page showing some of the contacts the author has been credited with over the years. Fig. 5: The Belgian Castles and Fortresses website showing the contacts the author has made as a hunter of Belgian Castles.

although only QSOs from 1 January 2021 and later count for the ECA. This scheme is run by **Bob Saunders M0MJA**, the English Castles Awards founder and awards creator/manager. He manages the ECA reference list and is the World Castles Awards Coordinator for England.

As far as I am aware, there aren't separate award schemes for other parts of the British Isles, apart from Ireland, which has over 1500 castles listed on the main WCA list:

https://cotaei.wordpress.com

Missing English Castles

When I first clicked on the link to the spreadsheet on the WCA website to find castles in my area of England, I was surprised to find very many missing – so many that I didn't feel inclined to explore the WCA awards any further. The Welsh and Scottish entries on the WCA website certainly look more complete to me than the English. The list on the ECA website is certainly far better, and I didn't spot any obvious omissions. Over 3,700 castles are listed on the ECA website, in comparison to the meagre 430 on the WCA website. I'd therefore encourage readers looking for English Castles to use the list on the ECA spreadsheet.

https://tinyurl.com/22ap9r7u

Identifiers

The same identifiers are used for both WCA and ECA. They are in the format of DXCC entity prefix followed by a hyphen and a five-digit number. For example, the Tower of London is G-00003.

Hunters and Activators

In common with several other awards schemes, the WCA scheme distinguishes between hunters and activators. Activators are amateurs who operate from within 1km of a castle. Hunters are those amateurs who make contact with Activators. Hunters may, for example, operate from the comfort of their home shacks or elsewhere.

Activation Rules

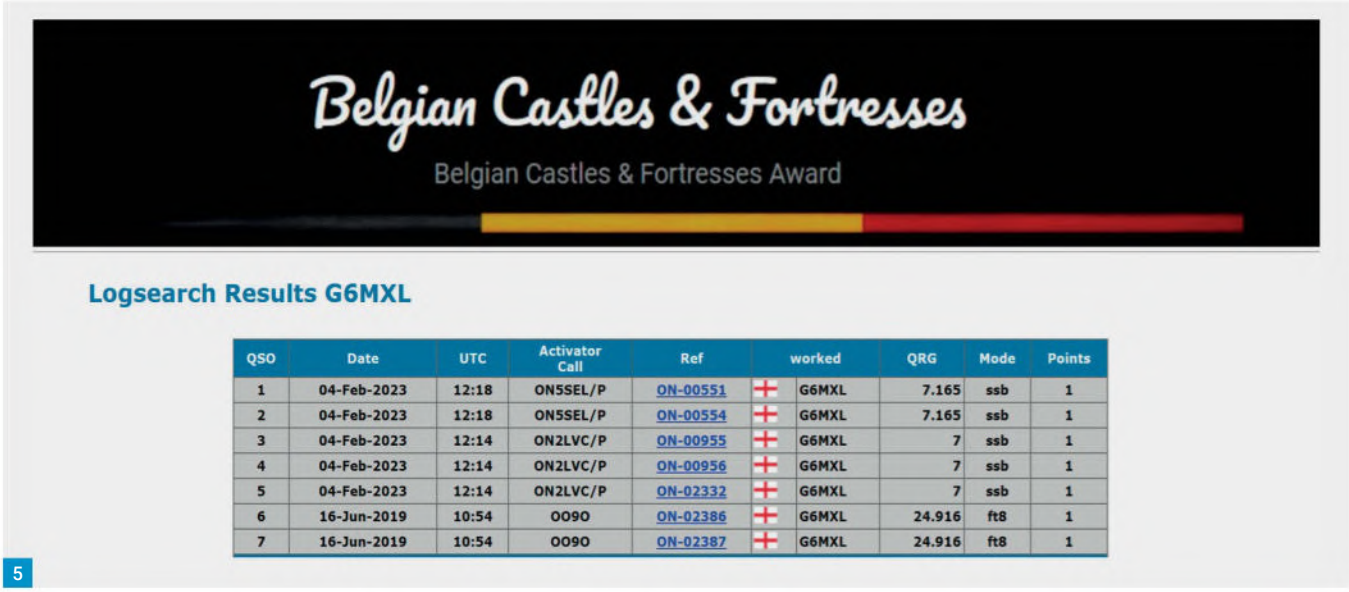
For an activation to count, you must make at least 50 QSOs from within a 1km radius of a castle. The QSOs may be spread over a number of operating sessions over any period of time you choose, but duplicate slots (same callsign worked on the same band and same mode) don't count. Many castles are located within 1km of a second castle, so with careful planning, you may be able to activate more than one castle simultaneously.

The 1km rule is quite convenient in several respects. It means that you don't need to take your station into the castle premises itself, which might involve entrance fees, steep slopes and ground that you'd not be permitted to hammer stakes into. You might be able to operate from an adjacent car park alongside, **Fig. 3**, or at the base of a hilltop overlooked by the castle. Although a downside to this may be that the castle and hill might block radio signals in some directions.

I imagine a number of readers who live within 1km of a castle (perhaps in a village or town immediately outside the castle), might be thinking that they can claim numerous contacts towards the award. I'm sorry to have to disappoint them, as only /P or /M contacts count towards ECA activators awards. However, there is a World Castles Activator Award for resident operators who need to make no less than 1000 contacts from the area within 1km of the castle.

As with many other award schemes, activators are expected to act responsibly and not cause harm to the castles or disturb visitors and not trespass etc.

It is also worth noting that many castles are located within areas of Outstanding Natural Beauty and National Parks, so activating a castle may also count towards World-Wide Flora and Fauna (WWFF) and Parks on the Air (POTA). In addi-



QSO	Date	UTC	Activator Call	Ref	worked	QRG	Mode	Points
1	04-Feb-2023	12:18	ON5SEL/P	ON-00551	G6MXL	7.165	ssb	1
2	04-Feb-2023	12:18	ON5SEL/P	ON-00554	G6MXL	7.165	ssb	1
3	04-Feb-2023	12:14	ON2LVC/P	ON-00955	G6MXL	7	ssb	1
4	04-Feb-2023	12:14	ON2LVC/P	ON-00956	G6MXL	7	ssb	1
5	04-Feb-2023	12:14	ON2LVC/P	ON-02332	G6MXL	7	ssb	1
6	16-Jun-2019	10:54	OO9O	ON-02386	G6MXL	24.916	ft8	1
7	16-Jun-2019	10:54	OO9O	ON-02387	G6MXL	24.916	ft8	1

5

tion, activations in the British Isles will also count towards Worked All Britain (WAB) or Worked All Ireland (WAI) awards.

Activator Logs

Only activators need to upload their logs. In the early days of the WCA, QSL cards were required to confirm contacts. These days, activators can have their logs uploaded to a central database, and hunters can see their contacts listed. Logs for ECA should be submitted in .adi format by email, including the relevant castle reference(s) in the email header to

logs@englishcastlesawards.uk

Full details can be found on the ECA website. The Basic Activator Award requires just five activations (each of at least 50 contacts). Logs for WCA should be sent to

wca11team@gmail.com

My Call	Date (D-M-Y)	Band	Mode	Call	WCA Nr.	Castles
G6MXL	12-May-2013	20m	SSB	CU3AA	CT-01809	AZ-295
G6MXL	11-Feb-2018	40m	RTTY	DK1FW	DL-01732	WBB-24017
G6MXL	11-Feb-2018	40m	RTTY	DK1FW	DL-01733	WBB-24018
G6MXL	11-Feb-2018	40m	RTTY	DK1FW	DL-01735	WBB-24020

4

Hunters

Hunters can see the contacts with castles that have been credited by visiting WCA e-Log page and entering their callsign, **Fig. 4**:

www.qth.cz/wcagroup/export/log_eng.php

Claiming Awards

A range of awards is available for working castles. The basic award is available for working just 15 castles, with others available for working as many 1500 castles! The Hunter award can also be obtained by listeners as described on the respective websites. As the name suggests, English Castle Awards are only available for working English castles.

You can also find links to the various country-specific awards on the main WCA web page. I clicked on the Belgian Castles and Fortresses award page and on entering my callsign was presented with a list of qualifying contacts with Belgian castles that I had already made as a hunter, **Fig. 5**.

Activity Period

In addition to the various awards, I've mentioned above, there is an annual activity period to promote ECA with Castle Cups to be won. In 2023 it takes place from Saturday 5 August to Sunday 13 August inclusive.

There are no band or mode restrictions. Details can be found at:

https://englishcastlesawards.uk/the-castle-cup

Frequencies

While it is possible to use any bands, modes and frequencies that you are licensed to use for WCA and ECA contacts, the frequencies shown in **Table 1** are suggested by WCA for SSB and CW contacts. 80m and 40m are a good choice.

Hints and Tips

I found that starting off as a casual hunter was a good way to start my Castles on the Air journey. I have yet to progress to an activation, but I think that will follow in the near future. I'd suggest keeping an eye on both the WCA and ECA websites, as activators advertise details of activations a day or two before their operation. Spots often appear on DX Clusters, including a Polish one dedicated to WCA at:

https://pzk.pl/dyplomy/wca-dx-cluster

Band	CW	SSB
80m	3.531MHz	3.731MHz
40m	7.031MHz	7.131MHz
30m	10.121MHz	
20m	14.031MHz	14.251MHz
17m	18.081MHz	18.131MHz
15m	21.031MHz	21.251MHz
12m	24.911MHz	24.951MHz
10m	28.031MHz	28.551MHz

Table 1: Recommended CW and SSB frequencies for WCA activators to use.

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1

Amateur Television: An Update

Dave Crump G8GKQ gives an update on UK amateur TV activities – why not join in the fun?

Radio amateurs have been transmitting and receiving television pictures since the late 1940s. However, the techniques used have changed many times since then. Initial transmissions were 405-line black and white; cameras and display monitors were generally homebuilt due to the cost of commercial TV equipment. During the 1970s amateur TV followed the broadcasters and migrated to 625-line pictures with colour following soon after.

Initial transmissions used 70cm AM and 3cm FM. As the available bandwidth in 70cm reduced, activity migrated to 23cm FM. This was, in part, enabled by the availability of cheap satellite TV receivers, which could receive the signals directly.

As satellite TV has transitioned to digital transmissions, so has amateur TV. Initial experiments used heavy, power-hungry ex-broadcast equipment with modified domestic satellite receivers, but it is now possible to use a laptop or a single-board computer (such as a Raspberry Pi) to enable both transmission and reception of Digital Amateur Television. This brings it well within the reach of the average amateur.

Amateur TV Activity

There is amateur TV (ATV) activity on all bands from 50MHz to 122GHz, so if you have equipment for any of these bands, it would be easy to get started. The usual operating frequencies are detailed in **Table 1**.

Most ATV activity in the UK uses DVB-S or DVB-S2 transmissions in bandwidths of between 2MHz and 500kHz. This enables the use of the 71MHz and 146MHz NoV bands as well as allowing us to use all the microwave bands without disturbing other users. The DVB-T mode used for UK terrestrial broadcast has proved to be less robust than the DVB-S/S2 mode used for satellite transmissions.

Amateur TV activity is a lot more relaxed than phone, computer or CW modes, even during contests. The emphasis is on helping each other to transmit and receive the best pictures. There are four sorts of activity which overlap, but each has a different emphasis:

Simplex Operation: Just as for phone or CW, fixed station to fixed station routine contacts take place. These are generally set up by voice calls (on 144.75MHz FM) or skeds, and normally use the 146, 437 or 1296MHz bands over distances up to 50km. Unless specific equipment tests are taking place (when Test Cards would be used) the content is usually talking about progress on the latest technical project, with handheld cameras allowing the detail to be shown. These transmissions generally carry sound as well.

Repeater Operation: There are a number of ATV repeaters around the country. These often have receive inputs on multiple bands with automatic selection of any active inputs. Output frequencies are generally in the 1300MHz to 1325MHz range, or on 3.4GHz. Most repeaters also stream their output on the internet at:

https://batc.org.uk/live

A number also have password-controlled internet inputs. Again, content is usually 'talking heads' and reports of technical progress (or technical problems!).

Portable Operation: The British Amateur Television Club (BATC) promotes an ATV Activity Weekend every month and publishes details of them on its forum:

https://forum.batc.org.uk/viewforum.php?f=75

Prospective portable stations then publicise details of where they are likely to be operating from and what bands they will be using. During the activity weekend, both fixed and portable stations will be active, with shorter duration contacts simply trying to establish that the equipment works over the chosen path. Again, many contacts are arranged over 144.75MHzFM. The photo, **Fig. 1**, shows my own portable setup for one of these events.

On 70cm contacts are regularly made over 200km and, during enhanced propagation, 400km is achievable.

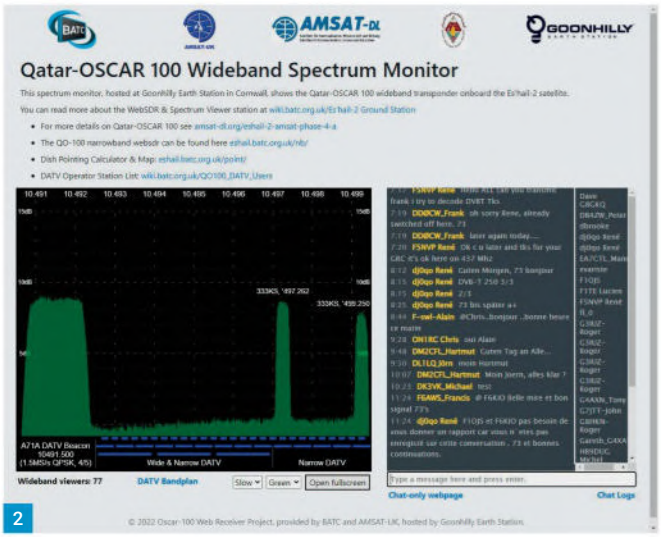
There is an annual IARU ATV Contest in June each year, which attracts around 100 participants across the region where the aim is to pass a four-digit code by video as proof of contact. This is open to both portable and fixed stations.

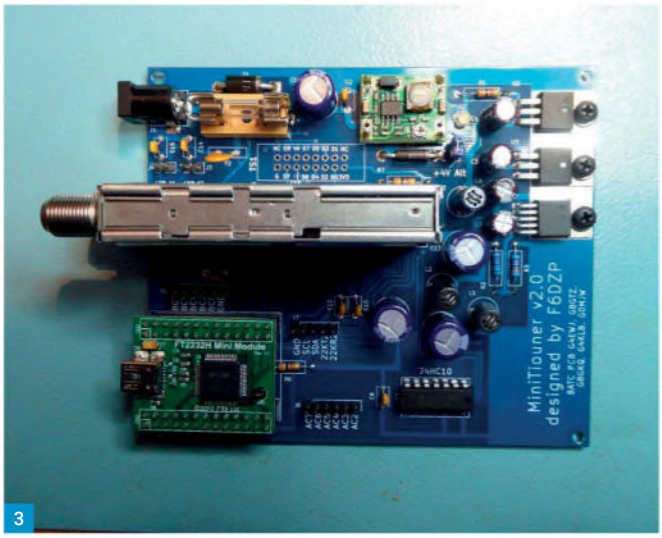
Satellite Operation: The QO-100 satellite carries a wideband transponder for amateur television. The uplink is on 2.4GHz with the downlink at 10.49GHz. The coverage area includes one third of the globe from Brazil to Thailand and from South Africa to Norway. Contacts are both simplex and duplex in many languages. To allow the best use of this valuable resource, there is a spectrum viewer, **Fig. 2**, with a chat window at:

https://eshail.batc.org.uk/wb

Getting Started

The best way to get started with amateur TV is to build (or purchase) a tuner for Digital ATV. This unit, 'The MiniTiouner', **Fig. 3**, takes the received





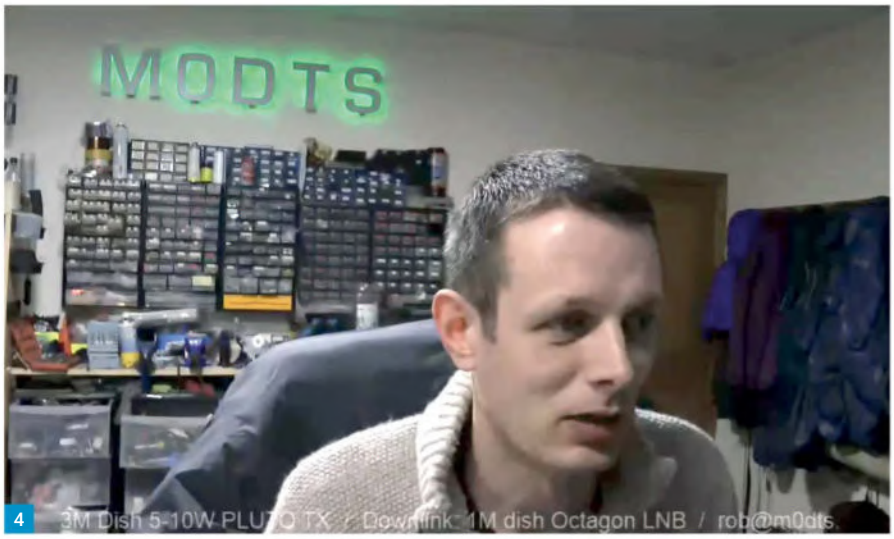


Fig. 1: G8GKQ/P on 146MHz, 1255MHz and 10369MHz DATV. Fig. 2: The QO-100 online Spectrum Viewer with Chat. Fig. 3: The MiniTiouner Amateur TV Tuner. Fig. 4: A Typical DATV Picture Received on QO-100. Fig. 5: The BATC Portsdown 4 Touchscreen-controlled DATV Transceiver. Fig. 6: The BATC Ryde Receiver with Remote Control and On-screen Menu. Fig. 7: The DATV-Easy Software enabling ATV Transmissions from a Windows PC. Fig. 8: A 1.2m QO-100 Dish with Adjacent PA in Waterproof Box.

signal from your existing receive preamp or down-converter, and connects to a PC or Raspberry Pi by USB to decode and display the received pictures (and sound). The MiniTiouner is a very versatile unit and covers input frequencies from 144MHz to 2450MHz; it just needs a good preamp in front of it.

Construction of the MiniTiouner is described in detail on the BATC Wiki:

https://wiki.batc.org.uk/MiniTioune

The hard-to-get components are stocked by the BATC's online shop. Although it is an easy build, some operators may prefer to buy a ready-built version, such as this example from Elad, available from Wimo:

www.wimo.com/en/pf-rxsat

Using the MiniTiouner, and the free MiniTioune software on a PC, you can watch amateur TV transmissions in your local area.

QO-100 Receive

To receive ATV transmissions relayed by the QO-100 satellite, you will need at least an 80cm dish pointed in a similar direction to the satellites used by Sky TV. Exact pointing of bearing and elevation for your location can be calculated from a link on the QO-100 Spectrum Viewer page. A normal domestic 'Universal' LNB can be used on the dish – this will amplify and down-convert the signal to the 740 – 750MHz range. There is a getting started guide on the BATC Wiki here:

https://tinyurl.com/28j8mtyx

It is easiest to align the dish on the stronger, vertically polarised, narrowband transponder beacon signal first and then switch to horizontal polarisation to receive the QO-100 ATV beacon. The alignment is critical so that you receive a strong enough signal to decode some of the weaker stations. The photo, **Fig. 4**, shows a picture received via QO-100.

If you want a preview of the activity on QO-100, you can watch the live stream of the BATC QO-100 net on the BATC Streamer (URL below) at 8pm every Thursday evening.

https://batc.org.uk/live

Getting Going with ATV Transmit

The BATC Portsdown 4 project, **Fig. 5**, is ideal for beginners to ATV. It uses a Raspberry Pi 4, controlled by a touchscreen, to drive a software defined radio (such as the Pluto or LimeSDR) to generate a few milliwatts of digital ATV. This can then be amplified in a linear amplifier up to a reasonable power level and transmitted using your existing antennas. The pictures can either come from a Raspberry Pi Camera, certain USB webcams or an old camcorder with a video output. The same Raspberry Pi and Touchscreen can be used with the MiniTiouner for receive.

No computing knowledge is required, as pre-programmed SD Cards are available from the BATC Shop, and there is very little soldering to do; most of the parts simply plug together. The project is described in detail on the BATC Wiki:

https://tinyurl.com/2sk2e328

Over 500 examples have been built. It provides the ideal starter home station and is perfectly suited to portable operation.

