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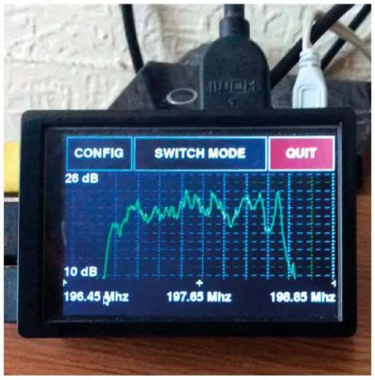

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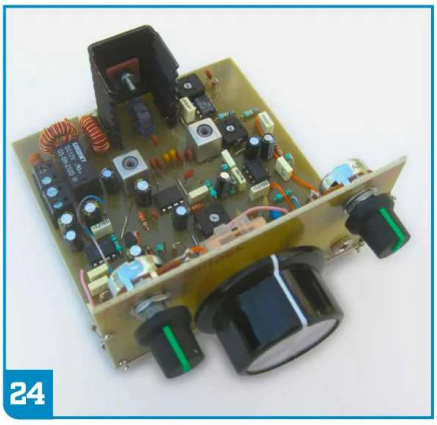
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Newsdesk

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

New from Icom

Icom UK are pleased to announce that their latest amateur radio hand portable. The ID-50E is now available for sale from authorised Icom amateur radio dealers with a suggested retail price of £449.99 inc.VAT.

As well as operating as a normal FM radio the ID-50E is designed to work on the D-STAR (Digital Smart Technology for Amateur Radio) network. With D-STAR compatibility users gain access to an extensive network of repeaters, reflectors and linking capabilities greatly expanding communication possibilities. The D-STAR DV mode can send not only voice but also image data. Photos from a smart device can be imported into the ID-50E using the ST-ID50A/W picture utility software to exchange photos and QSL cards.

The ID-50E Band Scope and Waterfall displays can visually show active channels with a wide span and timeline so it is easy to find active channels by sight. The Dualwatch function doubles QSO opportunities to monitor VHF/VHF, VHF/UHF and UHF/UHF bands at the same time.

The ID-50E can also receive both the Airband and the FM bands.

Moreover, almost all of the optional accessories for the ID-52/ID-51/ ID-31 series transceivers can be shared. A large-capacity battery pack, BP-307, for the IC-705, is available as well.

For further information about this new model, visit the 'ID-50E Dual-Band D-STAR Digital Handheld Radio Transceiver' product page:

https://tinyurl.com/yc75rdsp

Icom UK are also pleased to provide details of a new receiver coming to its amateur radio and receiver product range, the IC-R15 wideband receiver. Unveiled at the recent Tokyo Hamfair 2023, the IC-R15 was a surprise show for visitors, capturing their interest with its impressive design and range of features.

The new IC-R15 wideband receiver has a frequency range of 76 to 500MHz and supports AM/FM/WFM modes. Like its predecessor, the IC-R30, the receiver has two VFOs and can simultaneously receive two signals in all frequency bands. The receiver has a large colour LCD screen and features Bluetooth connectivity, a recording function and a Micro-SD card slot. In addition, it is possible to charge the IC-R15 via a USB-C connection.

As with other recent Icom models, this receiver features an improved user interface, making it easier, especially for beginners who want to get straight on to listen to whatever is on the air. Experienced radio amateurs and monitoring professionals will also find the IC-R15 an easy-to-use listening device for any purpose. The receiver can be seen as a must for those keen on listening to Airband broadcasts.

Also at the Tokyo Hamfair, the Icom booth showcased its full range of amateur radio and receiver products, including the IC-PW2 linear amplifier, for which further details have been made available on new IC-PW2 webpages.

Icom UK will of course publish details about launch dates and pricing for the IC-R15 and PW2 on their website and social media channel as soon as they have them.

www.icomuk.co.uk

RNARS 30th anniversary of HQ move to HMS Collingwood

On 28 July the RNARS celebrated the 30th anniversary of the move of their HQ Shack from *HMS Mercury* to *HMS Collingwood*. The HQ Shack in *HMS Collingwood* was formally opened by **Admiral of the Fleet Sir Edward Ashmore GCB DSC**, Patron of the RNARS on 30 July 1993. **Commodore Paul Sutermeister** was the last Commanding Officer of *HMS Mercury* before it was closed in 1993 and the Signal School was moved to *HMS Collingwood*.