Linear amplifiers for Digital Amateur TV need to be a lot more linear than required for SSB. Typical amateur market PAs can only be driven to about one quarter of their rated power otherwise the signal develops 'shoulders', which interfere with adjacent channels or, worse, transmit out of band.

A Simple Receiver for the Shack

You do not necessarily need to use a Windows PC with the MiniTiouner. You can also use a Raspberry Pi 4 connected to an HDMI monitor, all controlled from an infra-red remote control – just like a domestic satellite TV set-top box. The BATC have

Frequency	Mode	Parameters	Notes
29.25MHz	DVB-T	333kHz QPSK	Max 500kHz bandwidth
51.7MHz	DVB-T	333kHz QPSK	Max 500kHz bandwidth
71.0MHz	DVB-T DVB-S2	333kHz QPSK 333kS QPSK	NoV required. 70.5 - 71.5MHz
146.5MHz	DVB-S2	333kS QPSK	NoV required. 146.0 – 147.0MHz
437.0MHz	DVB-S2	333kS QPSK 1MS QPSK	Band Plan 436.0 – 438.0MHz
1255.0MHz	DVB-S2 FM ATV	Various SRs	FM ATV being replaced by DATV Caution not to interfere with Primary User
2395.0MHz	DVB-S2	Various SRs	
3405.0MHz	DVB-S2	333kS	
5665.0MHz	FM ATV	Wideband FM	Using FPV Drone equipment
5762.5MHz	DVB-S2	333kS	Using NB Transverters (from 146.5)
10370.5MHz	DVB-S2	333kS	Using NB Transverters (from 146.5)
24047.5MHz	DVB-S2	333kS	Using NB Transverters (from 143.5)
47090.5MHz	DVB-S2	333kS	Using NB Transverters (from 146.5)
75978.5MHz	DVB-S2	333kS	Using NB Transverters (from 146.5)

Table 1: Amateur TV Recommended Frequencies

6


7

a complete design for this, known as the Ryde Receiver, **Fig. 6**, and pre-built SD Cards with the software on are available from the BATC Shop. This receiver is ideal for receiving all the high-definition pictures that are available from QO-100 and local repeaters. It is also capable of playing the video streams from the BATC website.

Using a Windows PC for Transmit

The Portsdown project provides a simple transmitter, but higher quality pictures can be transmitted in a narrower bandwidth using the capabilities of a modern PC with a dedicated graphics processor. The PC can also act as a video mixing desk enabling very professional-looking transmissions. The software at the heart of this is DATV-Easy, **Fig. 7**, which is written by F1EJP and available for free download from the VivaDATV forum (registration required):

www.vivadatv.org

The free video mixing software 'OBS' is very popular, although some users prefer the paid-for vMix. Note that there is a free trial of the HD capabilities of vMix, but this only lasts for 60 days after which the software reverts to standard definition only.

The output from the video mixing software is fed to the DATV-Easy Software, which controls the video encoding on the graphics card and drives the SDR, which generates the RF. It works with either the Pluto or LimeSDR.

Transmitting to QO-100

The uplink to QO-100 is in the band 2401MHz to 2410MHz, and typically needs about 50W of RF into a 1.2m dish to achieve reasonable results. You can use a separate transmit dish or you can use a single combined feed for transmitting on 2.4GHz and receiving on 10.49GHz. There is a published design for a combined feed (the 'POTY') that can be home constructed from copper tubing and copper plate.


5

One challenge for QO-100 is finding a power amplifier that you can put close enough to the dish so that you still have 50W after feeder losses. Most operators use converted surplus mobile phone base station equipment, mounted in a waterproof box next to the dish, **Fig. 8**.


8

ATV Fun using 'Drone' Transmitters

While most ATV activity uses digital techniques, it is possible to use the cheap analogue transmitters and receivers used for relaying drone video on the 6cm band. These modules can be bought cheaply on eBay for under £20 each and many of them can be tuned to 5665MHz, which puts them within the 6cm band. They work with old camcorder cameras and PAL monitors, which are now available very cheaply on the second-hand market.

With small panel antennas, it is easy to send pictures over 10km to 20km line of sight paths. Using larger dishes, 100km paths can be covered.

Information and Support

The British Amateur Television Club supports a very active online community of ATV enthusiasts – almost 1500 worldwide. In addition to producing a quarterly magazine, the BATC host a Wiki and a forum for questions and answers. All the capabilities described in this article are supported with 'how-to' guides on the BATC Wiki:

https://wiki.batc.org.uk

The forum and the Wiki are open to all, but to get the most recent copies of the magazine membership is required.

BATC membership is cheap at £8 per year (or £20 to be mailed the printed magazine). Free membership is offered to students under 25 in full time education.

Conclusion

Amateur TV is a fascinating extension to amateur radio, and most operators with an existing VHF or UHF station will only need a Minitiouner to get started.

You can see what is happening by looking at the BATC Streamer; it's especially worth viewing the Thursday evening 8pm QO-100 net on the live stream:

https://batc.org.uk/live

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WSJT and SDR

Mike Richards G4WNC starts with a look at the improved performance of WSJT-X v2.6.1. This column is also the start of a new series where he explains the principles and measurements behind today's SDR rigs.

Now that the full-release version of WSJT-X v2.6.1 is available, I thought it would be good to make a fresh comparison with its leading competitor, JTDX. First, you need to be aware of some changes to the WSJT-X website. The Princeton version of the site was down for an extended period over Christmas while the university carried out some major improvements. During this time, WSJT-X activity focussed on their SourceForge site (URL below). At the time of writing, this remains the best site to use as it has the most up-to-date versions of the software.

wsjt.sourceforge.io

WSJT-X v2.6.0 was released, followed quickly by v2.6.1, which provided some bug fixes for the Q65 modes and a couple of FT8 issues. The 2.6.0 version was a major release and supplied several significant enhancements, including mode selection buttons on the main window, improved performance for FT8 and many more. Full details can be found in the release notes and the updated user guide. I was particularly interested to see how the improved FT8 performance fared using the comparison technique I developed to compare WSJT-X with JTDX.

WSJT-X vs JTDX Comparison

Let's begin by briefly running through the comparison process. The audio source was a recording I made during a contest a few months ago. This high-quality 48kHz audio recording was edited to start at the beginning of a decode cycle and run for about five minutes. The file is played back using the Audacity cross-platform audio editor and recorder. The digital output from Audacity is fed into a Virtual Audio Cable (VAC), and this same VAC is used as the input source for WSJT-X and JTDX. This lets me run the decoders simultaneously. The PC is an Intel 10th Gen i7 processor based with lots of memory, so it can easily handle dual decoding. Both programs were operated using their default settings, other than changing the WSJT-X receive bandwidth to 3kHz to match that used by JTDX.

Before commencing the measurements, I erased the ALL.txt file in both WSJT-X and JTDX. I then began the playback manually by watching the 15-second decode cycle and starting playback at the beginning of a cycle. At the end of the recording, I imported the two ALL.txt files into an Excel spreadsheet. Once imported, I use various techniques to tidy up the data and remove white space and other unwanted characters. I then used the Excel COUNTIF function to find and highlight unique decodes. By unique, I mean a message decoded by one package but missed by the other. I completed the comparison by manually examining the unique decodes and discounting those that were not genuine unique decodes. For those wanting to run their own comparisons or take a closer look at my data, I've published the spreadsheet and the audio file in a post on my website:

www.g4wnc.com

WSJT-X v2.6.1 showed a worthwhile improvement, achieving 427 decodes against 429 from JTDX. The difference is so small as to be insignificant. The corrected unique decodes show that WSJT-X decoded eight messages that JTDX missed, whilst JTDX decoded 14 messages that WSJT-X missed, **Fig. 1**. These are very small margins, so we can safely say that the performance difference is insignificant. However, for those wanting to squeeze the last gram of performance, I think JTDX may offer more decoder control, but you do require some expertise to coax the additional performance.

Understanding SDRs

Software Defined Radio has become commonplace, and most new transceivers use the technology in some form. Because of this, I thought it would be helpful to work through the elements of an SDR rig to understand more about how they work and how to interpret the measurements and specifications.

Let's begin by setting out what I mean by the term SDR. Software Defined Radio is a very broad term that covers a multitude of radio technologies. Many popular and low-cost SDRs, such as the RTL-SDR dongles, SDR-Play and Airspy ranges, use a mix of analogue and digital technologies. If we take the RTL-SDR dongle as an example, the RF front-end and frequency conversion stages employ traditional superhet techniques with a mixer and local oscillator, **Fig. 2**. The digital conversion occurs only when the signal has been mixed down to baseband. With most SDRs, the primary factor determining the price range is the point at which the analogue to digital conversion (ADC) occurs. The cost rises significantly as the digital conversion gets closer to the antenna. This is because we are digitising much higher frequencies, so the analogue to digital conversion sample rate must be much higher, which also means the output data rate from the ADC becomes exceptionally high.

For example, a typical HF transceiver covering up to the 6m band, will sample the signal at just over 122MSPS (million samples per second). It is also likely to use a 16-bit ADC, so the output data rate becomes 16 x 122M = 1.952 Gb/s. That's a very high data rate and moving data at that speed can be challenging. However, for an SDR, we need to be able to perform calculations on that data in real-time. As a result, the ADC is usually very expensive, and output processing needs to be handled using a Field Programmable Gate Array (FPGA). An FPGA comprises thousands of logic gates and other functions connected in software to create a customised chip. In addition to being very fast, FPGAs can process data in parallel, so they are ideal for the real-time processing of high-speed data. The snag is that they are expensive and require specialised programming skills (also expensive) to configure them!

Before I go on to describe SDR principles in more detail, let's summarise the main benefits.

Flexibility – As the available modulation and demodulation modes are defined in the software, new modes can be added by updating the software. This applies to many other radio features where a software change can transform performance. This flexibility is particularly useful in commercial and military applications because standard hardware can be reconfigured to produce various products.

Superb Filtering – For amateur radio use, one of the major benefits is the ease with which very sharp, 'brick wall', filters can be created. These can be used to provide very precise bandwidth control or extremely sharp notch filters.

Spectrum Displays – SDRs provide detailed spectrum displays that bring the convenience of click tuning along with the ability to view the activity on an entire band.

Simplified Radio Architecture – In designs where the ADC is located near the antenna, the analogue hardware requirement is significantly reduced and often comprises an attenuator, variable gain amplifier and a single filter.

Low Cost SDRs

Let's begin the analysis with a look at the RTL-SDR dongle and specifically the RTL-SDR BLOG V3 dongle, as this is a good example of this class of devices. The two main components are the Rafael Micro R820T digital TV tuner chip and the RTL2832U digital TV demodulator chip. I've shown a block diagram of the RTL-SDR Blog dongle in **Fig. 3**. The role of the R820T tuner is to convert the incoming RF signal into a 2MHz wide, low IF. The chip includes a programmable gain RF amplifier followed by a tracking RF filter and then the mixer. The local oscillator signal for the mixer is provided using a programmable fractional Phase Locked

JTDX Unique Messages					Corr No
20230208_140300	-6	2.1	1541	OY1DZ YO3GOD KN34	1
20230208_140300	-17	-0.4	434	GI5KSO EA8CBP IL18	1
20230208_140345	-5	0.8	1206	RK4FF EA5/DH0YAH 73	1
20230208_140400	-11	0.5	1975	4S6NCH DD1US JN49	1
20230208_140400	-13	0.5	1993	GI5KSO OH3HE KP32	1
20230208_140415	-17	0.5	1015	DL1LSL RL6LS -04	1
20230208_140430	-19	1.5	1906	CQ F1PPH JN07	1
20230208_140430	-9	0.1	1413	F4JAR UX7UU -19	1
20230208_140430	-16	0.5	2189	SP6AXW W1PY -01	1
20230208_140500	-13	0.5	1044	FT8WW IC8SQS -05	1
20230208_140500	-19	1.4	1906	CQ F1PPH JN07	1
20230208_140530	-22	1.5	1906	CQ F1PPH JN07	1
20230208_140600	-18	1.4	1906	CQ F1PPH JN07	1
20230208_140645	-19	0.5	898	IU2QDB IW6ON 73	1
				Total =	14

WSJT-X Unique Messages					Corr No
230208_140315	-18	0.3	834	YO3GOD OY1DZ -09	1
230208_140430	-21	0.5	1158	WA0LJM J72GCG -11	1
230208_140500	-24	0.5	1159	WA0LJM J72GCG RRR	1
230208_140545	-19	0.5	1385	G1ZHD IZ7MFY -08	1
230208_140600	0	2.3	440	CU3HN YC3BMX OI62	1
230208_140630	-21	0.8	710	M0BEN UA3ALF R-05	1
230208_140715	-22	0.5	1501	VE7ON S56KFG -06	1
230208_140730	-18	0.6	2166	F1MLZ RA3ABG KO95	1
				Total =	8

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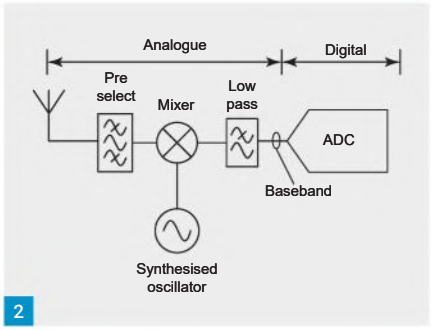

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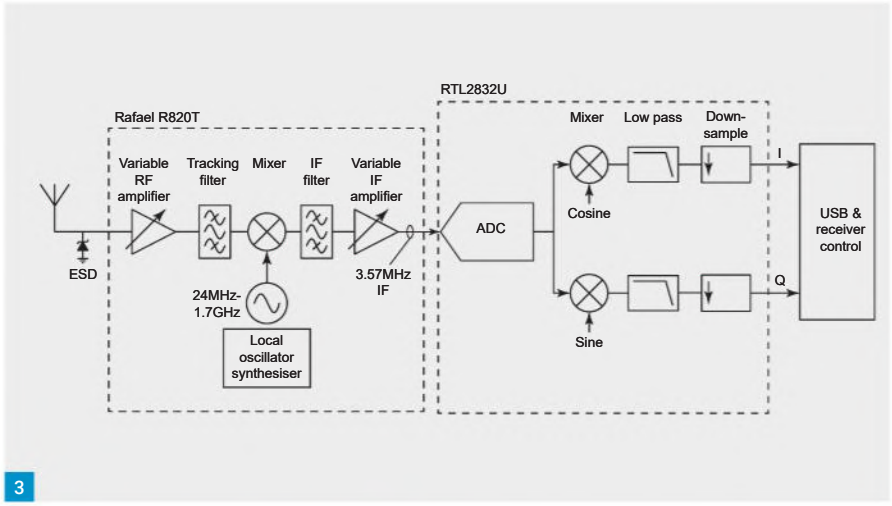

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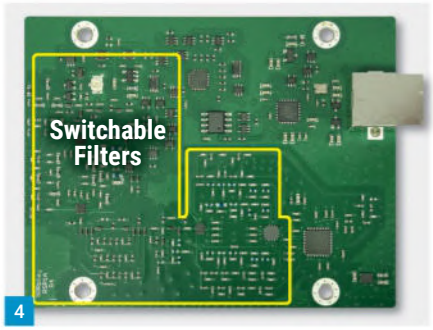

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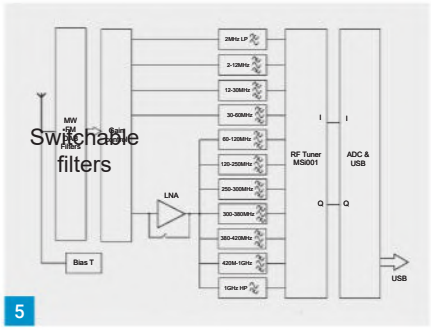

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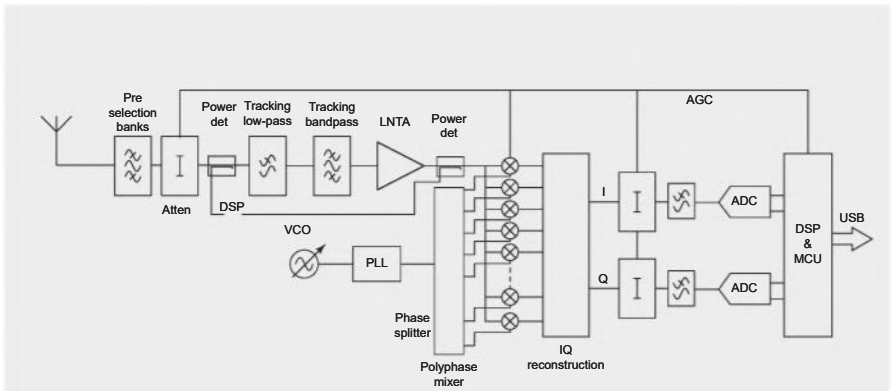

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Fig. 1: Table of unique decodes from WSJT-X and JTDX. Fig. 2: Typical low-cost SDR Dongle architecture. Fig. 3: Simplified block diagram of the RTL-SDR Blog V3 dongle. Fig. 4: SDR-Play RSP-1A PCB. Fig. 5: SDR-Play RSP-1A block diagram. Fig. 6: Airspy HF Plus Discovery simplified block diagram.

Loop (PLL). Using a fractional PLL is important as it reduces the phase noise. I'll cover that topic in more detail later in this series. While the signal path through, and the output from the tuner, is purely analogue, all the tuning and gain control is performed digitally via an Inter-Integrated Communication serial link. This link is commonly called I2C. Despite its simple architecture and small size, the R820T tuner offers surprisingly good performance. The major performance issue is managing the dynamic range of the applied RF and protecting the mixer from strong out-of-band signals. If these interfering signals get through to the mixer, they can cause overload and increase the number of spurious signals in the received spectrum. As the R820T tuner only covers from 64MHz and above it is relatively easy to provide front-end filters to block out strong signals, i.e. the VHF-FM broadcast band.

Some of the more sophisticated receivers such as the SDR-Play series use a similar architecture with an analogue front-end, but the tuner chip (Mirics MSi001) is designed to handle a wider spectrum from Longwave through to digital TV. With such a wide frequency range, managing the incoming signal levels becomes significantly more difficult. If you look inside an RSP-1A, **Fig. 4,** you will see that a large proportion of the PCB is dedicated to switchable RF filtering. In **Fig. 5** I've shown a simplified block diagram of the RSP-1 where you can see that there are 11 switchable filter blocks, a switchable amplifier and gain control before the signal reaches the tuner chip. This design has evolved over the years and squeezes a very good performance from the chipset. The Airspy Discovery HF+ is in a similar price range but uses a next-generation TV tuner chip-based design, that includes polyphase harmonic rejection mixers. In addition to rejecting harmonics up to the 21st, the polyphase mixers are passive and far less prone to overload. Partnering with the polyphase mixers is the use of N-Path tracking bandpass filters. N-Path filters are simple switched capacitor-based filters but suffer the weakness of passing harmonics of the centre frequency. While this has limited their usefulness in the past, the use of harmonic rejection mixers overcomes that problem, so N-Path filters and polyphase mixers are made for each other! The result is a receiver with superb performance, and I've shown a block diagram in **Fig. 6**.

Next month I will delve much deeper into SDRs and specifically the analogue to digital conversion process. This critical building block of any SDR has a significant impact on the RF performance, so it's worth spending some time to get to grips with the different methods of analogue to digital conversion. **PW**

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1

What Constitutes a Contact?

Tim Kirby GW4VXE reports on a bumper month for VHF/UHF propagation, but starts by answering a question.

Nick Bennett 2E0FGQ posed an interesting question following a QSO we had on 2m FT8. He wrote, "*Towards the end of our QSO the WSJT-X software had already popped up the log QSO box and I had clicked that, but your final RR73 was in the process of being received. I never got that, but the logging laptop (over the network) had already accepted it as a QSO. In effect, we had exchanged signal reports and callsigns, so from my point of view it was a genuine contact. However, I suspect that from your perspective, it was not completed if the software didn't receive my RR. It could be that there are many one-way QSOs like this (due to signal strength suddenly dropping) where one party logs it and the other feels they cannot. Often, the aggrieved party will continue to send their final report, fully expecting, and hoping, that the other side will eventually respond, but often, the other side has moved on. Not the end of the world, but interestingly a slight weakness of digital modes where you don't have that immediacy of voice 'overs' and a full 15 seconds of time where signals can drop. I wonder what others feel about this, and what they feel constitutes a 'proper' FT8 QSO for logging purposes*".

I replied to Nick, "*It's an interesting, almost philosophical question! I have always tried to work by the IARU minimum exchange for a valid VHF QSO (see URL below), where both callsigns should be exchanged, as well as a report and an acknowledgment of that report should be received. It all goes back to the days of playing meteor scatter with high speed keyers and tape recorders! So, in the case in point, I'd got an R report from you, although I didn't get a 73 from you, I'd happily consider the QSO complete as all the required elements were satisfied. The difficulty, of course, is that because I didn't get the final 73, I might not have logged it because the software didn't prompt me to do so. If I had reason to believe you were likely to want a confirmation, then I certainly would have done! I've encountered this a few times and have been happy to go back through the WSJT.ALL file, checking what I received and upload an LoTW record accordingly. That depends on the other party emailing and asking what happened of course*".

https://tinyurl.com/yckh9v4v

I see some people saying that they don't log QSOs unless the final 73 is received. That's up to them, but it's not necessary. After all, you could, in theory go on and on with different levels of acknowledgements.

Thanks to Nick for an interesting question. I suspect that some VHF operators may be unaware of the IARU's definition of 'what constitutes a QSO'. It's worth bearing this in mind when operating on FT8 and the other digital modes.

The 8m Band

Roger Lapthorn G3XBM (Cambridge) has had reports from the USA and Canada of his 2.5W FT8 signals on the 8m band and has seen signals from the Caribbean, Eire and Croatia. Roger is still waiting to hear from OFCOM whether his Innovation and Trials licence will be renewed after April this year.

Great to hear from **Paul Farley G7PUV** who operates as **G9PUV** on 8m. Paul writes, "*40MHz has burst into life after a quiet few weeks with F2 propagation to the US most afternoons this week. It's been really encouraging to see so many well known 6m callsigns enthusiastic about 40MHz and sending reports to the Cluster, in the chat rooms or via direct email. What has been interesting is to see how few stations are using antennas designed for 40MHz, most use either 50MHz Yagis or in some cases 28MHz. It shows how well less than optimal setups can perform on 40MHz.*

"With so few countries allowing access to 40MHz the majority of my reports are reception of my FT8 signal but it's been very interesting to see how far it reaches and how often the F2 MUF reaches 8m. Up until now it has yet to reach 6m although my highest recorded MUF based on Low VHF monitoring has been 45MHz so it's creeping closer to the magic band".

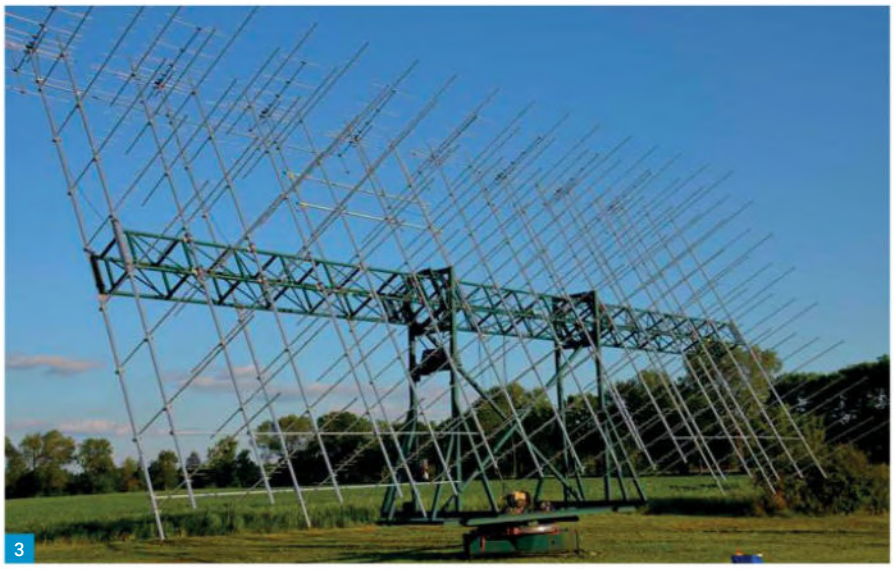
Some of the interesting reports that Paul has received include TI5/N5BEK (EJ79) on 18 January and RV6LCY (LN08) on 21 January. 8 February was a great day and Paul had 15 reports from the US east coast, with signals up to +18dB as well as XE2JS (DL68), HC2FG (FI07), WM2XEJ (EM83) – two way. On 9 February, Paul was heard by OD5KU (KM73) although they'd had a two-way on Christmas Day. Paul notes that the F2 MUF in the mornings is often above the 40MHz ISM band and numerous radars and data bursts can be heard in the band, or above it, beaming out to the East. When the band is open in the afternoon towards North America, nothing is heard either in band or even below it. So, any monitors in the Middle East and Asia would be very welcome indeed!

The 6m Band

Steve Telenius-Lowe PJ4DX writes, "*In the last month I did work two stations in the Canary Islands on 6m FT8, EA8RH on 17 January and EA8/DL9XJ on the 18th but, apart from a couple of semi-local PY stations, I only found one other opening during the month. It was, however, quite a spectacular one! From 2325UTC on 29 January until 0030UTC on the 30th Eva PJ4EVA and I worked 23 ZL stations in the ZL2, 3 and 4 call districts. We both also worked VK3KJ and I also worked VK3DUT. Best DX was VK3KJ at 15,760km*".

Here at **GW4VXE** (Goodwick) I caught an opening to the south on 28 January, working into EA6 and EA7.

Photo 1: Although not active on VHF yet from his new location, Colin Fawcett G8YIG has been working on his new shack.
Photo 2: A screenshot of the reception reports received on 8m on 18 February by G7PUV. Photo 3: The huge moonbounce array used by DL7APV. Photo 4: VHF/UHF Contesting US style, the inside of the rover station operated by N7DSX and K7LSX.



The 2m Band

David Johnson G4DHF (Spalding) enjoyed the spectacular tropo event at the end of January. David said that the duct was incredibly narrow and when he turned his beam more than 10° away from the 65° heading, he lost propagation. Highlights of David's log include RA3LX (KO65), RA3LBW (KO64), EA3LBK (KO64), UA2FBW (KO04), RA2FX (KO05), OH4MVH (KP32), OH1ND (KP00), OH3NE (KP11), OH2FNR (KP20), OH1NG (KP10), OH2LIY (KP20), OH2FQV (KP20), OH3KLJ (KP21), OHOAZX (KP00), OG2G (KP00), YL2FZ (KO37), YL3AJE (KO16), YL2RN (KO26), EU6MW (KO55), EW6FS (KO35), EW6D (KO55), EW6EM (KO54), EW7RF (KO55) and LY2BRA (KO14). RA3LX was David's best DX at a distance of 2198km. There were plenty of SP, SM and LA stations too, but as David says, those were local by comparison. Interestingly, David says that for a day until the duct moved south into the UK, he and his neighbour **Dave G0LBK** (JO03) had most of the opening to themselves! David says that the last time he remembers an opening like that was back in 2007 when he was working UA stations on CW. In those days there was no ON4KST nor digital modes!

Kevin Hewitt ZB2GI (Gibraltar) has been monitoring APRS on the 144.800MHz FM channel and says that he received 1649 packets during an overnight test, consisting of APRS position, telemetry, BBS and DX Cluster reports. Clearly no shortage of activity in the area.

Ian Bontoft G4ELW (Bridgwater) says that he finally saw some better conditions on 2m tropo towards the end of January. Ian's first QSO out of the UK since the start of December was on 21 January when he worked F4BKV (IN95). During the 23rd and 24th, Ian watched as many of us did in the west and southwest, while the stations in the east had a field day towards Scandinavia and beyond. However, on 24 January, Ian worked OZ5TG (JO45) and OZ1BEF (JO46). On 3 February, the band opened up to the south and Ian worked EA1U (IN83), F6GNR (IN97), F6CIS (IN94), F5LMG (IN88), F0GOW (IN96), F6GRA (JN04), F4BKV (IN95) and EA2XR (IN83). The good conditions continued next day when Ian worked EC2BBS (IN93), F6BQX (IN96) and EA1UR (IN53). All Ian's QSOs were made using 15W of FT8 to a 5-element Yagi at about 4m above the ground. Ian does mention that he's working on the idea of a tower.

Tony Collett G4NBS (Cambridge) switched on his 2m system by chance on 23 January and was delighted to work OH1ND (KP00) who was the only signal seen. During the opening to the south on 4 February, Tony worked EA1M (IN53), EA1UR (IN53), EA1GCN (IN73), EC2BBS (IN93), F6CIS (IN94), F4BKV (IN95), F6BQX (IN96), F6APE (IN97) and F5DYD (JN03). On the afternoon of 8 February, Tony worked DK3EE (JO41), EI4ACB (IO62) and G4ITR (IO95) before the 70cm activity started.

Mike Meadows G4GUG (Gloucestershire) likes the idea of using directional calls on FT8, eg CQ E G4GUG IO81. He says, *"Surely this would give distant stations an idea which way signal is being radiated and time for aerials to be aligned to complete the QSO"*. Why not – it might well be useful at times.

Jef VanRaepenbusch ON8NT (Aalter) made a few QSOs during the January FT8 Activity Period, including G8EEM (IO93), G0DJA (IO93), GI6ATZ (IO74), M0DSR (IO82) and G4HGI (IO83).

Roger G3XBM says he is active in the UKAC sessions (and on 70cm too) with his 2m big wheel antenna but says that the FT8 sessions are much easier!

Roger Daniel G4RUW (Newbury) caught the tropo on 24 January, when he worked OZ1ADL (JO46) and OZ1IIL (JO47) – who was a new square. On 1 February, Roger worked F6ANO (JN18) and then next day, F6CIS (IN94) and F0GOW (IN96). Roger said that lots of EAs were audible, but he couldn't raise them with his 10W and feels that propagation seems to have been better to the north of him.

The 70cm Band

David G4DHF used his portable log periodic antenna to work EW7CC (KO44) on FT8 at a distance of 1982km during the late January tropo.

Kev ZB2GI keeps an ear on the ZB2BU/R repeater located at the top of the Rock of Gibraltar, which has good coverage. This month,

though, Kev only mentions a QSO with EA7KWE in San Roque, just across the border.

Keith Watkins G8IXN (Redruth) keeps an eye on a number of 70cm repeaters and in fact has been monitoring ADS-B transmissions (1090MHz) from aircraft to see if they can be used to identify enhanced conditions on the higher bands and he thinks that there does seem to be some correlation between greater distances being logged on ADS-B and tropo propagation. On 6 February, Keith was seeing aircraft out to a distance of around 725km where he normally sees them out to around 530km. At the same time, GB3SP (Pembrokeshire) was S9 and the GB3ND repeater, normally around S3, was S9.

Tony G4NBS had a great time with the tropo. It all started around 1645UTC on 23 January. Tony heard the FT8 tones from OH4MVH (KP32) at a distance of 1959km, who was the best DX that day. Other highlights from Tony's log include OH1ND (KP00), SM0KAK (O89), SM0DW (O88) and SM0PYH (JO99). Next day, things got even better when Tony worked RA3LBW (KO64) at 2115km with other QSOs of note being LY2WR (KO24), EW7RF (KO55), EW6FS (KO35), EW7CC (KO44) and RV3YM (KO63) – 2211km. Russia and Belarus were all time new DXCCs for Tony, with Finland and Latvia being new ones on FT8. On 4 February, Tony worked EA1U (IN83) and GM4FVM (IO85) along with a few G stations. During the AFS contest on 5 February, Tony enjoyed some SSB QSOs and found lots of activity, though there didn't seem to be much support from PA or DL. The best DX was F6BYJ (JN05) by aircraft scatter, but other notable QSOs were F4FET (JO00), F4HOG (JN09), F1MKG (JN08), F6DKW (JN18), DF2VJ (JN39), DK1PZ (JO41), PE1EWR (JO11), PA1BVM (JO21), EI3KD (IO51), EI8KN (IO62), GM4FVM (IO85), GM4BYF (IO85), GM4PPT (IO75), GD8EXI (IO74), GI6ATZ (IO74) and G7RAU (IN79). During the FT8 Activity period on 8 February, Tony found plenty of activity and made 88 QSOs in 28 different locators. The best contacts to the east were DK5IR (JN49), DF4IAE (JN49), DL5FCW (JO40), DL1DBR (JO41), DG6YID (JO42), OZ7MHZ (JO44), OV3T (JO46), GM0HBK (IO77), GM8MJV (IO85), EI3KD (IO51) and EI8KN (IO62). What a log! Well done, Tony.

Mike G4GUG is planning to put up 2 x 15 element Diamond Yagis for the band, but plans have stalled temporarily owing to the freezing weather.

Phil Oakley G0BVD (Great Torrington) spent an hour during the RSGB AFS contest on 5 February and worked G4ODA (IO92), M1MHZ (IO92), G3XDY (JO02), G4RRA (IO80) and GW4CC (IO71). Best DX was G3XDY at 624km.

Bernd Wilde DL7APV is well known for having an astonishing moonbounce array on 70cm, consisting of 128 x 11 element Yagis. If conditions are reasonable, Bernd can work stations running between 25 and 50W to an 8-element Yagi. Over a recent weekend, Bernd made a point of trying to work low power stations from the satellite community, who were using satellite antennas such as the Arrow antenna. Bernd worked over 40 new stations, including **Dave G4RGK** (15W and 21 element) and **Robbie EI2IP** (70W and 12 element). Bernd plans to repeat the experiment.

The 23cm Band

Roger G3XBM has had his first ever two-way SSB QSO on the 23cm band with a station in Cambridge. The QSO was over a difficult path and Roger was running 2W. Roger is hoping to try looking for 23cm beacons by aircraft scatter using Airscout to predict the best times. He is using an indoor 2-element Yagi, pointing through the window.

Satellites

Jef ON8NT monitored the schools contacts from the ISS on 19 and 26 January.

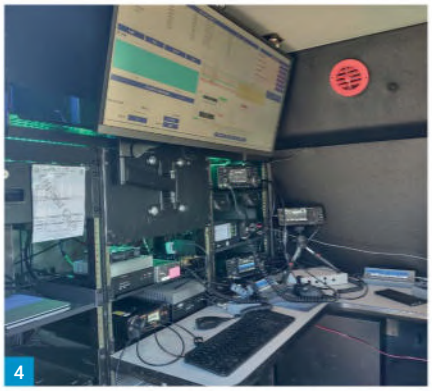
Patrick Stoddard WD9EWK (Phoenix) writes, *"GreenCube (IO-117) remains active, and many satellite operators are obtaining various awards like the CQ Worked All Zones, Worked All States, and Worked All Continents. It remains popular. AO-91 had a hiccup, where it was off for a few days, but has returned to limited operation in daylight. The ISS radios are still in operation, except around spacewalks and the docking/undocking operations.*

*"In January, **Endaf N6UTC** (also **MW1BQO**) mentioned he wanted to operate from an area near Palm Springs, east of Los Angeles in southern California. After seeing Endaf's grid map for the continental USA, I offered to help fill in some grids around Arizona. On 21 January, I planned to visit six grids Endaf needed from that area, a great time for me to see snow on mountaintops around southern Arizona.*

"Close to home, the first grid N6UTC needed was DM33. This grid covers part of the Phoenix area, but I went to the southeastern corner of that grid, a 45-minute drive south. AO-91 would cover both of us while I was there, and we were able to make a quick contact. One grid down...

"After DM33, I drove south about ten minutes to the DM32/DM42 grid line, in farmland near a Nissan test track. There was a CAS-4B pass coming by. As the pass started, I started calling CQ, and after a couple of minutes N6UTC called me. We made a contact, giving N6UTC two more grids. I relinquished the spot on the CAS-4B transponder, allowing N6UTC to work more stations across the continental USA, and I started a 90-minute drive southeast to Tucson in southern Arizona and the next CAS-4B pass...

"After the drive, I parked in grid DM41 south of Tucson, about 50 miles north of the Mexico/USA border. I had a few minutes to set up my station before CAS-4B came up. Once again, after some CQ calls, N6UTC called me. Another contact, and another grid for N6UTC. I had given N6UTC four grids and I had one more stop to give N6UTC two more grids...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"About an hour east of Tucson is the DM51/DM52 grid line. I made the drive and had more time to set up for the third consecutive CAS-4B pass of the day. This spot is in southeastern Arizona, under the shadow of Mount Graham to the north, home to many observatories, and a fair bit of snow on the mountaintop. When CAS-4B came up, this time I heard N6UTC CQing. I called, we made a contact, and then I made a few more contacts from this rarely-heard spot in Arizona. N6UTC gained six grids from me during my drive, and he also picked up a similar number of grids from other stations".

An Accidental Entry to the ARRL January VHF Contest

Patrick continues, *"As I started my drive home, I saw a van parked on the side of a road, with a large mast coming out of the roof. This weekend was the ARRL January VHF contest, and I found a rover station operating in that contest. Curious, I stopped and walked around the van. I was met by **Dan N7DSX** and his wife **Lesli K7LSX**, who were both operating in the contest across many bands between 6m and 2.3GHz. Even though I hadn't planned to participate in the contest, I offered to give both of them a few contacts on bands I could operate. With my FT-817, I was able to work them on 2m and 70cm SSB with my Elk log periodic. Not having a 6m antenna, I offered to try for 6m contacts using a dummy load as an antenna on my FT-817, which was successful.*

"At this point, making three contacts each with N7DSX and K7LSX, I had one more band I could offer, 222MHz (1.25m). My TH-D74 handheld radio, which I was using for APRS on my drive, operates on this band in FM. I had a telescoping whip antenna that I could set for this band. The N7DSX/K7LSX station didn't have a radio for this band, but had an IC-705 along with a 222MHz transverter. Now I had four contacts each with N7DSX and K7LSX, and I sent in a contest entry after I returned home".