The celebration was attended by the Society's Patron, **Admiral Sir Philip Jones**, GCB DL former 1st Sea Lord, by the Society's President Commodore **Paul Sutermeister** DL RN, by **Captain Tim Davey** RN Commanding Officer of *HMS Collingwood*, by WO **Mark Gower**, Base Warrant Officer *HMS Collingwood*, by representatives of the Radio Society of Great Britain, of the Royal Signals Amateur Radio Society, of local radio clubs including Fareham & District Amateur Radio Society, Horndean and District Amateur Radio Club, Isle of Wight Amateur Radio Society, Fort Purbrook Amateur Radio Club, Itchen Valley Amateur Radio Club and by members of the RNARS.

The celebration was opened with prayers of rededication led by **Rev. John Backhouse**, Naval Padre.

Commodore Sutermeister described the events around the decision by the Admiralty to close the Signal School in *HMS Mercury* and transfer it to *HMS Collingwood*.

Lt Cdr GD 'Doug' Hotchkiss RN (Retd) GW4BEQ described how **Captain Henry Jackson** RN carried out early wireless trials on board naval ships and but for the fact of his appointment as Naval Attache in Paris curtailing his experiments he might well have received the accolades and honours later accorded to **Guglielmo Marconi**.

Admiral Jones gave the loyal toast and Captain Davey wished the RNARS another 30 years of success in *HMS Collingwood*.

The Society struck a Challenge Coin to commemorate the event and on behalf of the Society **Joe Kirk G3ZDF** presented Challenge Coins to the distinguished guests and to representatives of the local radio clubs.

Captain Davey presented the RNARS with an HMS Collingwood/Maritime Warfare School Challenge Coin. **Rod Angel G4ZUP** presented the RNARS with an Isle of Wight themed pennant on behalf of the Isle of Wight Amateur Radio Society.

The photo shows Joe G3ZDF, Sir Philip Jones GCB DL and Ian M0LIH.

Further photos of the event are available at:
https://tinyurl.com/mr34rwcx

Southeast Builders Club update

Having established a core membership of 20 the group held the first AGM and activity day in June 2023. The activities involved a 2m foxhunt to test out the 'tape measure' DF antennas made at the May 2023 meeting. The foxhunt held on the downs in the Guildford area had a competitive element and was won by **Jon M0TWM**. The AGM followed the foxhunt and was attended by RSGB RR10 **Keith G4JED** who addressed the group and presented the foxhunt prize to Jon and the RSGB Affiliation Certificate, which was received by **Eric M0REQ** the club's co-founder. The club was due to return to evening activities in September with planned evenings on a VLF RX project, Shack Automation with Microcontrollers and Home Assistant Devices and a from scratch KiCad project. The club callsign is G8KVU and the relevance of this callsign is outlined on the G8KVU QRZ page.

https://www.facebook.com/hamradiobuilders
hamradiobuilders@gmail.com

The club meets on the third Wednesday of the month 19.30-21.30 at Grafham Room, Horsham Road, Grafham GU5 0LJ.

The what3words address for the club is:
///hiring.hedgehog.prayers
https://w3w.co/hiring.hedgehog.prayers

New from Moonraker

The new Scanking TXHF-6 Doscone Antenna covers 3-1000MHz on receive and you can also transmit on 80-6m up to 200W.

Gain: 2.15dBi over standard discone; Height: 84cm; Diameter: 220cm; Radius: 110cm; Connection: SO239.