That's it for this month! Many thanks to everyone who's contributed – a really interesting month for VHF/UHF. See you next time. **PW**

Rallies & Events

All information published here reflects the situation up to and including **10th February 2022**. Readers are advised to check with the organisers of any rally or event before setting out for a visit. The Radio Enthusiast website **www.radioenthusiast.co.uk** has the latest updates, please check it regularly. To get your event on this list, e-mail the full details as early as possible: **wiessala@hotmail.com**

4 March
LAGAN VALLEY ARS RALLY: Hillsborough Village Centre, 7 Ballynahinch Road, BT26 6AR. Doors open 10.30 am.
www.lvars.uk

5 March
EXETER RADIO & ELECTRONICS RALLY: The 2023 Exeter Radio & Electronic Rally will be held at *America Hall*, De la Rue Way, Pinhoe, Exeter EX4 8PW. The doors will open at 10.30 am (10.15 for disabled visitors). Admission is £3.00 (under 16's free). (BB *[book in from 10.15 am]* | TS).
Tel: 07714 198374
E-mail: g3zvi@yahoo.co.uk

11 March
SOUTH KESTEVEN ARS, JUNK SALE: Railway Club, Grantham, NG31 7AU. Doors are open for traders at 8 am (bring your own table), and to the public between 9.30 am and 1 pm. Admission for traders is £5 and for the public £1. The maximum table length is 2m. Please book in advance to avoid disappointment (CR).
s.mason@skars.co.uk
https://tinyurl.com/bdeumuf6

12 March
DOVER ARC: HAMZILLA RADIO FEST At the *Julie Rose Stadium* in Ashford, Kent TN24 9QX. Early bird tickets are available; open from 9:30 am; general admission from 10 am. Local and national traders are welcome. Join *SDR Play, Ceecom Antennas, Icom*, and *ICQ Podcast*. Book your ticket and/or table online (BA | BB | CR | FP | D). TBC: (RSGB | L | RF | Wi-Fi).
www.Hamzilla.uk
club@darconline
Twitter: @HamzillaRally
https://tinyurl.com/ywx3uz7e

26 – 28 March
RADIODAYS EUROPE 2023: In the Finale of *Radiodays Europe 2022*, it was announced that Prague would be the host city for this now three-day event, in 2023, 26 – 28 March.
https://www.radiodayseurope.com

15 April
YEOVIL ARC 37TH QRP CONVENTION: The Digby Hall, Sherborne, Dorset DT9 3AA. Doors open from 9.30 am to 1.30 pm. Admission is £3 (no dogs except guide dogs). Supported by RSGB, G-QRP & RAFARS . (BB | CR | CS | TS | Parking (N.B.: car parking charges apply) | L).
http://yeovil-arc.com
qrp@yeovil-arc.com

16 April
HOLSWORTHY SPRING RALLY & BOOT SALE: Holsworthy Livestock Market EX22 7FA. Doors are open from 10 am. Traders and car boot.
holsworthyarc@gmail.com

23 April
NORTHERN AMATEUR RADIO SOCIETIES ASSOCIATION (NARSA): Blackpool Rally, Norbreck Castle Hotel; Queen's Promenade, Norbreck, Blackpool FY2 9AA.
https://narsa.org.uk

9-30 April
IRISH RADIO TRANSMITTERS SOCIETY 90TH AGM WEEKEND RADIO SHOW : Doors open at 11 am and entry is €5 per person. Additional interested traders are welcome. Icom UK is among the sponsors of raffle prizes on the day (BB | CR | D | FP | LB | L [Saturday, April 29th] | RF | TI: 145.550MHz (S22) | TS | Wi-Fi [free]).
www.irts.ie
www.sbrc.ie/agmweekend
admin@sbrc.ie

7 May
DARTMOOR RADIO RALLY: The DRC Rally will be held again at The Yelverton War Memorial Hall, Meavy Lane, Yelverton. Devon, PL20 6AL. Doors are open at 10 am. Admission is £2.50 (BB | CR | FP | TS).
07854 088 882
2e0rph@gmail.com

7 May
THORPE CAMP HAMFEST 2023: Thorpe Camp Visitor Centre. £4 per person entry. Traders are to arrive from 7 am. Visitors are to arrive from 8 am. (CR) – *no need to book*.
thorpecampvc@gmail.com

14 May
BRAEHEAD RALLY : This Rally is being run by Raynet-UK.
https://tinyurl.com/4c8wsebt
www.braeheadradiorally.com

11 June
JUNCTION 28 RALLY: Alfreton Leisure Centre Bowls Hall, Church St. Alfreton, DE55 7BD. Trader Bookings are now being taken. Opening at 10:15, traders will have access from 08:00. Everything is indoors. £12.00 per table (all provided) admission is £3.00 per person.
As usual, we will offer 100 tables for traders, including dealers, manufacturers, and large and small suppliers providing new and used equipment. Local and national or specialist clubs represented. There were more than 400 visitors last year.
For a booking form, location map, and so on, see the URL below:
www.snadarc.com
secretary@snadarc.com

11 June
MENDIPS RALLY: Farrington Gurney Memorial Hall, Church Lane, Farrington Gurney, Somerset BS39 6TY. Tables will be in the hall together with car boot stalls on the field; entrance is £2; the doors will be open at 9.30 am; traders from 7.30 am.
07870 168 197
mendipsrally@hotmail.com

18 June
EAST SUFFOLK WIRELESS REVIVAL (IPSWICH RADIO RALLY): Kirton Recreation Ground, Back Road, Kirton IP10 0PW (just off the A14).
Doors will open at 9.30 am, and the entry fee for visitors is £3. Trade tables will be available from £10.
B4SWR HF station. (BB| CBS | CR | FP | RSGB | SIG | TS)
07710 046 846
www.eswr.org.uk

23-25 June
HAMRADIO FRIEDRICHSHAFEN
https://tinyurl.com/ycysjkhr

25 June
NEWBURY RADIO RALLY: Newbury Showground, next to junction 13 of the M4 motorway in Berkshire, RG18 9QZ. This is the 34th year of The Newbury Radio Rally, and it is the ideal event for anyone interested in radio communications, computing and electronics. There will be a display area with an amateur radio station and exhibits. Open to sellers at 8.00 am and visitors at 9.00 am. Entry is £3 for visitors and £15 for a seller's pitch. (CR | CS | D | FP | SIG)
www.nadars.org.uk/rally.asp
NewburyRally@nadars.org.uk
www.nadars.org.uk

30 July
WILTSHIRE RADIO AND CAR BOOT SALE: Kington Langley Village Hall and Playing Field, Kington Langley, Wilts. SN15 5NJ. 9 am to 1 pm. Entry is £2. Traders Welcome. Indoor tables £10, Car booters £10, Vans £15.
Chairman@Chippenhamradio.club

13 August
FLIGHT REFUELLING AMATEUR RADIO SOCIETY HAMFEST: Radio, electronics & computers. Cobham Sports & Social Club Ground, Merley Park Rd, Ashington, Broadstone, Wimborne, BH21 3DA. Entry £4.Note: No dogs, other than assistant dogs, are allowed on site. (CBS | CR | FP | L | TS).
https://www.frars.co.uk/hamfest

27 August
MILTON KEYNES ARS RALLY: The rally will be held at a new venue this year – Heron's Lodge Guide Activity Centre, Bradwell Road, Loughton Lodge, Milton Keynes, MK8 9AA. The site has excellent modern facilities. Entrance fee £3. Open to the public from 9 am. For trader and exhibitor enquiries, please e-mail (below). Outdoor pitches and indoor tables are available (CR | D | FP).
rally@mkars.org.uk
www.mkars.org.uk

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

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

Keith Rawlings G4MIU
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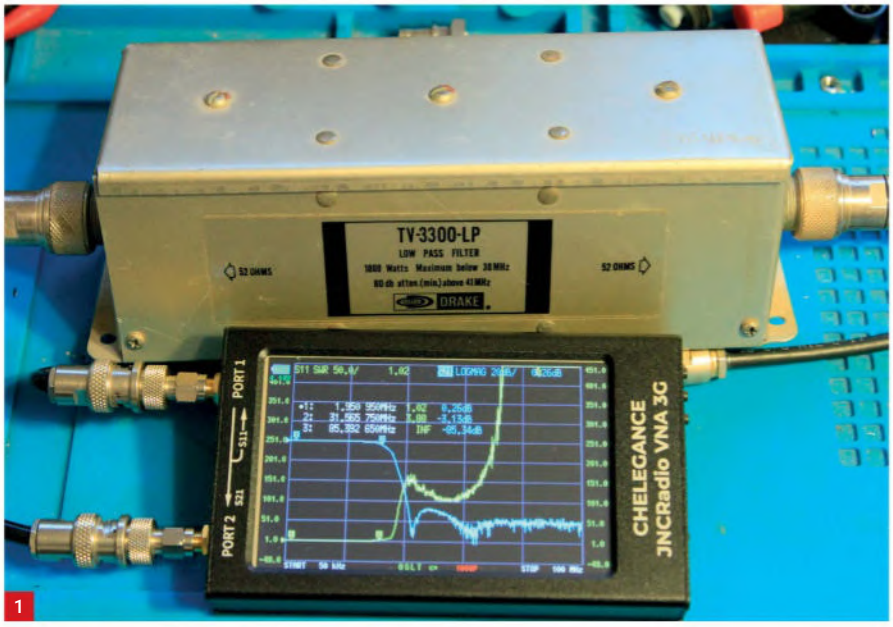

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Using a VNA for a Range of Measurements

Keith Rawlings G4MIU finds a multitude of uses for the VNA he reviewed recently.

In the February 2023 issue of *PW* I reviewed the useful little Two Port VNA-3G Vector Network Analyser (VNA), which was kindly provided for review by Martin Lynch and Sons. It covers the frequency range of 50kHz to 3GHz, undertakes S11 and S21 measurements and also has a handy in-built signal generator.

Reviewing modern equipment, whether it be a top of the range transceiver or a 'gadget' such as the VNA-3G, while always enjoyable, can be difficult. This is because most of today's equipment has so many features so much has to be left out in a short magazine review and the VNA-3G was no exception.

So, I thought that this month I would run over a number of basic S22 Two Port Through measurements that were made during the review period that didn't make it into the review itself. Not all are directly antenna related but I hope you find them interesting!

The VNA-3G is based on the NanoVNA and most of what follows will the applicable to the NanoVNA as well as a number of other Two Port VNAs that are aimed at the amateur market.

Drake Low Pass Filter

I have a Drake TV-3300-LP HF Low Pass filter, which has been hanging about in my shack since the early 1980s where it was once used with a KW2000E and also a Yaesu FT-707. As it has not been used for a number of years, I connected it to the VNA-3G to have a 'look' at how it is performing now.

A 'Thru' Two Port calibration was performed on the VNA-3G over the range of 50kHz to 100MHz. I limited the span to 100MHz was because I was only interested in its insertion loss at HF and its cut-off point.

BNC Adaptors were fitted to the VNA and BNC patch leads used to connect to PL259-to-BNC adaptors to match the filter. A BNC Cal Kit was used on the BNC patch leads and two traces were selected on the VNA to read S11 VSWR and S22 LOGMAG. **Fig. 1** demonstrates the setup with the yellow trace representing S11 VSWR and the blue trace S22 LOGMAG (dB).

The VNA-3G clearly demonstrated the response of the filter. Insertion loss was less than 0.3dB over the HF range with a sharp cut-off over 30MHz, the filter being 3dB down at 31.5MHz and 85dB beyond. Despite its age this filter is still capable of doing the job asked of it.

When used in the real world this filter will be 'bi-directional', that is signals will need to pass though it for receive as well as transmit, and in this example I have only swept it in the one direction. To properly characterise the device the leads would need to be reversed and the filter swept, effectively, in the other direction.

Unknown Filter

Well, I say 'unknown'. I do know now that it is a 21.415MHz bandpass filter because I characterised it on my VNWA some time ago, but before that I did not know its details! Here I used the same procedure on the VNA-3G as I did with the VNWA to display the filter's centre frequency and bandwidth.

The Cal Kit and SMA leads provided with the VNA-3G outfit were used for a Two Port calibration of the unit over the range 50kHz to 100MHz. Two SMA sockets were then soldered to the filter and the SMA leads connected to it, **Fig. 2**.

I swept the filter over the calibrated range to look for a trace on the VNA-3G, finding one at around 21MHz. I then set a sweep of 21 to 23MHz where the response of the filter could more clearly be seen, **Fig. 3**.

This then enabled me to assess the centre frequency more accurately so I could set a more suitable sweep of 21.3 to 21.5MHz where the characteristics of the filter may now be clearly seen, **Fig. 4**.

The VNA-3G may be used to measure the filter's ripple/insertion loss, bandwidth and centre frequency. However, for this basic test I made no attempt to match the filter's impedance to that of the VNA-3G so there was likely a considerable mismatch.

Problematic Coaxial Switch

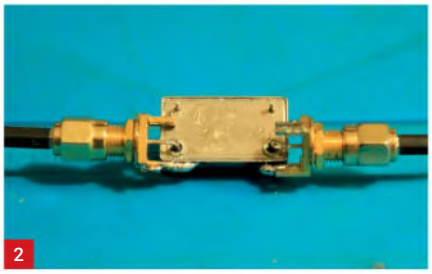
Another item laying in a drawer in my shack was a coaxial switch, which had once been used to switch between a diamond V2000 and a 5-element 2m beam used with my FT-857. It had shown signs of being intermittent and long ago consigned to the drawer to be 'looked at later'.

The switch, seen in **Fig. 5**, had been bought from one of the 'big retailers' around 2005. I thought it would be interesting to see what it looked like on the VNA-3G, so using the supplied Cal kit and cable, I calibrated Thru from 50kHz to 3GHz.

As the switch was fitted with Type-N connectors, SMA-to-N adaptors were fitted. It was accepted that there may have been error in the accuracy of the readings at higher frequencies as the calibration planes of these adaptors were unknown. A 50Ω load was fitted to the unused port of the switch during measurements. A sweep of the switch caused quite a surprise to say the least, see **Fig. 6**.

Here we have S11 VSWR (in blue this time) and S22 dB(loss) in yellow, of just one port of the switch (the other was somewhat different but equally poor). At 50kHz the insertion loss was –77dB, slowly reducing until at 1GHz it was 1.8dB. Clearly something was seriously wrong here!

Gently poking the contacts with a screwdriver made the response improve greatly. Obviously



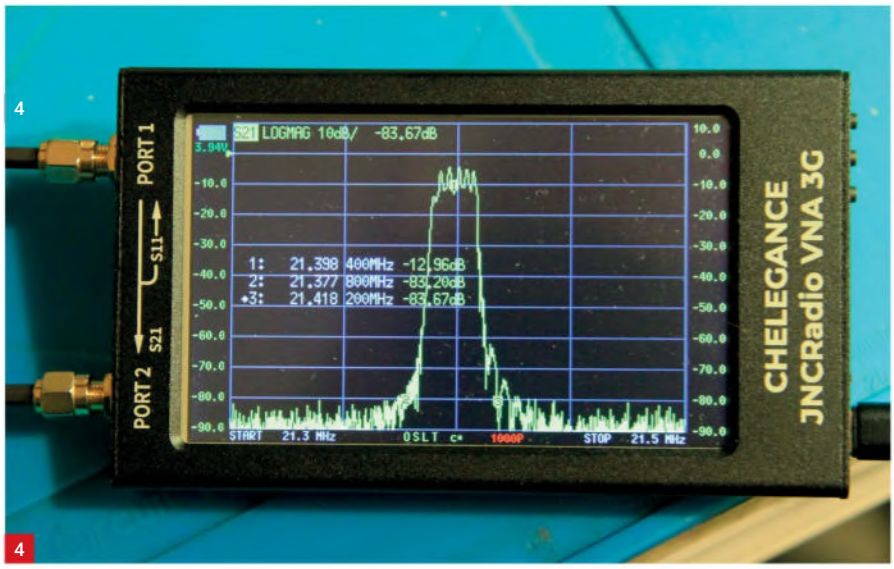


Fig. 1: Setup for testing a lowpass filter. Fig. 2: SMA connectors soldered to filter for test purposes. Fig. 3: Sweeping the filter, initial setting 21 to 23MHz. Fig. 4: Zooming in – 21.3 to 21.5MHz. Fig. 5: The suspect coaxial switch. Fig. 6: Testing the switch – ouch! Fig. 7: Measurement setup for Y splitter. Fig. 8: A monopole antenna for April!

there was a serious problem with the switch contacts so it awaits the removal of the N sockets before it meets the bin.

Simple Y Splitter (or Combiner)

Here I characterised a simple resistive Y splitter bought cheaply off of eBay. It has a quoted insertion loss of 6dB per port, a bandwidth of DC to 500MHz but no isolation is quoted. Again, the supplied calibration kit was used and I chanced my arm with a calibration up to 3GHz.

The measurement setup was as seen in **Fig. 7** where the input from the VNA was applied to the 'common' port, which I shall arbitrarily call port one, and the output to the VNA was from one of the two splitter ports, arbitrarily called ports two and three, with the unused port terminated in the 50Ω load from the Cal kit.

A resistive splitter such as this will suffer 3.0103dB of resistive loss with a cumulative loss of 6.0206dB also, the isolation of a resistive splitter equals the insertion loss, 6.0206dB.

As can be seen from Fig. 7 the splitter's response was quite flat even up to 1500MHz although there was a 'disturbance' in the trace lower in frequency. Insertion loss is within a fraction of the quoted 6dB and only 0.6dB out at 3GHz.

Swapping over to the second port returned virtually identical results as did reversing the connections and performing the measurements again. Isolation was measured by connecting the VNA-3G to ports two and three with port one to the load. Not shown in the photos, insertion loss was a tad under 6dB as expected, so very good results for a board that was delivered to my doorstep for just over £4.

Remember that there will always be some error in these measurements and also not to get too 'hung up' on fractions of a dB for amateur use.

Saved Calibration

The VNA-3G has the very useful feature of being able to save 12 User Calibrations. This is very convenient for measurements that may need to be recalled on a regular basis.

For example, a 1.8-30MHz calibration may be made at the end of the coax feeder to an HF antenna and stored on the VNA-3G. This calibration may then be recalled so that any antenna you may care to connect to this feeder may be measured in the shack as if it was at the antenna feedpoint. A sweep of the antenna may also be undertaken and saved as an .s1p file to the VNA-3G. You can then recall this calibration in NanoSaver as a benchmark for future reference to check and see if the antenna is still matching as it was.

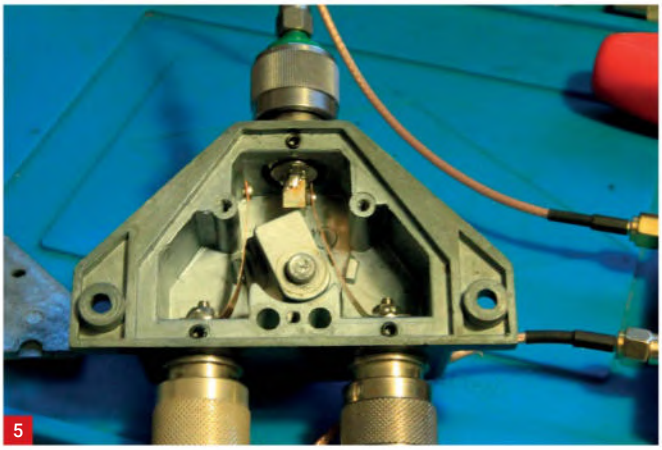
Another use is where a portable antenna may have a number of calibration ranges saved for each band. It is then a simple matter to plug the feeder into the VNA-3G, select the required calibration, and then check or adjust the antenna for minimum SWR thereby saving time and precious battery power while putting less strain on those finals!

When not being used on antennas, calibrations may be saved and recalled for something like an often-used test jig such as the VNA or VNWA test board kits:

www.sdr-kits.net/documents/Testboard_kit.pdf

I have not covered the measurement of RF amplifiers but it is possible to do so with a VNA, however care is needed. Preamplifiers that require DC power over a feeder need to be properly isolated to ensure this voltage does not reach the VNA ports. Also ensure that the output from the VNA does not overdrive the amplifier and that the output from the amplifier is less than the maximum permitted level of the VNA input ports. Use suitable attenuators with appropriate power ratings if you are not sure. The use of decibels makes it a simple matter to calculate amplifier gain with an attenuator in place.

An attenuator is placed from the output of the amplifier under test to the receive port but attenuation may also be placed on the input to an amplifier to prevent over-driving. It is good practice to check an attenuator is good by using the VNA first



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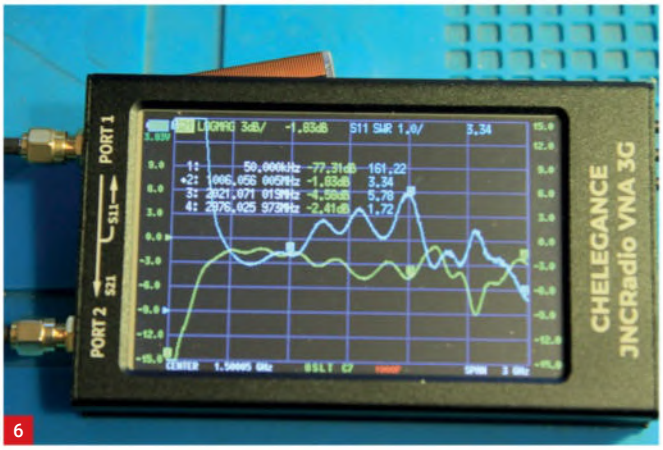

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as I have found damaged attenuators that have previously been used on VNAs and spectrum analysers that have been ruined undertaking 'protection duties'! Admittedly these have been power attenuators damaged during transmitter testing.

The VNA-3G and its cousins can be used for the testing of high-power amplifiers and the same warnings as above apply. Attenuators need to be capable of handling the power and have high enough levels of attenuation to bring the levels down to those that the VNA can handle safely.