The price is £129.95.

https://tinyurl.com/yc452v9z

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

Rallies & Events

All information published here reflects the situation up to and including **24th August 2023**. Readers are advised to always 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, to: **practicalwireless@warnersgroup.co.uk**

24 September
(change of date from 8 October)
HACK GREEN MILITARY SURPLUS & MILITARY RADIO HANGAR SALE: Hack Green Secret Nuclear Bunker, Nantwich, Cheshire CW5 8AL. Sale of electronic equipment, amateur gear, components, military radio items, and vehicle spares.
coldwar@hackgreen.co.uk
www.hackgreen.co.uk
https://www.facebook.com/HGsecretbunker/

24 September
BURY ST EDMUNDS RADIO RALLY: The Rougham Tower Museum IP32 7QB. Opens 9.30am (Traders 8am). Trade stands, Table top sales, bring and buy, Local radio clubs displays, RSGB Book stall, Raynet. Refreshments available from the Museums cafeteria and toilet facilities. Entry £3. Table top sales £6. Traders and vans £12 (no need to pre book). The Rougham tower Museum (94th BG of the USAAF 8th Air Force during WW2) will be open to the pubic (free entry). So come along and make a day of it. (BB CBS CR CS FM RSGB)
rally2023@bsears.co.uk

24 September
WESTON SUPER MARE RADIO SOCIETY 8TH RADIO & ELECTRONICS RALLY : The Campus Community Centre; Worle, Weston super Mare BS24 7DX. Entry is at 10:00 am and is £3 per person. Under 16s free of charge. The Campus is very close to Junction 21 of the M5 Motorway. (CR | FP)
Tel: 07871 034 206
westonradiosociety@gmail.com
www.g4wsm.club

1 October
49TH WELSH RADIO RALLY: Llanwern High School, Hartridge Farm Rd, Newport, NP18 2YE. Doors Open 10am, Traders 8am. Entry £3 as last year. Free Parking. Bring & Buy. Refreshments. Talk by Eric Edwards GW8LJJ. The Changing World of Amateur Radio. Nostalgia for some, history for others. Presented by Eric in is usual cheerful manner. (BB CR L)
welshradiorally@gw6gw.co.uk
rackhamone@aol.com
01495 226149
07976 368250

7 October
DX FEILE: Shannon Springs Hotel, Ennis Road, Shannon, Co.Clare. DXpedition presentations, DX Quiz, Pile-Up Challenges and Jumbo Tombola Raffle etc. Convention Day Ticket : €20. Single Room for Saturday 7th, Convention Day Ticket, Lunch, Evening Dinner, Breakfast Sunday morning 8th...€240. Double Room for Saturday 7th, 1 x Convention Day Ticket, 2 x Lunch, 2 x Evening Dinner, 2 x Breakfast Sunday morning 8th...€320. Twin bedded Room for Saturday 7th, 2 x Convention Day Tickets, 2 x Lunch, 2 x Evening Dinner, 2 x Breakfast Sunday morning 8th...€340. Early Booking is advised due to limited availability.
eidxg.com

15 October
HORNSEA ARC RALLY: Driffield Showground, YO25 9DW. Organiser: Les, 2E0LBJ.
01377 252 393
lbjpinkney1@hotmail.co.uk

22 October
GALASHIELS RADIO RALLY : Volunteer Hall, St Johns Street, Galashiels, TD1 3JX. Doors open at 11 am. (BB | CR | TS). Contact: Jim Keddie, GDARS Secretary
mail@gm7lun.co.uk

25 November
WILTSHIRE WINTER RADIO RALLY [SATURDAY]: Kington Langley Village Hall and Playing Field, Kington Langley, Wilts. SN15 5NJ.
Open 9 am to 3 pm. Traders Welcome. Entry is £3, indoor tables £10. Depending on the weather, there may be a small car boot section.
Further information (see also: 30 July). (CS D FP RSGB SIG TS WiFi)
Chairman@Chippenhamradio.club
www.chippenhamradioclub.co.uk

9 December
MID-DEVON AMATEUR RADIO & COMPUTER FAIR: The first Mid-Devon Amateur Radio & Computer Fair will be held on December 9th at * Winkleigh Sports & Recreation Centre, Mid-Devon EX19 8HZ from 09:00 – 14:00. Entrance £3, no charge for partners & under 16s. Easy access from the A3124, ample parking, hot food and refreshments available. A chance to pick up hard-to-find electronic components, two-way radio and computer hardware.
Traders £5 per 6 foot frontage + £5 if you require physical table(s), first-come-first-served, pre booking advance recommended. Mains electricity should be available to most traders FOC. (CR FP TS)
Talk-in on S22 and the South West Cluster (DMR TG950 slot 2) repeaters.
Phil G6DLJ
07990 563147
philbridges@hotmai.com