Feedback

I received a message from **Godfrey G4GLM** regarding problems running NanoSaver and a NanoVNA (not VNA-3G) under a Win 7x32-bit operating system. I had previously used the software running under Win XPx32 when I evaluated a NanoVNA clone for *RadioUser* and I had no problems running it with either Windows 10 or Windows 11 64 bit. Some online research revealed that Win7 and also Win 8 have problems recognising the NanoVNA, which is seen as a virtual USB Comm-Port by windows. A version of NanoSaver has been developed to counter this problem and can be found within the NanoVNA user groups IO:

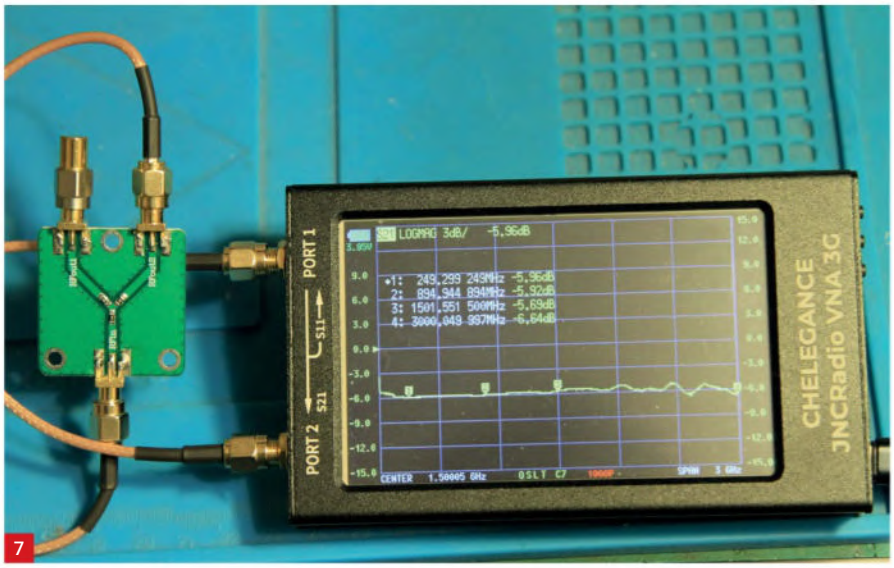
https://tinyurl.com/ppw5e9yx

Unfortunately, in Godfrey's case we could not get the PC software to recognise the device.

VNA-3G: I've had a report from a reader that the issues I found with the VNA-3G signal generator whereby the 6dB and 9dB attenuator settings were not functioning have been resolved by a firmware update. A test signal from a VNA-3G has been fed into a spectrum analyser to confirm that all attenuation settings now work as advertised. The current firmware version at the time of writing is v1.2.0 and can be found here:

https://tinyurl.com/mrs76rpt

It is good to know that Chelegance are on the ball!



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Conformal Monopole

To finish off this April issue I would like to report on a little-known Monopole antenna, **Fig. 8**. Information is sparse but it appears that this antenna system is modular in that additional pieces may be added to the array to improve coverage. The elements may be installed either vertically such as conformally on the side of a building or, unusually compared to a traditional monopole, in an inverted-V configuration such as over a roof. It is not clear how the monopole elements are fed or indeed what their operating range is. Perhaps readers may be able to comment further?

See you all next month. **PW**

Don Field G3XTT
practicalwireless@warnersgroup.co.uk

1

The Bijou Three

We delve into the PW archives once again, this time to feature a broadcast bands receiver from the 1930s.

Designers have, from time to time, produced receivers of the so-called "midget" type, but these have been in the majority of cases a compromise; We have set out to design an efficient receiver, which could be housed in a really small cabinet, and yet would give really first-class results - giving, for instance, the choice of several stations on the loudspeaker. The photographs and illustrations will give some idea of the compactness of this set, and it will be seen that there is no waste of space in any direction, and the set can justly be called "a midget."

The Circuit

The circuit is clearly shown, and it will be seen to employ the usual three-valve arrangement of S.G. detector and pentode valves. The tuner is an ingenious "all-in" device, employing an aperiodic aerial coil with variable coupling, short and long wave grid coils, and a common reaction winding. The change-over from short to long waves is accomplished by the same spindle that varies the aerial coupling, and this also operates the on-off switch. The S.G. valve is aperiodically coupled to the detector valve, and this is transformer-coupled to the pentode. Stability is assured by decoupling the detector stage, and a by-pass condenser is employed from the screening grid to earth.

The Receiver

The receiver itself is built on the semi-chassis arrangement, the baseboard being raised on small fillets of wood, and some of the wiring being carried out below the base. This enables the wiring to be carried out neatly, and also simplifies the connections. The valve-holders are of the chassis-mounting type, which are quite simple to mount, and are rigid. The variable condenser has a slow-motion drive, and the panel also carries a small variable condenser for adjusting the aerial, if it is found necessary.

Construction

Now that all the main details have been described. we may proceed with a description of the actual constructional work. The components are listed, and should all be obtained before any of the work is undertaken, as it is always advisable to arrange every individual component in its position before fixing, so as to make quite certain that enough clearance is left at each point for valves, condenser vanes, etc. The three holes for the valve-holders should be drilled first, and then the small holes through which the connecting wires pass. Attach the small fillets at the sides, and then mount the valve-holders. See that these are the correct way round before screwing down, and note that the five-pin holder is at the extreme left of the base (viewed from the rear). Attach the remainder of the parts, leaving the coil till last, so as to avoid damage to the wiring. The panel should next be marked out, and the escutcheon attached, with the condenser.

While this is being done, and until the rest of the receiver is completed, the vanes should be kept closed up to avoid risk of bent plates or other distortion. Mount the other condensers, and you are then ready for wiring-up.

Wiring

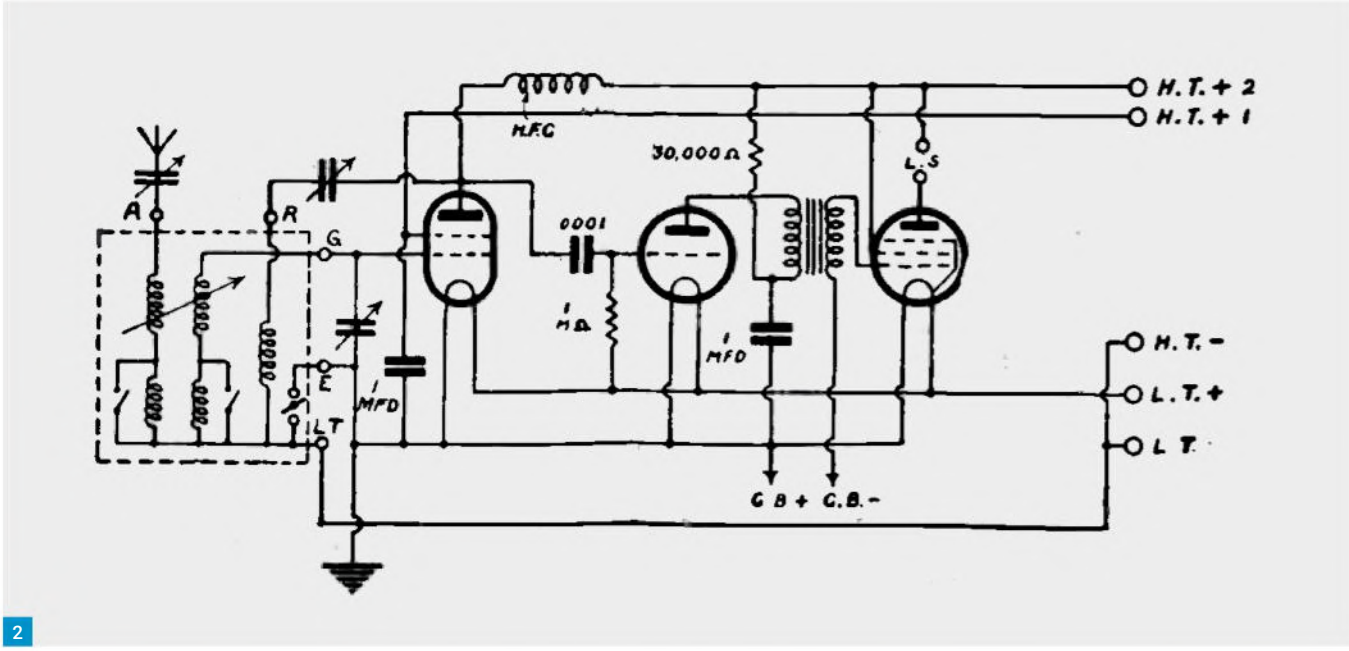
The wiring diagram, **Fig. 2**, shows clearly the arrangement of all the leads, and no troubles should arise in this connection. The leads to the valve-holders should be put in first, and in view of the smallness of the slot in the legs, only one wire should be put in. Therefore, trace out the leads, and cut off such a length that the wire will cover the full distance. Then scrape bare at the points where contact is made. This instruction applies particularly to the filament wiring.

When connecting up, plug H.T.2 into the maximum tapping on the H.T. battery; namely, 100 to 120 volts. H.T.1 should be tried in any socket from 27 to 50 volts. If the set tends to oscillate too readily, use a low voltage; but if it does not oscillate, use a higher figure. The higher the voltage you use on the screening grid the greater will be the magnification until you reach the optimum point.

Do not, however, use more than 55 volts if you wish to get long life from the H.T. battery, as the total plate current also increases with the voltage. G.B.– should be plugged in at 4½ volts on the grid bias battery.

Described as "A Cheap and Efficient Little Receiver with a Splendid Performance", this design appeared in the October 29th 1932 issue of PW.

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



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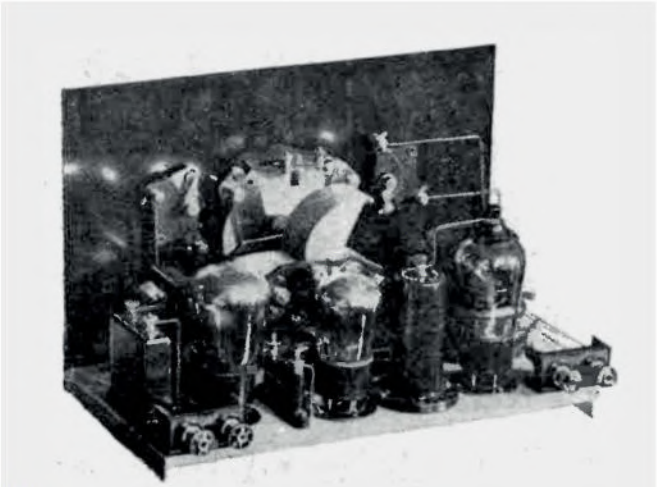

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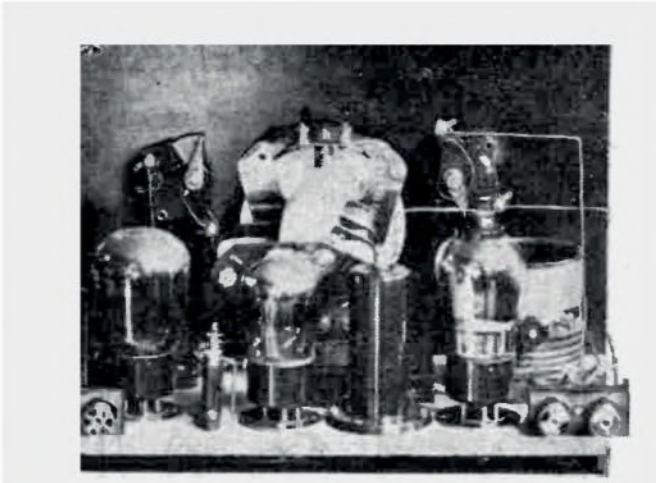

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Fig. 1: Front view of the Bijou, showing controls, and the neat Clarion Cabinet.
Fig. 2: Circuit diagram of the Bijou.
Fig. 3: Three-quarter rear view of the Bijou Three.
Fig. 4: Rear view of the Bijou, showing rails for raising the breadboard to clear valve-holders, etc. Fig. 5: Rear view of the Bijou with breadboard tilted to show sub-baseboard wiring.
Fig. 6: Wiring diagram for the Bijou Three.

When you have inserted the valves, joined up the aerial, earth, and L.T. battery turn the control knob on the left of the panel a few degrees to the right. This will switch on the valves and at the same time put the receiver into a sensitive condition on the medium waveband. Set the control of the condenser above this knob in a position where the moving vanes of the condenser are about half-way out.

Now rotate the main tuning control, which is the lower knob in the metal escutcheon. and you will soon find your local station. Provided you are using an outside aerial, and this is not too large, you will find tuning is fairly sharp. The left-hand knob, as it is rotated further to the right, will increase the strength of signals, but will also flatten the tuning – or, in other words destroy the selectivity.

The reaction knob (that on the right of the panel) will increase the strength of the signal, but if turned too far the set will burst into oscillation. The most sensitive condition is just before the oscillation point. You will have noticed by this time that there are three controls affecting volume: the coil control, the aerial condenser, and the reaction condenser. The two former controls have also the effect of varying selectivity, so that to receive certain stations which are normally jammed use will have to be made of all three of these controls.

The coupling coil must be set to such a position that the signal strength is just below that which is finally required, and the reaction control used to bring the volume up.

Once the idea of handling these controls has been grasped, it will be found quite simple although the description of the working may seem rather complicated.

No description of actual results will be given, as so much depends on local conditions, etc. It may be mentioned, however that at a test it was possible to get Radio-Paris, really loud, with no interference whatever from Daventry 5XX.

Calibration Notes for Builders of the Bijou Three

If you regularly follow the measurement charts issued by the Brussels Laboratory of the Technical Committee of the U.I.R. you will have noticed that stations in general are get-

ting much better behaved with regard to the important matter of keeping to their allotted frequency or – if you prefer it that way – wavelength. Most of the big stations are checked by a U.I.R. wavemeter and their frequency graphs are nowadays beautifully "straight line." Turn up the charts issued as recently as two years ago and you will have a shock!

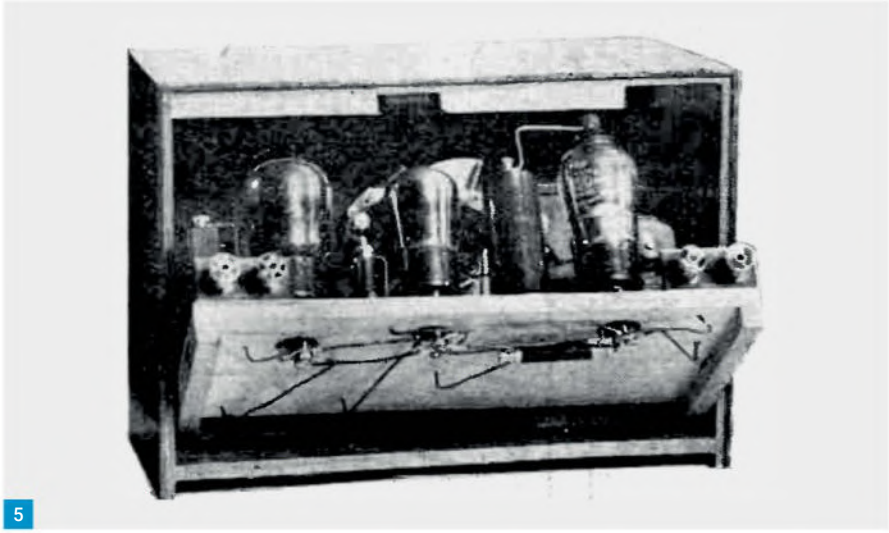
Some of the most reputable stations were terrible offenders in those days and some of their charts read like those of an influenza patient's temperature. With an overcrowded ether, however, no tolerance can be allowed and the powers that be watch with eagle eyes any departure from the allotted frequency.

The overlap on either side of a wavelength is fairly large and the nine frequencies separation is proving none too generous with all our selective sets and better transmitting equipment. Incidentally don't forget that the most reliable way of identifying unknown transmissions is by the use of a wavemeter. These are fairly simple to make and handle, although the calibration trouble seems to some people to be insurmountable.

The most important point is the obtaining of a really good variable condenser with really accurate "straight line frequency" characteristics, and with clear open dial markings. You tune in as many stations of known frequency as possible and by means of a graph plot out the dial readings corresponding with the frequencies you thus obtain. A straight line drawn through the points you obtain will complete your calibration. **PW**

Components List

- Panel 12in. by 8in. (Brit. Hard Rubber Co.).
- .0005 Variable with Slow Motion Dial (Telsen).
- .0003 Compax Variable Condenser (Polar).
- .00015 Compax Variable Condenser (Polar).
- 2 1 mfd. Fixed Condensers (T.C.C.).
- .0001 Fixed Condenser (T.C.C.).
- Dual Range Aerial Coil (Ready Radio).
- H.F. Choke (S.G. Type,H F 4) (Bulgin).
- L.F. Transformer (Lissen Hypernik).
- 3 Chassis Type Valve-holders (two 4-pin and one 5-pin) (Clix).
- 2 Terminal Mounts (Belling Lee).
- 30,000 ohm Spaghetti Resistance (Lewcos).
- 4 Terminals (Aerial, Earth, L.S.–, L.S.+) (Eelex).
- 1 1 meg. Grid Leak (Graham Farish Ohmite).
- 3 Valves (S.G. 218, 210 D and 220 Pen.) (Six-Sixty).
- Cabinet and Baseboard, 12in. by 6in. (Clarion Bijou).
- 2 Coils Glazite.
- 100-volt H.T. Battery (Ediswan).
- L.T. 2-volt Accumulator (Lissen).
- 1 9-volt Grid Bias Battery (Ediswan).
- 1 5-way Belling Lee Battery Cord.
- 2 Wander Plugs (G.B.–, and G.B.+) (Eelex).
- Short length of Flex.
- Screws, etc.
- 1 Loud-speaker (Ormond R. 450 in Cabinet).



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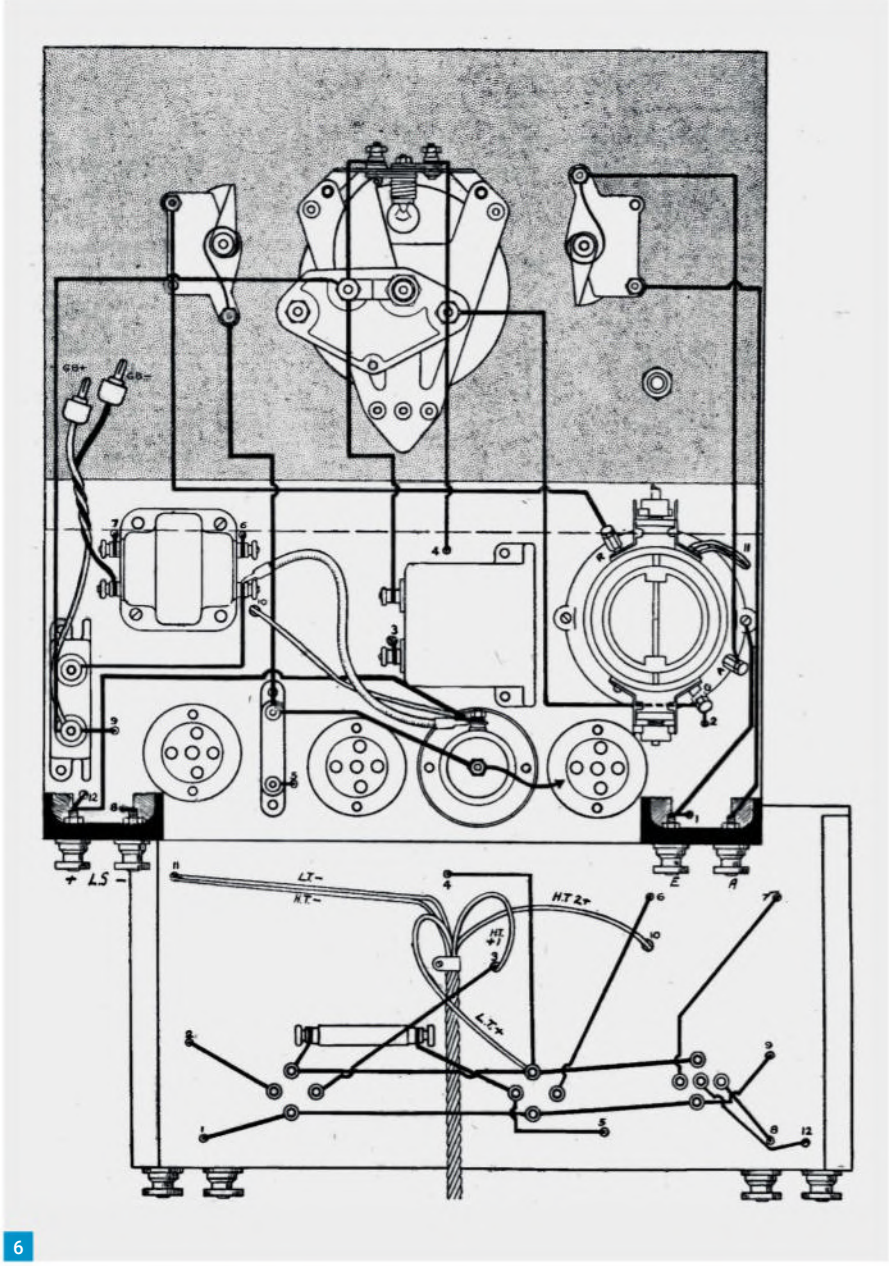

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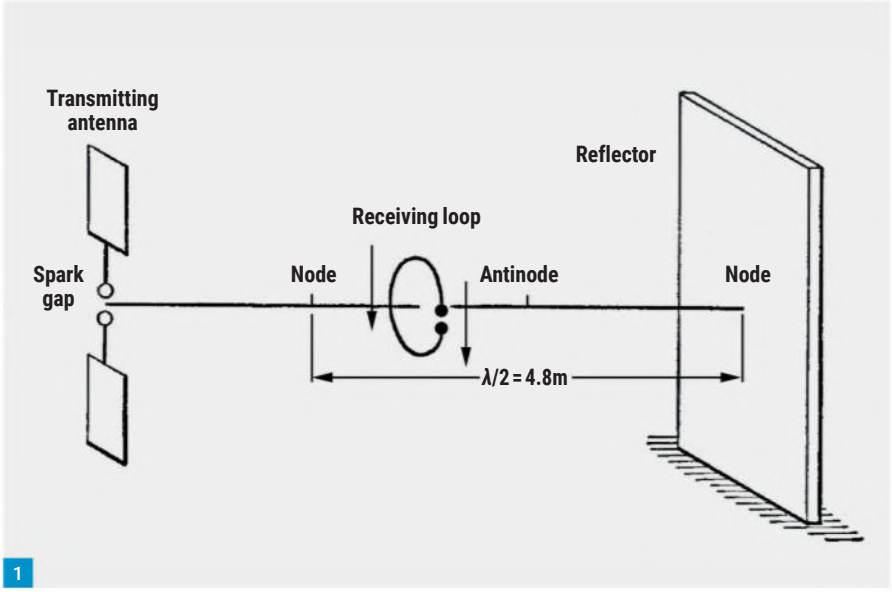
Dr Bruce Taylor HB9ANY
bgtaylor@ieee.org



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Classic Wavemeters

Dr Bruce Taylor HB9ANY describes radio frequency measurement before the digital age.

It's hardly surprising that in addition to the familiar *QRM* and *QRN*, the Q-code *QRH ("What is your wavelength?")* was one of the very first to be defined by the International Radiotelegraph Convention of 1912. Radio amateurs are so well aware that DX propagation is closely linked with operating wavelength that it may seem strange that when **Marconi** first spanned the Atlantic on 12 December 1901 he had very little idea of what frequency he was using. Later analysis of what could be deduced about the antenna and circuit constants of his 15kW spark transmitting station at Poldhu suggests that it probably had a fundamental resonant frequency of around 820kHz. However, the path attenuation at that frequency during the daylight hours at a sunspot minimum would have been very high. If indeed the Morse 'S' signals from Cornwall were heard in Newfoundland, they are more likely to have been a harmonic of that frequency, to which Marconi's untuned receiver would also have been sensitive.

Heinrich Hertz

The first systematic measurements of the lengths of what we now call radio waves were made in 1888 by the German physicist who first confirmed **Clerk Maxwell's** theoretical prediction of their existence – **Heinrich Hertz**. Nine years earlier **David Hughes**, a British-American experimenter who had invented the carbon microphone and an international standard printing telegraph, had achieved wireless telegraphy over a distance of 500 yards. But when he demonstrated his apparatus to eminent representatives of the Royal Society, they attributed the phenomenon simply to electromagnetic induction. Although Hughes disagreed, he didn't know how the transmission was working and it wasn't until after Hertz's work that he understood that he had actually been communicating with radio waves.

For one of his pioneering experiments, Hertz used a high voltage spark generator to excite oscillations in a vertical dipole antenna consisting of a pair of 30cm copper rods, end-loaded by 40cm square brass capacity hats, **Fig. 1**. He then used a circular test loop of radius 35cm to explore the standing wave pattern in the space between the transmitting antenna and a reflector consisting of a 2m by 4m zinc plate. Working in a large darkened lecture room, he measured the distance between the nodes and antinodes of the pattern by observing the intensity of the tiny sparks across a microscopic air gap in the receiving loop. In this way he determined that the wavelength of the radiation was 9.6m, corresponding to a frequency of about 31MHz. He did further measurements at a wavelength (as determined by the above method) of 4m (75MHz) and studied the diffraction, polarisation, reflection and refraction of radio waves at a wavelength of 66cm (455MHz) before repeating the experiments at 30cm (1GHz).

The Cymometer

But the wavelengths employed in the early days of wireless communication were in the range of hundreds and even thousands of metres, so that they couldn't be conveniently measured by Hertz's standing wave method. The instrument that Marconi lacked in 1901 was invented and patented three years later by his scientific consultant **John Ambrose Fleming** (of thermionic diode fame). Fleming called his direct-reading portable wavemeter a cymometer, from the Greek *Kyma*, meaning *wave*. The basis of the cymometer is a resonant circuit in which the capacitance C and the inductance L can be varied together in the same proportions by a single manual control. Since the resonant frequency is inversely proportional to √LC, this means that the instrument can be calibrated with a linear wavelength scale.

The cymometer comprises a 109cm long helical inductor, aligned parallel with a capacitor formed by an assembly of two or more concentric brass cylinders separated by ebonite dielectric, **Fig. 2**. The control handle, which allows the capacitance to be varied by changing the degree of overlap of the cylinders, also varies the position of a sliding semi-circular contact saddle on the inductor. It carries a pointer over five scales, calibrated in cm, in wavelength in feet and metres, in the value of √LC (which Fleming called the oscillation constant) and in 'Number of oscillations per one millionth second' (ie, MHz). Of course, the frequency scale is non-linear. In use, an external wire loop inductively couples the instrument to the RF field to be measured, and resonance can be indicated either by the intensity of the glow of a neon tube or by a thermocouple connected to a sensitive galvanometer.

Marconi manufactured several different models of cymometer, to cover a wavelength range from about 30 to 3000m. In 1906 the most expensive model, including the delicate galvanometer and mounted on a fine polished mahogany base, cost over £42 – around £5000 in today's money. As with much other wireless apparatus of this early period, cymometers were built with a very high standard of craftsmanship and they are now collectors' items. The term cymometer has fallen out of usage and today the instrument would be described as a special form of absorption wavemeter.

Absorption Wavemeters

Later designs of absorption wavemeter dispensed with the complex cymometer mechanism in favour of plug-in inductors, or coils with fixed switched-selected taps. Fleming's coaxial cylinder variable capacitor was replaced by the familiar rotary type with interleaved semi-circular plates, which had

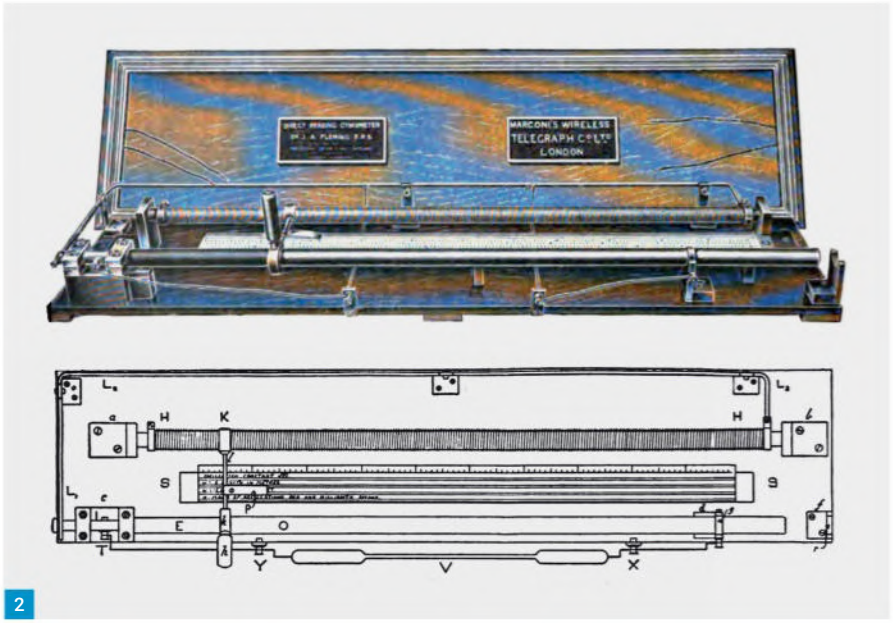
Fig. 1: Hertz measured wavelength by exploring the standing wave pattern in front of a reflector. Fig. 2: The slide handle of the cymometer varies the capacitance and inductance simultaneously. Fig. 3: The R502 absorption wavemeter has a diecast front panel and chassis in a fine teak case. Fig. 4: R502 coils: Left 100-200kHz, Centre 2.8-5.8MHz, Right 22-48MHz.

been invented by the Hungarian-born engineer **Dezső Korda** in 1893. Direct calibration was generally superseded by the use of individual calibration charts or tables and after thermionic valves became available, neon indicators were displaced by diode rectifiers and DC microammeters.

But the tradition of building wavemeters by skilled instrument craftsmen with the finest materials and workmanship continued, even during the bleakest period of WW2 austerity. **Fig. 3** shows the Model R502 absorption wavemeter that was introduced by Standard Telephones and Cables Ltd of London (STC) in the summer of 1940, while Britain was struggling for survival and aerial battles raged over much of southern England. It is housed in a superbly finished teak case with meticulously fashioned 24-finger corner box joints. The wavemeter owes its stability to a very rigid construction, with a complex machined diecast chassis that is integral with the front panel (see URL below), and it has a precision slow motion vernier tuning drive.

https://tinyurl.com/R502chassis

The R502 was supplied with nine plug-in coils, covering the frequency range 100kHz to 48MHz, or alternatively 190kHz to 87MHz. The coils are wound on ceramic formers attached to precision machined 17.4mm diameter coax plugs and each one is engraved with the serial number of the wavemeter with which it has been calibrated. They range from hundreds of turns of fine 0.25mm diameter wire for the lowest frequency range to a single turn of 4mm wide copper tape for the highest, **Fig. 4**. These coils, along with the instrument itself, a spare Marconi Osram screened HL2 valve and a Type S 1.5V battery, are housed in a sturdy teak case that alone weighs over 11kg, **Fig. 5**. Ease of maintenance wasn't a priority, for battery replacement requires opening the unit and the removal of the valve and eight screws with twelve washers, in addition to the battery terminal and flying lead! The HL2 is a directly-heated triode, but in the R502 it is used as a diode detector with the grid connected to the anode. Resonance is indicated by a 250µA DC moving coil microammeter, which doubles as a 2.5V voltmeter when the battery test switch is pressed. Although the Admiralty specified a calibration accuracy of ±0.5%, STC optimistically claimed that it exceeded ±0.15% throughout all ranges. A hinged compartment



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inside the lid of the case contains nine paxolin (SRBP) sheets carrying 27 individually drawn calibration charts for the instrument. An example of part of the chart that includes the 80m band is provided here:

https://tinyurl.com/R502chart

When germanium semiconductor diodes became available, they were immediately adopted for absorption wavemeters because of their small size, low forward voltage of around 300mV and absence of a power supply requirement. In 1952, Eddystone introduced the compact Model 696, which is housed in a diecast box and uses eight plug-in coils to cover the range 200kHz to 150MHz, **Fig. 6**. As with the R502, the instrument has individual hand-calibrated charts, which were supplied rolled in a protective tube. The meter has a 200µA movement. A later Model 696/1 was supplied

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with nine coils, extending the upper frequency coverage to 200MHz and allowing it to be used to check for VHF parasitic oscillations in an HF band transmitter. When using any absorption wavemeter, it's important to avoid detuning the source by keeping the coupling to the

wavemeter as loose as possible. In the case of overcoupling, the frequency response can even become double-humped, which can cause some confusion in measurement.

In 1954 the Eddystone Model 696/1 cost £13.53, a substantial sum for a hobbyist, so many radio amateurs made their own absorption wavemeters, where possible borrowing a signal generator to calibrate them. For some construction projects it wasn't necessary to calibrate with great precision or to cover a wide range of frequencies. Typical applications were neutralising an RF amplifier, or ensuring that the correct harmonic had been selected when tuning the multiplier stages in a homebrew transmitter. (For example, if a 3.5MHz doubler were inadvertently tuned to 10.5MHz instead of 7MHz, the following stage would mysteriously work on 21MHz but not on 14MHz or 28MHz!). For this type of test, a much simpler wavemeter such as the Raymart 'Rapid Bandchecker' was entirely adequate. This practical instrument covers the 80m to 10m amateur bands in three switched ranges and uses a small flashlight filament bulb as resonance indicator, **Fig. 7**. In 1955 it was priced at about £1. This model was followed by an improved 'Super Bandchecker' that had a microammeter indicator and optionally included 160m coverage. In 1970 it cost £4.50.

Heterodyne Wavemeters

The accuracy of an absorption wavemeter is limited by the *Q* of its resonant circuit, which determines the sharpness of the response curve. For greater precision, a wavemeter with an accurately calibrated built-in VFO is required. Such a heterodyne wavemeter has a mixer that generates an audible beat frequency that is the difference between the external transmitter frequency and the fundamental, harmonics or sidebands of the VFO. When the VFO is adjusted for zero-beat, the frequency of the signal can be read off. In addition to a stable VFO, a mixer and an AF amplifier for the beat signal, a heterodyne wavemeter usually incorporates an oscillator with one or more crystals. To achieve high accuracy, a harmonic of the crystal oscillator near the frequency to be measured is used as a marker to correct the calibration of the VFO.

When I was first licensed as GM3NZI in 1959, homebrew transmitters were common and General Post Office regulations required that all radio amateurs had to be equipped with a wavemeter capable of verifying that their transmissions were within the assigned frequency bands. One of the instruments favoured by the GPO inspectors was the three-valve BC-221, **Fig. 8**, which was available on the Government surplus market but which was rather expensive. Since station inspections were quite rare, many more amateurs declared 'BC-221' on their licence forms than had ever even seen one! The wavemeter has a 1MHz crystal calibrator and a VFO covering 125-250kHz and 2-4MHz. The schematic diagram of the BC-221-A is provided here:

https://tinyurl.com/BC221schema

Other models are similar.

Using the 2nd, 4th and 8th harmonics from the lower range and the 2nd, 4th and 5th harmonics from the higher one, the instrument gives continuous coverage from 125kHz to 20MHz. In practice, the harmonics are strong enough for it to be used well above these ranges. Different manufacturers produced at least ten versions of the BC-221, some with wooden and some with aluminium alloy cases. Although

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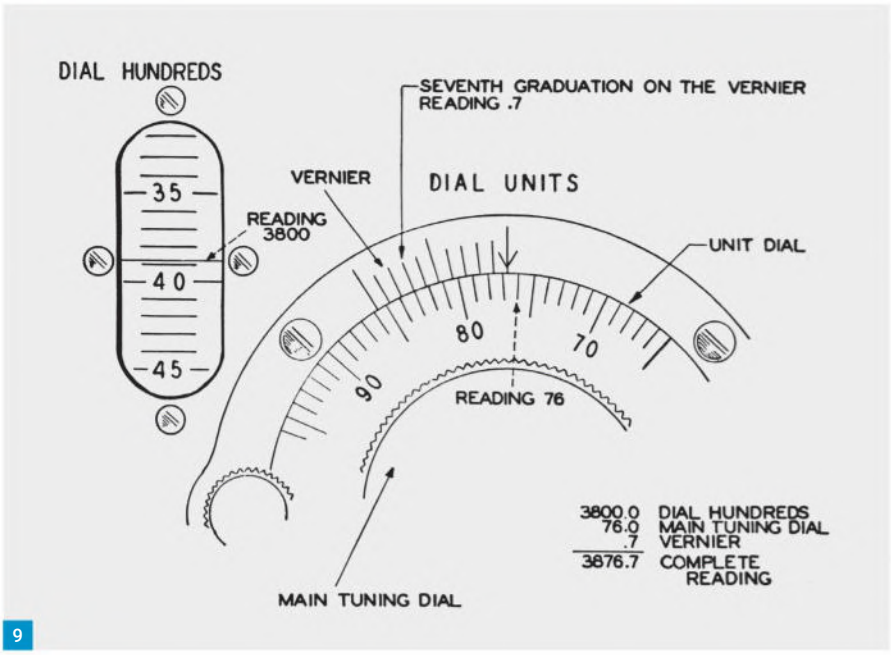

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Fig. 5: The R502 wavemeter was supplied with nine coils, calibration charts, and a spare valve and battery. Fig. 6: The Eddystone 696 absorption wavemeter has a sensitive 200µA meter.
Fig. 7: The Raymart Rapid Bandchecker can be used to check transmitter multiplier stages.
Fig. 8: The BC-221 heterodyne wavemeter uses mainly harmonics of its 125-250kHz and 2-4MHz VFO.
Fig. 9: The BC-221 vernier tuning dial allows a five-figure readout.

the various models have six different types of control panel arrangement, all versions have corrector, bandswitch and gain controls and the same precision tuning dial shown in **Fig. 9**. By means of the hundreds dial and the vernier scale on the main tuning knob a five-figure readout is possible. (eg, 1kHz at 14MHz). The total maximum frequency error of the BC-221, including crystal tolerance, calibration error, battery state and environmental factors was specified as 1355Hz, or 0.034% at 4MHz.

Each BC-221 has an individual printed calibration book that lists the correspondence between the vernier dial reading and frequency. The book lists fundamental and harmonic frequencies for 1251 dial settings at 100Hz intervals for the low range and 2001 settings at 1kHz intervals for the high range. Initially, the manual calibration of each instrument required over a week, but in later production the dial readings corresponding to the frequencies were determined and typed on the pages by an ingenious semi-automatic mechanism. In the 1950s, a photographic system was developed that could recalibrate five wavemeters per day. To avoid having to thumb through many pages, tabbed indexes are provided to allow the appropriate page for any dial setting or frequency to be located rapidly. This type of wavemeter has to be used carefully to avoid errors caused by heterodyning with the wrong harmonic. If the approximate frequency of the signal to be measured is unknown, an absorption wavemeter should be used to locate it first of all.

The RAF W1191A wavemeter, **Fig. 10**, was also popular with radio amateurs during the post-war period. This instrument uses four valves, one of which is a triode-heptode that combines the functions of Hartley VFO and mixer. The schematic diagram is provided here: **https://tinyurl.com/W1191schema**

Unlike the BC221, the VFO covers 100kHz to 20MHz on the fundamental in eight switched bands and harmonics can be used above this range. There is provision for selecting two crystals, one of which is a 1MHz calibration marker, and the instrument can also be operated with crystal control alone. A 4pF trimmer capacitor in parallel with the main 125pF tuning capacitor allows the calibration to be corrected. The RF output can be modulated with a 1200Hz tone for tuning a receiver without a BFO, so that the wavemeter can be used as an accurate

signal generator. A short rod antenna that can be plugged into the coax input or output sockets is stored in the lid of the instrument.

The early W1191 wavemeters have directly calibrated tuning scales, but the more common W1191A version is provided with an individually handwritten calibration chart for each tuning range, such as this example:

https://tinyurl.com/W1191chart

Accuracy was specified as ±0.1% in the temperature range 0-35°C and recalibration at an RAF Test Equipment Calibration Centre was recommended every 12 months. This was performed by writing the new dial readings on a paper strip that was stuck over the preceding ones on the pre-printed calibration charts. One important detail is not readily apparent: The small fine-tuning knob has a very high reduction ratio and can't be turned rapidly. To make a large change of frequency, it can be pulled out to a click stop that frees the main tuning knob to be turned directly to any position on the dial. The index pointer below the fine-tuning knob should be pulled downwards to re-engage the normal slow motion tuning drive.

Fig. 10: The W1191A heterodyne wavemeter covers 100kHz to 20MHz in eight ranges.
Fig. 11: The Class D No.1 wavemeter generates a spectrum of signals at 100kHz separation above and below its VFO frequency. Courtesy PA3ESY.
Fig. 12: The transistorised Mk II Edometer covers 390kHz to 115MHz in seven ranges.
Fig. 13: This homebrew GDO uses a precision Muirhead geared tuning dial.