***What3Words///focal.fountain.laminated**

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** 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

NEWS EXTRA

NEW PACT EXPANDS AMATEUR RADIO USE DURING EMERGENCIES: A new agreement between the African Telecommunication Union and the International Amateur Radio Union is being hailed as a landmark agreement on the African continent. Praising amateur radio for its responsiveness in a crisis, the secretary-general of the African Telecommunications Union signed an agreement with the International Amateur Radio Union (IARU) advocating for expanded use of amateur radio during emergencies in African nations. The agreement places a special emphasis on amateur radio's role in the 51 African countries that belong to the ATU. Both organisations pledged to cooperate when preparing for and responding to crises.
A large part of the pact involves coordinating workshops and training programs and stepping up promotion of Science, Technology, Engineering and Mathematics education in Africa through the use of amateur radio.
Sylvain Azarian F4GKR, the president of IARU Region 1, said that the agreement would also have an impact on regulatory changes that are needed for amateur radio in Africa. As he signed the pact, he told those in attendance *"This is our first step to initiating a collaborative approach that is keen to find solutions and to ensure a conducive environment for amateur radio operations in the region."*

DIGIPEATING SATELLITES SET FOR LAUNCH : Slovakia and Romania are preparing to launch digipeating satellites this autumn, following coordination of their frequencies by the International Amateur Radio Union.
The Slovakian satellite, a 1U CubeSat, will have experimental slow-scan digital video as well as a digipeater operating around the clock on two different bands. Because the satellite has an educational role to fulfil, there will be messages transmitted in both CW and using AX.25 occasionally. The IARU has coordinated a downlink on 436.680MHz.
The Romanian satellite is a picoSAT with the primary role of serving as a digital amateur radio repeater.
A CW beacon will also be transmitted so that amateurs can measure various properties of the signals and detect its speed by using Doppler. The satellite will also transmit low-resolution SSDV images in GFSK mode.
The satellite will be using a downlink on 436.235MHz. CW will be sent at 20wpm. GFSK telemetry will be sent at 500bps and GFSK SSDV will be sent at 5kBps.

Fig. 1: An ERA BP34 Audio Filter (foreground). Fig. 2: An ERA Advert in PW in the 1980s (PW, December 1990: p. 53). Fig. 3: Two types of Microreader. Fig. 4: The ERA TS232 External Screen. Fig. 5: A Symphony in Green: The AOR AR7030 and the ERA RS232 External Screen. Fig. 6: Ken Reitz's older US setup (Courtesy of Ken Reitz/TSM). Fig. 7: The shack setup with a weather station and a vintage scanner (Realistic PRO2006, for MSIB transmissions). Fig. 8: Old and new can work together: feeding the ERA decoders and screen from a Deepelec DeepSDR101. Fig. 9: The Wellbrook Loop is best for bringing in the RTTY signals, in my experience.

I was also curious as to what else there would still be to receive via RTTY signals, in the age of ever-new digital modes. As in other areas, the go-to reference for this is the *Klingenfuss Guide to Utility Radio Stations ('KF')*, currently in its 2023/4 version (pages 363 ff.).

Here, you will find the usual German Meteo listings (MET) for sure, but also some remaining aeronautical signals from around the globe (many of them are now digital).

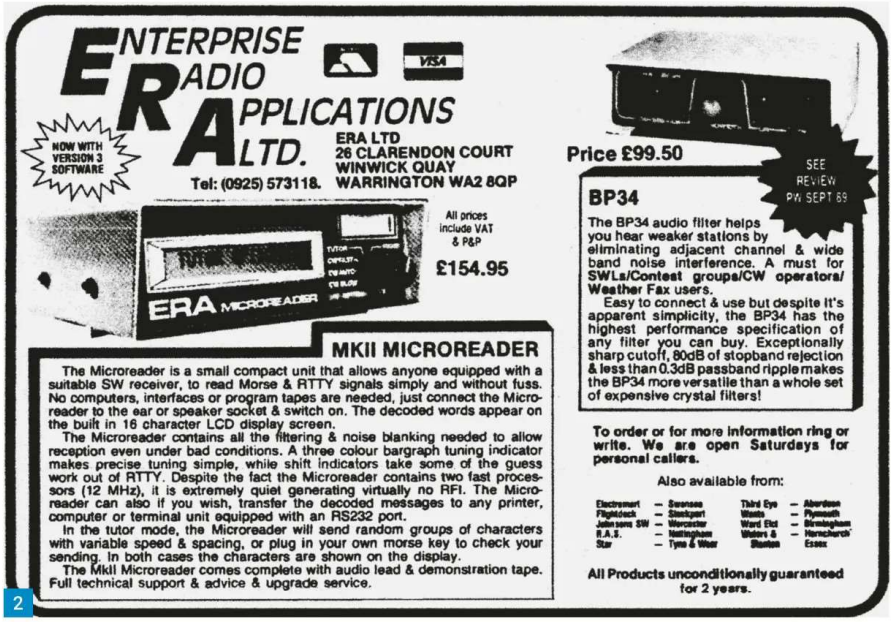
Asking some of my radio colleagues and friends, I found out a little more:

Other RTTY and CW signals

For example, my colleague and fellow contributor **Tim Kirby** said: *"Yes, there's still some amateur use of RTTY. Mainly in contests, these days. Frequencies to listen are **3585, 7085, 14085** (most common), **21085**, and **28085kHz**. In a contest, any activity will be 5kHz on either side of these frequencies. You'll find more on CW though. During the day, you'll probably hear CW around **7000 - 7030, 14000 - 14070, 18068 - 18090, 21000 - 21070, 24890 - 24910** and **28000 – 28070**. You may also find some CW beacons between **28200** and **28300**. During the day, at the moment, 14, 18 and 21MHz are probably the most likely bands to yield some results for CW."*

Don Field, our esteemed editor, confirmed this and added: *"RTTY is pretty much only used nowadays in RTTY Contests. FT8 seems to have taken over for day-to-day contacts (and a few other modern data modes). But, yes, CW is still going strong – about 90% cent of my contacts are still on CW."* That last statement surprised me, I thought new modes had all but taken over.

Meanwhile, **Jörg Klingenfuss**, the publisher of the eponymous frequency guide books from Germany pointed me to **5195kHz** (Kiel; DRA5; 45 Baud: solar activity forecasts; KF: p. 110, 301) and the sporadic 'historical' transmissions from KFS and KPH. PBB transmits RTTY with 75 Baud; and, occasionally, there are other NATO transmissions in the clear (see below, and the KF). (N.B.: **KPH**, CA, USA: **https://tinyurl.com/48dan8z6** **KFS**, CA, USA: **https://tinyurl.com/4kz2mdwr**



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PBB, Dutch Navy, Den Helder, Netherlands: **https://tinyurl.com/bdzyutfm;** KG 2023/24: 311).

And, last but not least **Ken Reitz**, editor of the (USA) *Spectrum Monitor*, commented, *"... I have a vintage mid-1980s-era Commodore C-64 (that I bought new, back in the day) with an 'SWL' cartridge that copies CW and RTTY very well (displayed on any NTSC TV). Every year or so, I drag it out to make sure it still works. It does! Back in the 1980s, there were still commercial press services that used HF to transmit news dispatches. More recently I've used it to copy 30m band DWD WX transmissions (the photograph is from March 2022)"* (**Fig. 6**).

In terms of RTTY 'radio sport', in the first half of 2023, some of the more widely advertised RTTY contests included those below, but this is not a comprehensive listing, as there are many more clubs internationally getting involved.

Too many, in fact, to be listed here.

- The *80m Club Championship* (one RTTY event each month from February through July)
- The *British Amateur Radio Teledata Group's Sprint 75* Contest (April)
- The *SP DX RTTY Contest* (April)
- The *Northern California Contest Club's NCCC Sprint* (June 2023).

The ERA gear in use

With the above comments in mind, it was time to hit the airwaves, so to speak. I connected both *Microreaders* I used for this project to my AOR AR7030 first, **Fig. 7**. The 'standard' model is the only one that has an RS232 connection socket to plug the ERA RS232 screen into and the

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Keylines

Not a lot of radio for me in the past month, as we were away for a break and in any case the bands seem to have been relatively quiet. But in early September I notch up 55 years licensed, which got me thinking.