British Army wavemeters ranged in performance from Class A (the highest precision, typically for use in labs) to Class D (for general use in the field, such as tuning WS19 or WS22 sets). After WW2, surplus Class D No. 1 wavemeters were readily available for less than £5. This model, **Fig. 11**, uses a single ARTH2 (similar to ECH35) triode-heptode valve and covers 1.9-8MHz in two ranges, with a specified accuracy of ±2kHz. The schematic diagram of the wavemeter is provided here:

https://tinyurl.com/ClassDschema

The principle of operation differs from that of more conventional wavemeters such as the BC-221 and W1191A. The heptode VFO section only tunes over two 100kHz ranges, from 3.4-3.5MHz and 6.1-6.2MHz, and the tuning dial is marked from 0 to 100kHz. This VFO signal is modulated by the copious harmonics generated by the 100kHz crystal oscillator triode section, to produce sidebands containing a spectrum of frequencies at 100kHz separation above and below the VFO frequency. When pressed, a Check button causes a slight change in the VFO frequency to verify that the beat note heard is not just from a harmonic of the crystal oscillator. The oscillator can alternatively be switched to a 1MHz crystal in the same encapsulation as the 100kHz one, to provide fixed calibration markers up to at least 25MHz. In this mode the heptode section just acts as an amplifier. The instrument is normally powered from a 6V battery and

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originally uses a vibrator and selenium rectifier to generate the HT supply for the valve.

Dip Meters

An absorption wavemeter can measure the frequency of a transmitter or other source of radiation, while a heterodyne wavemeter can also be used to calibrate the tuning of a receiver. But in experimental work there is also a need to measure the resonant frequency of an entirely passive circuit, antenna or device. A grid dip oscillator (GDO), or 'dip meter' to include the later transistorised variants, is a very useful instrument for this. In the classic design a sensitive microammeter monitors the grid current of a valve VFO, and a dip in this current is observed when the VFO is swung through the resonant frequency of the external circuit to which it is inductively coupled. Plug-in coils are normally employed to allow the instrument to cover a wide frequency range with a single variable tuning capacitor.

Since its invention in the 1920s, many commercial manufacturers have produced dip meters, including the popular Heathkit GD-1U GDO kit by Daystrom, which covers 1.8 - 250MHz and cost £11 in 1962. It uses a single 6AB4 triode valve and its schematic diagram is provided here:

https://tinyurl.com/GD1Uschema

Eddystone offered the transistorised S902 Edometer, which has directly calibrated slide-rule scales. The MkII version, which cost £27.50 in 1969, was supplied in a fine mahogany transit case, **Fig. 12**, but it covers only up to 115MHz. Its schematic diagram is provided here:

https://tinyurl.com/S902schema

Since a GDO is simple, inexpensive to make and very useful for amateur projects, many were also home designed and constructed. The 1950s example shown in **Fig. 13** uses a 6J6 double-triode and includes a 1kHz tone modulator to add to the versatility. It is built in an Eddystone diecast box with a Colpitts oscillator using a split-stator tuning capacitor and the dial is a Muirhead type with a smooth epicyclic gearbox that was used extensively on military equipment during the 1940s and 50s. With seven coils wound on Eddystone two-pin formers it covers all amateur bands up to 144MHz. The coupling coil attached to a socket allows the activity of quartz crystals to be checked.

Epilogue

Sadly, Heinrich Hertz didn't live to see the dawn of practical applications of his work. He died in 1894 at the age of only 36, just six years after he made his pioneering measurements proving the existence of electromagnetic waves. Less than two years later, Marconi demonstrated his system of wireless telegraphy and radio communication was born. Had Hertz lived longer, he would certainly have made many more valuable contributions to radio science. It is fitting that when the International System of Units was approved by the *General Conference on Weights and Measures* in 1960, the SI unit of frequency *Hz* was established in his honour. **PW**

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Early Studio Techniques

Keith Hamer and **Garry Smith** continue looking at the early days of the BBC, focusing on studio techniques to produce artificial echo effects. Also featured are more details about the history of Swiss broadcasting, a return visit to Bournemouth with Marconi, the 40th anniversary of BBC Breakfast Time, BBC2 colour films, the Blattnerphone, and television pioneer, Vladimir Zworykin. There is also a vintage equipment advertisement from 1927.

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By the mid-1920s, the BBC realised that the design of studios was very important in order to produce the correct sound quality for broadcasting. Originally, there was only one studio at Savoy Hill, built with very heavily draped walls to try and make it soundproof. Inside, everything sounded extremely dead. Subsequently, better studios were designed with lighter draping on the walls, which produced improved acoustics. *Studio 7* was the first purpose-built facility to feature these improvements, **Fig. 1**. All the existing studios were modified for specific types of performance. One studio was designed for large orchestras whereas another was for small orchestral combinations and solos. A third, smaller still, was used for talks, and a fourth for plays with adjoining facilities for producing simple sound effects.

The equipment used in all the studios was standardised, consisting of microphones hung on heavy movable stands with long flexible leads terminated in a series of wall or floor plugs. These were subsequently connected to the corresponding microphone amplifier. The output from the amplifier was taken to the main control room where all programmes were produced.

At the time, these studios were considered to be sufficiently good. However, later investigations showed that whatever alterations were made in the way of draping, or leaving bare, the walls of a studio, the microphone always produced undesired results, which the BBC termed as the *room effect*. In the case of orchestras, the *hall effect* was required for transmission. Eventually, BBC engineers produced the correct effect by adding *artificial echo*. From that point onwards, the tendency was to design studios that were acoustically of medium deadness, but with bright decorations and upholstery. Draping was replaced by artistic panelling and pillars, and the effect on artists was, apparently, 'invigorating'. Just before a broadcast was about to start, the correct amount of artificial echo was introduced electrically to give the required *reverberation effect* for any particular item in a programme.

The reverberation effect in the studio was produced by using two microphones, side by side. One of the microphone leads, via its appropriate amplifier, was connected direct to the control room. The other lead went to a loudspeaker situated in a distant echo room, which had bare plaster walls and a concrete floor and ceiling. The room was kept closed during the process. The sound from the

Fig. 1: Studio 7 at Savoy Hill, featuring an improved design for better acoustics. (Keith Hamer+Garry Smith) Fig. 2: An advertisement in 1927 for a selection of Edison Bell wireless equipment. (Keith Hamer+Garry Smith) Fig. 3: The Haven Hotel in Dorset at the time of Guglielmo Marconi's stay. (Keith Hamer+Garry Smith) Fig. 4: The Blue Plaque to commemorate Marconi's work at the Haven Hotel in Sandbanks. (David Morris, Lytchett Matravers, Dorset) Fig. 5: A rare photograph of the first SRG-SSR emblem from 1931, depicting the Sottens and Beromünster transmitters. (Keith Hamer+Garry Smith) Fig. 6: The original opening graphics used on 17 January 1983, at the launch of *BBC Breakfast Time*. (Keith Hamer+Garry Smith)

loudspeaker was reflected many times by the walls of the room, the resulting sound being rather a confused reproduction of the original music in the studio. The sound was picked up by a microphone in the echo room and mixed in the control room with the direct music from the first microphone.

By varying the proportions of the combined sound, various effects could be obtained. With direct music alone, the result was similar to the original performance in the studio. Depending on how much the proportions of the music via the echo room were increased, the results could give the impression that the orchestra was performing in a large room, a small hall, a large hall, or even a cathedral.

By adjusting the proportion control, it was possible to give just the artistically correct effect for any particular item. The arrangements in the echo room were such that the type of reverberation could be altered very considerably. The effective length of time of reverberation was controlled by an experienced musician whose sole duty was to watch the balancing of orchestras and of solo artists in relation to the piano and the acoustic effect during transmission.

Broadcasts were usually adjusted for best results on a high-quality cone loudspeaker. This did not represent the very best form of loudspeaker, but the average type used by listeners at home with good receiving sets. Anyone who found the echo effect continuously annoying were informed that this was not the fault of the BBC and the listener should search for some serious unsuspected problem with their receiver!

Vintage Wireless Equipment

This month's ramble through vintage copies of forsaken newspapers and magazines has found four advertisements for the price of one, **Fig. 2**.

The text for *The Edison Bell Double Cone-Type Speaker*, *The Regent Cabinet Speaker*, and two types of condensers, has been left in its original format to reflect the spelling, grammar and punctuation of the time.

This is the full description of the equipment originally featured in an advertisement, dated 1927:

THE EDISON BELL DOUBLE CONE TYPE SPEAKER has no marked resonance point on the musical scale, making the reproduction of music exceptionally sweet.
Everything that is broadcast is faithfully reproduced.
Price . . . £2 2s.
Cat. No. R/308.
EDISON BELL REGENT CABINET SPEAKER
EMBODIES all the characteristics of the double cone, with added improvements. In solid mahogany case with mother-o'-pearl grill.
Price . . £5 10s.
Cat. No. R/364.
INSIST ON EDISON BELL CONDENSERS
TESTED 500 VOLTS FLAT TYPE
TESTED 500 VOLTS UPRIGHT TYPE
THEY ARE BRITISH MADE AND GUARANTEED BY A NAME WITH 30 YEARS REPUTATION BEHIND IT
SEND for FULL CATALOGUE of SETS & COMPONENTS FREE.
Edison Bell Ltd., Glengall Rd., London, S.E.15

No doubt the solid mahogany case and mother-o'-pearl grill clinched the sale if the head of the house was choosing the loudspeaker back in 1927!

Marconi In Bournemouth, Revisited

In the January and February columns, we featured some of the experiments carried out by **Guglielmo Marconi** while he was staying at the *Madeira Hotel* in Bournemouth (now the *Court Royal Convalescent Home for South Wales Miners*), and the *Haven Hotel* at Sandbanks, Parkstone.

David Morris of Lytchett Matravers, near Poole, has written to say that he has recently started to subscribe to *Practical Wireless* and enjoyed reading about Marconi's exploits.

David writes: *"I have sent a picture of the rather tatty Blue Plaque erected to commemorate Marconi's work at the Haven Hotel, Sandbanks. The picture was taken in January 2022. The plaque is located on the outside of the hotel's rear gates.*

"There is a 'Marconi Lounge' at the Haven Hotel, although there is nothing of particular interest for the radio enthusiast to see. There are continuing talks about the demolition of the hotel.

"As Bournemouth is local to me, I found your PW *article 'Marconi In Bournemouth' to be of interest. Keep up the good work!"*

The Haven Hotel was originally built in 1887 with numerous successive renovations. **Guglielmo Marconi** lived there with his family for a number of years and **Fig. 3** shows the hotel as it would have been during his stay. At that time, it was owned by Frenchman, **Eugene Poulain**, who was noted for offering fine wine and haute cuisine menus. Marconi's communications firm, *The Marconi Wireless Telegraph and Signal Company*, was based at the hotel between 1898 and 1926. The Blue Plaque to commemorate Marconi's work is shown in **Fig. 4**. Part of the faded inscription reads: *"Guglielmo Marconi (1874-1937) Inventor of a wireless telegraphy system. He conducted experiments from Sandbanks over a 30 year period."*

Marconi erected a 120ft wooden mast in the hotel's grounds to carry out experiments. He had a similar mast at his previous location, the *Madeira Hotel*, until he was abruptly told to take it down and leave immediately by the manager for non-payment of his account! While at the Haven Hotel, Marconi transmitted the first radio signals across the English Channel from France to England.

The impressive hotel is located alongside the road that leads to the famous *Bramble Bush Bay* chain ferry. This particular vessel was brought into service in 1994, but the service between Sandbanks and Studland was originally opened in 1923, so Marconi would certainly have known it. Nowadays, the famous hotel has an uncertain future. There have been plans to demolish the building and replace it with 119 flats, together with a 27ft-high flood-defence wall. Perhaps not too surprisingly, the millionaire residents at Sandbanks lodged a complaint saying the development would spoil their view of the harbour.

3

BBC2 Colour Films

1 July 1967, saw the opening of the first colour television service in Europe. This was on BBC2 and just beat German television by one month, even though the UK system was largely based on work carried out in Germany! To entice people to buy a colour receiver, a series of entertaining films were broadcast during the daytime, known as *BBC2 Trade Test Colour Films*. Well over 100 were shown and some of the more memorable ones included *Atlantic Parks*, *Run Away To Sea*, *Giuseppina*, and *The Home-Made Car*. The latter was also shown once as a normal programme on BBC1. **Godfrey Manning G4GLM** has written from Edgware asking if any *PW* reader has a copy of his particular favourite, *Lure Of The Bahamas*. This 27-minute epic was produced by *Sound-Magic Productions* and shown from October 1968.

Service Information: Switzerland, Part 2

In 1930, the Swiss authorities decided that radio was an important public service, which should not be allowed to become simply a revenue-earning operation for private companies. With so many stations opening on an ad-hoc basis, the regulators believed that interference problems could arise affecting civil radio communications. It was, therefore, decided that broadcasting should be structured on a federal basis.

On Tuesday 24 February 1931, the *SRG-SSR* was established with the formation of the *Schweizerische Rundspruchgesellschaft* (*SRG*, serving German-speaking regions) and the *Société suisse de radiodiffusion* (*SSR*, French-speaking cantons). It was created by a government charter as an umbrella organisation for all Swiss regional radio broadcasters, **Fig. 5**. The provision of the infrastructure for broadcasting stations became the responsibility of the *+PTT* (the '+' denoting the Swiss PTT). The state-owned company took care of the procurement and maintenance of the studio equipment plus the transmitters and nationwide signal distribution.

In March 1931 the federal administration of the Swiss Confederation, known as the *Federal Council*, granted the SRG-SSR an exclusive licence to broadcast programmes on a national basis. **Maurice Rambert** was appointed the first Director-General of the SRG-SSR with a five-year term of office.

In the same year, it was agreed that all broadcast news reports had to be provided by the Swiss news organisation, the *Schweizerische Depeschenagentur* (SDA). This was the official press agency, which began in 1894. This agreement remained unchanged until 1971. The SRG-SSR was originally allowed to broadcast only two news bulletins each day.

The first national transmitters began operating in 1931: *Radio Sottens* for French-speaking regions on 25 March, and the German-language station, *Radio Beromünster*, on 1 May. An account of the Beromünster station was given in the January and February columns.

The *Radio Sottens* medium-wave station operated from a 188m self-supporting tower on 743kHz (403m) with an ERP of 25kW. **Roland Pièce** became technical director at the station.

The power was increased to 50kW in 1933. Following the *Luzern Frequency Plan*, *Radio Sottens* moved to 677kHz (443.1m) in 1934. In 1949, a new anti-fading aerial was installed. The frequency changed again to 764kHz (392.7m) in 1950 as a consequence of the *Copenhagen Frequency Plan*. Following the installation of a new transmitter in 1970, the power was increased to 500kW. Another set of frequency allocations devised in 1978, known as the *Geneva Frequency Plan*, resulted in the transmitter changing to 765kHz (392.2m). Ten years later, in 1988, the transmitter was totally replaced with the power finally being increased to 600kW. Only two years later, in 1990, the main aerial was replaced. Apart from the main tower, there was a spare medium-wave aerial installed on one of the two original 1931 self-supporting towers.

The Sottens main transmitter was switched off on 31 December 2010, and demolished on 20 August 2014. The spare transmitter was also switched off in December 2010, but remained in situ for a number of years before being dismantled.

There was also a shortwave transmitter at Sottens. This opened in 1972, with a power of 500kW. It employed a 62m tower with a rotating double curtain antenna in the 9, 11, 15, 17 and 21MHz bands. This particular type of reflective-array antenna consisted of multiple-wire dipole aerials, suspended in a vertical plane, in front of a 'curtain' reflector made of a flat upright screen of many long, parallel wires. The *AEG-Telefunken HR 4/4/0.9* transmitter was switched off on 23 October 2004. The transmitter and the aerial installation were dismantled in February 2005. This was the final shortwave transmitter to operate in Switzerland.

The Blattnerphone, Part 2

From 1934, the BBC made considerable use of an improved version of the Blattner system for recording programmes. It worked on the principle of making a magnetic recording on a fine steel tape. This was rolled up on a drum as the recording was made, in much the same way as a cinema film.

The Blattnerphone had many advantages. It was flexible in use, it gave a standard of reproduction which was satisfactory for most requirements, and it allowed a playing time of approximately 20 minutes without having to change to another machine, or any break in continuity.

On the downside, Blattner tape was very expensive. In fact, it was too expensive to make it practicable to store a large number of programmes permanently on tape. It was, however, possible to re-use Blattner tape because the magnetic recording could be erased by running it through a pair of polarised heads that were installed on the machines. In view of this facility, the Blattnerphone entered general service as recordings could be saved for repeat transmission to the various *BBC Empire Service* regions within 24 hours of the programme being originally produced.

In this way, the programme could be received in different parts of the British Empire at convenient hours for listening. For certain important broadcasts, Blattnerphone and wax recordings were used together, the Blattner recording having been employed for retransmission until the discs were ready for broadcast.

An improved wax recording system was brought into service, which used a fine cutting head for the tracking of the recording. This gave approximately 150 revolutions to an inch of track, as compared with 84 rotations with the standard apparatus. This, together with slow-speed turntables running at 60rpm, enabled a 12in recording to play for approximately nine minutes. For immediate playback, the Blattner system required a short time (about half that taken for the actual recording) to rewind the tape before it could be played. The wax system was quicker than this because the cutting head on the recording machine was changed for a specially designed pick-up, which was tracked by the mechanism so that it could follow the groove in the soft wax. Unfortunately, this destroyed the wax, but it was practicable to cut a number of waxes simultaneously when recording so that one or more could be used for playbacks and the others for processing. The ability to play back a wax copy before processing was of great assistance in making recordings of running commentaries. This method enabled the importance of the recording to be assessed, thereby eliminating the expense of an unsatisfactory record being processed.

40 Years of BBC Breakfast Television

BBC Breakfast Time celebrated its 40th anniversary last January. The programme was originally launched on 17 January 1983, **Fig. 6**. It was hosted by **Frank Bough**, **Selina Scott** and **Nick Ross**. It was Europe's first breakfast TV show, some 31 years after NBC's *Today* programme was launched in the USA. Previously, morning TV broadcasts in the UK had been restricted to the *Open University* and programmes for *Schools & Colleges,* or nothing at all, well, apart from the *BBC Colour Test Card 'F'* and carefully selected accompanying music.

Early Television Pioneers: Vladimir Zworykin, Part 4

Vladimir Zworykin's other electronic developments included innovations with an electron microscope and an early form of the *Electric Eye* system. This used his electron-image tube, which was sensitive to infrared light and the basis for a device he invented for seeing in the dark. This was first used in World War II. He also worked on various forms of secondary-emission multipliers, which were used in radiation detectors. The spread of television effectively came to an end during the War and in 1946, there were only about 7,000 receivers in the USA. By 1950, however, there were ten million, most of which used the same basic technology as Zworykin's original 1939 model.

He held more than 120 patents on developments ranging from gunnery controls to electronically-controlled missiles and automobiles. However, his place in scientific history is due mainly to two inventions patented as early as 1923 and 1929, the *Iconoscope Camera Tube* and the *Kinescope Picture Tube*, respectively. Together, they eventually formed the first all-electronic television system, although his original patents presented only incomplete designs, totally incapable of actually working satisfactorily in their registered form. It wasn't until 1933, when he worked at RCA, that he devised a fully functioning system, which replaced the cumbersome mechanical method involving spinning perforated discs that had dominated the early development of television.

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DX-TV & FM News

The latest DX news, plus details of changes to broadcast television and radio services, is available on-line via the *Radio Enthusiast* website. Simply search in the *Latest Articles* section.

www.radioenthusiast.co.uk

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Wanted

MY ANTENNAS EFHW 40 10m End fed wire antenna unused or as new top price paid. **Call Paul 07748948685**

MFJ – 784B TUNEABLE DSP FILTER. Preferably in good working order. I am willing to travel. **Brian G8NHN: 0779-285-9886, or email brian.x.house@gmail.com MANCHESTER**

COLLETT TERMINAL. Photo or real thing. Like an enlarged Wander plug. Fits 4mm sockets. Metal half-round, folded back on itself such as to create an eye for the wire. Resembles bifurcated split pin. **Call Godfrey G4GLM, (020) 8958 5113 after 10am, not Sunday mornings or email cgmm2@btinternet.com**

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The Curse of FT8?