Amateur radio has played a big part in my life throughout that time. It got me started in a career in telecoms, and kept me in touch with matters technical when I, as is typical, moved more from the engineering side to, in my case, marketing and strategy. Domestically, I would say the hobby has kept me sane as an antidote to the inevitable pressures of life, both from work and from the ups and downs of family life. And the nice thing about amateur radio, of course, is that it's a hobby that can be enjoyed from home but also offers plenty of scope for social interactions, whether through a radio club, volunteering for roles within the hobby (I was on various RSGB committees for over 30 years) or, in my case, going off on expeditions with friends.

Of course, for myself I've been in amateur radio journalism for a very long time too. In my early days I wrote for *Monitor*, the ISWL magazine, as secretary of my university radio club I edited the regular newsletter, and later, along with **Martin G3ZAY**, I took on the editorship of the RSGB's weekly *DX News Sheet*. And that led to me writing monthly for *Amateur Radio* magazine, *Ham Radio Today*, *RadCom* and now (for almost ten years) *PW*.

One of the good things about the hobby is that it has so many aspects, from operating to building, from routine to esoteric, should we so choose. And it's something that we can keep coming back to – even my own involvement, although constant, has varied in intensity according to work and family commitments at any given time. For example, my more ambitious DXpeditioning only started after the children had left home and I had both the time and the funds to do so.

More on Marconi

Following my recent visit to Marconi's family home (as reported in September *PW*), I decided I needed to learn more about this iconic inventor, entrepreneur, political player and much more. I therefore bought a copy of **Marc Raboy's** biography of the great man (and reviewed by **David Harris** in the December 2016 issue of *RadioUser*). Unfortunately, there is little technical material in the book despite its 863 pages, but the story is nevertheless fascinating. I was particularly struck with one quote, apparently from 1914, in which Marconi writes, *"The popular anticipation of pocket wireless telephones by means of which a passenger flying in an aeroplane over France or Italy might 'ring up' a friend walking about the streets of London with a receiver in his pocket cannot be said to have been as yet practically realized but there is nothing inconceivable or impracticable about such an achievement and the progress of wireless telephony seems to be pointing in that direction"*. What an astonishing prediction to be making at a time when wireless was still very much in its infancy!

C4FM

In our Letters pages this month is one from an old friend of mine from Reading days, **Dave Self G0TKV**. Dave is making the case for more C4FM facilities in his part of the world. Speaking with Dave, he believes that C4FM is the Rolls Royce to the Vauxhalls of D-STAR and DMR. Having yet to use any of them, other than for brief tests, I'm not in a position to comment. Is Dave right? And does it matter, given that I gather there are a number of gateways that translate between the different digital voice standards? And while many of we old timers may feel that any of these modes is not 'real' amateur radio, as Dave says they perform a valuable service and, indeed, may encourage users to become more involved in the wider hobby, as CB did in the 80s.

And while on the topic of digital voice, there was quite a flurry of activity on HF digital voice a few years ago, with different systems being tested and promoted. But it all seems to have gone very quiet. Can any readers give us an update or is HF digital voice dead in the water for amateur radio use?

Don Field G3XTT
Editor, *Practical Wireless* Magazine

Georg Wiessala
wiessala@hotmail.com

1

From Another ERA: The ERA Microreader & RS232 Screen in Action

Georg Wiessala puts together a temporary RTTY/CW receiving station with some vintage gems from the makers of the ERA Microreader and avoids computers altogether.

The last few years have shown me that there are some hobby radio accessories that I simply cannot be without, regardless of the onward march of technology.

For me, the *MFJ MFJ-890 Beacon Monitor*, for example (ca. £149-159 for the 'UK' version) has always been one such device, as has the *ERA BP34 Audio Filter* (*Practical Wireless*, September 1989: 46; see **Fig. 1**).

Old-fashioned, 'vintage' gear this may be, by today's standards, but what's wrong with that, I ask you?

I would not be without these shack essentials, much as I enjoy my latest Software-Defined Radio (SDR) setup and the new hybrid touchscreen gear, such as the nifty *Deepelec* wideband radios (*Deepelec DeepSDR101* cf. below).

The ERA brand

The same applies to the hardware CW/ RTTY Decoders once made by ERA. The brand name/ acronym 'ERA' stands for '*Enterprise Radio Applications*', a venerable British company, which once worked for some time in Warrington, near Liverpool, **Fig. 2**.