Dear Don,
You hit the nail on the head (*Keylines*, March). FT8 and the like have become a cancer to our hobby, and in time will result in the loss of available spectrum. FT8 is not radio as I know it and its use should not be promoted.
Andrew Lipian GW0TOI
Treharris, Wales

(***Editor's comment**: Thanks Andrew. I stand by my comment that we risk losing our frequencies if the majority of activity migrates to a few datacomms channels. But I do feel FT8 is a valid data mode in the context of amateur radio, just as RTTY is. As I write this I am watching FT8 activity on the 12m band and seeing large numbers of Chinese stations – I assume most have no English and probably don't have skills in Morse, but they are actively participating in the hobby, which must surely be a good thing?)*

Lead Gauge

Dear Don,
I've still got the Lead Bending Gauge as distributed with the November 1980 *PW* and seen on page 23 of the March 2023 issue. The embossed legend reads *"Presented free with Practical Wireless (c) IPC Magazines Ltd 1980"* and there are size gauges for wires and BA screws. The photo on page 23 suffers an optical illusion, unfavourable shadowing has distorted or obscured some of the holes, but it is the same item.
Godfrey Manning G4GLM
Edgware

(***Editor's comment**: Thanks Godfrey and your letter reminded me that somewhere I too have that item tucked away and forgotten about! Unfortunately, we are no longer in a position to include such 'goodies' with the magazine.)*

Major Solar Flares

Dear Don,
Between 18 months and two years ago there was a very interesting article in *New Scientist* about 'problems' associated with the occurrence of a major flare at the surface of the sun. This article was related to information from the US, which concluded that a major solar flare could do considerable damage to infrastructure etc and that repairing the damage could be a very costly operation, estimated at many billions of dollars.

It is fortunate that such events occur only rarely. However, there ought to be comprehensive contingency plans in place. As far as I know, there are none!

Consider, for example, our so-called 'obsolescent' wired telephone system. One of the effects of these flares is to 'wipe out' many communication systems using airwaves, wireless, radio, etc. So, we must assume that if wired telephone systems had been phased out, the emergency services would no longer be able to communicate efficiently or effectively? I believe that 'old fashioned' telephone systems should

★Star Letter★

The Star Letter will receive a voucher worth £20 to spend on items from our Book Store, or other services offered by Practical Wireless

Keylines, Feb 23

Dear Don,
I am one of the newer *PW* readers having come across from *RU* (although I did read *PW* back in the late 60s and early 70s). Your memory of the little VHF regenerative receiver prompted me to email you. I built one back in 68 or 69 – don't think they had a model name. Was indeed a wooden baseboard with a wooden panel at 90° to hold the regen pot, the tuning capacitor and a phone jack. Wiring to a bit of tag strip and different bands from 70MHz to about 180MHz achieved by soldering in three separate coils. Used it with a ground plane made of garden canes and speaker wire fed by 75Ω TV coax. Worked remarkably well! Now using an AOR-DV1 and Icom R8600 for VHF/UHF DX – quite a difference! The ergonomics on the 8600 are great but Icom haven't implemented the range of digital modes as is their wont – whereas the ergonomics on the AOR are terrible but it does decode pretty much everything. Moved on from canes and speaker wire to a log periodic and a number of discones.

Passed the RAE in 69 and got a bit of the way to 12wpm but was really a listener with an interest in propagation – MW DX and then tropical bands and then the marine V markers until they wound up with the implementation of GMDSS. When CB came along it was either that or take out a class B licence, which I did, got my Morse up to 12wpm and took out GM0GOV. Still do MW transatlantic stuff – all so much easier with the availability of real-time solar data and propagation tools. Graduated from an HRO MX through an SP600 to RA117 to NRD525 and 535 and now actually my FTdx5000 and IC-7300 do the job. The IC-7300 with its SDR capabilities and scope are actually very effective in winkling out the 10kHz stuff from the EU spacing and the ability to control bandwidth and shift to a much greater extent than the old fixed or crystal filters makes a real difference.

Good to remember the old simple equipment – good luck with the new *PW* incorporating *RU*!
Fred Dinning GM0GOV
Dunlop, Ayrshire

(***Editor's comment**: Thanks Fred. I too started by short-wave listening – it was the pirate radio stations of the 60s in the first instance and then on to shortwave broadcast stations and getting QSLs and goodies from around the world – yes, even a 'little red book' from Radio Peking! And I built a loop antenna for medium wave DXing – easier then in some ways than now because most of the European stations closed down overnight. I even wrote a broadcast bands column for the ISWL magazine* Monitor *for a while, as I recall! But amateur radio then took over, having discovered radio amateurs on AM on 80 and 160 metres and the rest, as they say, is history!)*

be retained and refurbished as an emergency 'reserve' facility.

Also, a comprehensive inventory should be researched and produced to determine the vulnerability, country-wide, of all electric and electronic systems. One type of alternative control system might include 'fluidic' systems and/or robust mechanical/clockwork systems.

Malcolm Barrell
Billericay, Essex

*(**Editor's comment**: Good to hear from you Malcolm. I tend to feel that governments are notoriously poor at planning for such eventualities – they are only here for five years at a time and I suspect they hope that nothing will happen on their watch, so to speak! Putting in alternative country-wide infrastructure would also be very costly, of course. On the flip side, while magazines and newspapers love a scare story, I am far from convinced that a major solar flare would be as damaging as some of these articles suggest although only time will tell.)*

Feedback

Dear Don,

I've been reading *PW* for nearly 50 years. I've just seen in the March issue that you haven't had any feedback on a couple of items, so I thought it's a good time to write to you at last!

I like the 'Archive' stuff; not just from the really early days, but also ones that I remember reading decades ago. I'm not much of a constructor, but I did manage to build the 20m DC receiver in 1978.

Face Behind the Call is also very interesting, not just to hear about the people, but also what kind of operating they get up to, and what their shack looks like. Speaking of which, it'll be good to read your ideas on setting up a new shack. I've been struggling to sort out a comfortable place to operate in our current house, but we do also have a stable full of rubbish next door…..

As to the bands being quiet, I do agree that it seems as though too many people are stuck on FT8, but I can only see the future having even more digital modes. I'm actually trying to get back into CW but do sometimes succumb to the temptation of easy contacts on FT8! I recently saw some videos about '145 Alive' – getting a bit of activity going on 2m FM. Maybe some non-contest activity periods would be good for other modes and bands? And systems like the spotting for SOTA and POTA etc help people to find activity too.

Keep up the good work!

Jon Jenkins GW4LJW.
Lampeter, Wales

*(**Editor's comment**: Many thanks for the feedback Jon, much appreciated. As for* Face Behind the Call*, which I very much enjoy too, radio amateurs are notorious for not wanting to publicise their activities and stations although* Short Wave Magazine ran *a very successful series* The Other Man's Shack *many years ago. I'm hoping **Roger Dowling G3NKH** continues to find suitable subjects for his series.)*

Thoughts on PW

Dear Don,

Having recently joined the *PW* fraternity from *RadioUser* I'd like to offer my opinion so far.

To be honest, there's very little in *PW* that interests me. Sorry. I miss **David Smith's** *Airband* column, **Chrissy Brand's** articles (I reckon she could fill a magazine on her own!) and **Robert Connolly's** *Maritime Matters* column, especially as I'm a retired Radio & Electronics Officer who likes to keep in touch with what's going on in the maritime world. I wonder if the authors could be coaxed out of retirement, if only for the benefit of the old *RU* brigade. The latest (March) issue only had three articles that I'd call 'interesting', namely the FT-710 review (until I saw the price!), **Fred Judd's** *Slim Jim* article and **Stuart Vanstone's** '*Build Your Own Shack*. I just skip over the rest. I may not renew my subscription. It's as simple as that.

Richard Ware
Gillingham, Dorset

*(**Editor's comment**: Thanks Richard and understood. We have 90 years of history as* Practical Wireless *and I wouldn't want to reduce the amateur radio content of the magazine. That said, I do realise we have a responsibility to readers who have come over from* RU *and am working to address that. For example, you mention **David Smith** and it does indeed look as though I can coax him into writing for us on Airband matters. It's early days yet so please bear with us for a little longer at least!)*

Reviews, Authors and Content

Dear Don,

Reading the letters from **Andrew Green** and **Paul Handley** (*PW* March, *Your Letters*) they summed up the demise of *RadioUser* adequately. A fellow reader and I were always comparing thoughts on content. As a radio amateur and short-wave listener I found *RU* simply did not cater for my interests. Within its varied content *Vintage TV*, along with the aeronautical and maritime pages were of interest. **Tim Kirby's** interesting topics disappeared and **Keith Rawlings'** pages that had some excellent construction pieces morphed into antenna design. The rest of the magazine was filled with nothing of interest for me along with endless reviews and to be ruthlessly honest I'm surprised it lasted as long as it did.

Having knocked the *Reviews* I noted the Rubberscopic Antenna review in March's *PW*. Brilliant bit of kit and one that I must acquire. It is not new to me, however.

I had occasion to visit Thailand three times over the last few years, the last visit with my wife. Those that have been there will be aware of the Royal Thai Police (RTP) known colloquially among ex-pats as 'The Boys in Brown.' Usually very smartly dressed they sport a PR, personal radio, which uses channels within the 154MHz band. NFM and analogue, the messages are easily intercepted. In fact, following an explosion in Bangkok, in which I was nearly a casualty, I returned to my hotel near Asok, set up my dongle with its 25cm of wire and listened to the messages. No information gained of course from the very difficult tonal Thai language: 43 consonants, 16 vowels and four tones.

I had noted the Rubberscopic Antennas on these PRs mounted on the users' shoulders and could not immediately understand why they would issue such an antenna.

The answer came from a Thai contact of mine; an amateur and also a RTP officer. He explained at length their operational conditions in and around Bangkok. With so many high-rise and steel-clad buildings and the variation of smaller buildings the signal strengths vary from the usable to rarely useable. In the countryside the distance of operation obviously affects signal strength. From his explanation the issue of the Rubberscopic being very obvious.

Paul Beaumont G7VAK
London

EFHW antennas

Dear Don,

Over the years there have been several designs for EFHWs similar to that from **Daimon G4USI**. In all of them the capacitor is specified as being rated at several kilovolts. Can someone please explain why?

The capacitor is in parallel with the 50Ω winding of the transformer and therefore across the transmitter output. Any high voltage at this point would soon destroy the output stage. With 100W in 50Ω the approximate peak voltage is 98V so a 250V component should be suitable. If a capacitor was fitted to the high impedance winding to tune it, then a high voltage item would certainly be needed.

Many thanks for an excellent magazine,

Jim Maxwell MW0HLW
Buckley, Flintshire

EMF meters

Dear Don,

With the need to assess and monitor our EMF now, I wondered if there were any EMF meters that the amateur could use. I have seen some

meters advertised as cheaply as £25, but gave no frequency range. Others more expensive with a range 30-300MHz. Calculations are all well and good but when it says *"further assessment required"* would not an actual meter reading be more useful? My own bit of wire runs quite close to my neighbour's property, so to comply I run lower power than I would like. Maybe an article on EMF/field strength meters in a future magazine?
E 'Redders' Bluer M5ACT
Waterlooville, Hants

*(**Editor's comment**: I did indeed review an EMF meter in the August 2021 issue of this magazine Redders. The GQ EMF-390 available from Moonraker for £115. As far as I can see, Moonraker no longer stock it but it's available from Amazon, as are a range of other similar meters. The downside is that OFCOM still don't specifically state limits in the way that an EMF meter would measure them, as far as I am aware, but in terms of power and distance.)*

The J-Pole Antenna

Dear Don,
I read **Tony Jones'** excellently-written article on J-poles in Feb '23 *PW* with interest. It has always struck me that the J-pole is actually the same as a Zepp, but the latter is usually used on HF.

I made one here, which I use for 60m. I can't remember the exact length I used for the stub, but it was probably 5% less than a quarter wave, I would have assumed the wire I used, nice thick phosphor-bronze antenna wire, had a low velocity factor. To find the elusive 50R-j0 point I simply clipped the cable from my antenna analyser up it until I found it. I just went out and measured it, 0.17m above the short. That makes it about 13%. I put a choke at the feedpoint too, to reduce common mode currents. That's a commercially-made one, 15 turns on an 80mm ferrite ring.

I also made it into a Double-Zepp by adding a second half-wave wire to the 'empty' top end of the stub, so to the uninitiated it appears as a doublet, until you spy the feed arrangement. I reckon this gives it a bit of gain. It performs really well – nice and quiet on receive too.

I guess you could do this for a 2m/70cm version too! I've attached a couple of photos of my 'giant J-pole' for your interest.
Andy Linton EA5JGN/EI2HH
Hondon de las Nieves, Spain

Thank you, MoD

Dear Don,
I was fascinated to read in *Keylines*, February 2023, that you used to listen in your school's Combined Cadet Force 'shack'.

I also was lucky enough to attend a school that had such a station and during my final year greatly appreciated being able to work others throughout the country on the CCF network, using the standard R107 and WS12, mostly in the area of 5MHz. In fact, at the end of the year, I had to decide whether I was going to let my interest in radio communication drop or to pursue it.

Not surprisingly, I decided to proceed. I took the RAE at the end of my first year at university and the Morse test at the end of the second, thanks, in no small measure, to the practice transmissions made on Top Band by the late G3AWL, to whom many amateurs in this area owe a considerable debt of gratitude. I have been on the air since April 1960.

Throughout this time I have enjoyed operating, currently using an FT-450D and an FT-817, but I still build my own equipment, at the moment a receiver for Top Band and 80m with octal-based valves using a WS19 MkIII chassis and cabinet.

Thanks to the MoD, we are now able to enjoy amateur radio activity on 5MHz, an ongoing legacy of earlier times.
John Hogg G3NUA
Hartlepool

Ferrite bars etc

Dear Georg,
May I call your attention to the bottom of page 62 of the February edition where your statement concerning the basebands is out by a factor of ten? ELF actually starts at 300Hz and goes up to 3kHz. VLF begins at 3kHz and goes up to 30kHz.

The submarine transmitter GBZ that I worked with for many years had a nominal centre frequency of 19.6kHz, it was a VLF set. 30kHz to 300kHz is, of course, the LF Band, hence Radio 2 on 198kHz.

I don't suppose I'm the only one who has noticed what was probably just a typo. Thanks for the article, it was enjoyable and informative.
Simon Pryce G0EIY
Shrewsbury

*(**Editor's comment**: Thanks Simon for your email to Georg. I have reproduced it here for clarification and apologise that neither Georg nor I picked up on this one.)*

Radio Maths

Dear Don,
I know a number of people who would love to study for the Advanced licence but can't because they know their maths is not up to it. The thing is, it never was and it is not their fault because they most likely never learned maths (as opposed to arithmetic) in the first place.

Arithmetic consists of applying operators plus, multiply etc to numbers. Maths is a conceptual thing, a tool to understand how 'things' relate to each other. Times tables and income tax are arithmetic. V=IR and dB are maths.

Should radio clubs offer remedial maths training? Fractions, algebra, formula transformation, powers et al? Do we need a syllabus, even if there is no exam, for essential radio maths?

Mr Sunak wants schoolchildren to study maths to the age of 18, so this is a societal problem. (I used to be an Information Analyst for the NHS, and percentages, let me tell you, were considered 'advanced maths', beyond the wits of managers with master's degrees!). Even if he succeeds, this won't help the many radio amateurs we have now who are stuck at Intermediate.

Something needs to be done. I just don't know what that is. What do *PW* readers think?
Charles (Tony) Jones G7ETW
Southampton

*(**Editor's comment**: Interesting one, Tony. My wife and daughter frequently argue with me that learning maths at school – yes, as against arithmetic – was, for them, a complete waste of time. Something they have never needed to use*

in 'real life'. Personally, I loved maths and as an engineer, it proved essential, of course. What, as Tony says, do readers think? And is it even relevant to amateur radio?)

Communication, band space and sheds (Your Letters)

Dear Don,

Exactly, what's that about? *"Only serious experimenters"* need apply to operate on the 5kHz (March 2023). As a **Bernard G4BXD** rightly points out, the rest of us are not 'serious experimenters' then? Mere bystanders (shamateurs?). On the sidelines just fooling ourselves into thinking we're all part and parcel of some huge collective communicational experiment when that might not be the case.

And yes, why another allocation at 8m to fiddle about with? Again, as Bernard comments, there is currently acres of 'unused' RF bandwidth at 6, 4, 2 and 70cm (there's also 23cm, but that's another story) to stir up trouble on. Okay, 8m ain't the same as VHF or UHF, but you probably get the idea. And why is it (it's been strangely prevalent for many years), do some people insist on hiding away in 'secret' in some far-off experimental frequency enclave talking to themselves, or maybe engaging in a furtive exchange with their partner-in-crime across town? It's as if off the beaten track activity is seemingly irresistible to a select few in our midst. Have they become so disengaged with the wider majority of the amateur radio community, that living inside a little self-imposed bubble has somehow blinkered them into believing that the bigger picture of communication with their fellow hobbyists doesn't really matter anymore?

Now, there's a funny thing, those who whisper their callsigns. Putting aside the fact that this annoying habit has been prevalent for ages, do those who engage in this sort of silent activity think that all of us have the hearing capabilities of dogs and cats? We haven't. Oh, and some of us, generally those of us who have a lot more turns on the coil, could have hearing problems. Like those operators who keep asking you to repeat your callsign and your QTH and so on. So don't be shy, please speak UP. We need to hear about all those interesting things you've done.

Hey, I sort of enjoyed reading about the trials and tribulations of building a shack in your back garden. However, unless I missed it, there was no mention of security. Personally, I wouldn't want to permanently leave several thousand pounds of radio gear in a garden shed without an appropriate deterrent. Even then, I'd think twice about leaving my radio equipment in a wooden shed. I prefer it be indoors. There again, I guess you could transfer it from the house to the shed. But what's the point of that? No, better to put your foot down with a firm hand and just say this is where my shack is going to be – in the spare bedroom. In the house. If you've not got a spare bedroom, negotiate.

Ray Howes G4OWY/G6AUW
Weymouth

Nipkow Disc

Dear Don,

In the January edition of *PW* was an article on *The Vintage Days of Radio* with a mention of **Paul Nipkow**, known for his Nipkow Disc. Around 1966 to 1968-ish when I'd be aged around 11 to 13, I found a strange aluminium disc about ten inches in diameter in our garden, it might have even have been eight inches, with holes drilled in a spiral going inwards. I thought nothing more of it and put it down. Only years later I discovered what it was a Nipkow Disc. I'm surprised it had been in such good condition for its age but it's probably well corroded now. How I wished I had kept it.

Bill Kitchen G4GHB
Ashton under Lyne

Long Time Reader

Dear Don,

I first bought *Practical Wireless* in 1973, that's 50 years old...half a century. I had read and hoarded every issue from 1932 to 1979. I wonder if any of your other readers can beat this?

Andrew Redding
PW Reader

***(Editor's comment**: I suspect the answer, Andrew, is that quite a few can! Indeed, this month's Letters suggest exactly that. My own first copy was bought in 1966 although I'm ashamed to admit there were periods when I preferred other amateur radio magazines!)*

Next Month

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

- **THE FACE BEHIND THE CALL:** Roger Dowling G3NKH goes behind the scenes with Paul Heiney, well known from That's Life and elsewhere.
- **DOUBLE TURN MAGNETIC LOOP FOR LF BANDS:** Maurice Webb GW0UGQ returns to the fray, this time with a double-turn magnetic loop.
- **A FIELD STRENGTH METER REVIEWED:** Dr Colyn Baillie-Searle GD4EIP reviews the latest offering from Kanga Kits.
- **TRAP THAT COAX:** Billy McFarland GM6DX takes readers through the design and building of coaxial traps for multiband antennas.
- **CARNARVON REVISITED:** For this month's Valve & Vintage outing, John Rowlands MW1CFN takes us to Marconi's Carnarvon station.
- **AIRCRAFT RADIO:** Joe Chester M1MWD visits the Smithsonian Museum in Washington DC and learns about the development of aircraft communications.

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