I have used the MFJ MFJ-462B Multi-Mode reader before but could never really get on with those, at least not here in the UK.

The two ERA decoder model types I am aware of so far are both called *Microreader*. These hardware decoding devices were once everywhere, and they continue to be popular on the second-hand market today (**Figs. 1** and **3**). The most 'recent' type I can remember was the *ERA Microreader Mk II* in the early 1990s (reviewed, for instance, in the *Short Wave Magazine*, February 1991: 19; cf. websites, below).

I recently found one of them for sale at the Norbreck Castle NARSA Radio Rally (*The Spectrum Monitor*, June 2023: 17; *PW*, July 2023: 48-49).

At the time, past reviewers always seemed to be very impressed with the ERA gear. In those old reviews – many of which you can still find online (see below) – the *BP34 Audio Filter* was regularly praised for its 'unpretentiousness' and suitability for Weather Facsimile (WXFAX) reception.

In addition, the Microreaders have received acclaim from many users for their solidity and simplicity of operation. For many hobbyists, those assessments continue to apply today.

An eBay bargain

I have always had a Microreader, of some sort, in my shack, although, for many years now, it had been condemned to the junk box in the attic. Over time, I'd take it out occasionally to wean myself off PC software decoders for a while. There was a model that looked slightly more 'modern', with a yellow-framed screen, round LEDs and push-buttons. However, I have also seen (but never owned) one with a green-framed screen.

The 'standard' model has a screen framed by a cream-coloured surround and noted for its LED tuning bars on the top right of the case. This is the one that, I hazard a guess, most of you will have.

I recently found a standard model of the reader on eBay. It was in much better condition than my old, battered, one, so I considered putting a bid in.

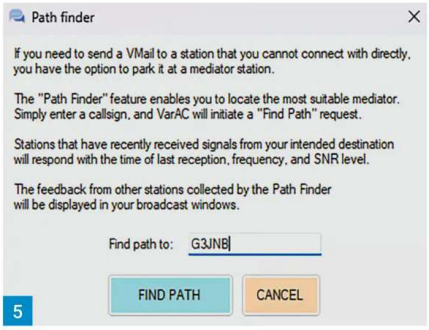
What really 'clinched' it for me, though, was the fact that the seller also offered the external ERA RS232 Display Screen in the package, once again in great nick (**Fig. 4**, top). I did have that screen once before but found it did not work as planned. Therefore, I dug a bit deeper into the hobby budget and managed to acquire the reader and screen. I was happy that I did, for the condition was nothing short of excellent.

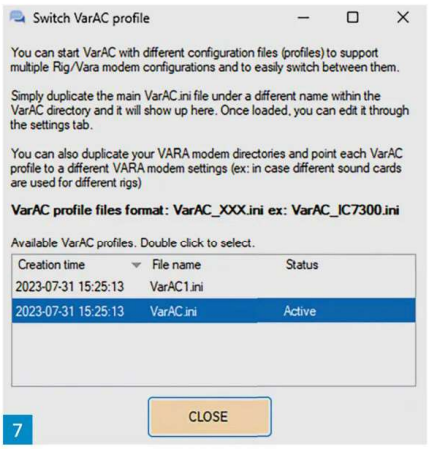
I am currently spending much time and energy on putting together a solid, hardware-dominated, HF receiving station based around my AOR AR7030, and the ERA kit complements this beautifully.

The aim is to have a setup for which, if you chose to, you do not require a computer, and which looks impressive and performs well. Take a look at the pictures in this article and tell me whether I am on my way to achieving that.

Signals and services on RTTY

Many of you will know by now that I have a hobby interest in combining weather forecasting and observation with radio monitoring, so you won't be surprised that I still monitor Radio Telex (RTTY) signals, mainly those from the German Weather Service (*Deutscher Wetterdienst, DWD*). The DWD transmits its two programmes daily from Pinneberg, near Hamburg in Germany, **Fig. 5**. The relevant frequencies are 147.3, 3855, 4583, **7646**, **10100.8**, 11039, 13882.5, 14467.3 and 15988kHz (the most reliable at my QTH here are in bold). As you know, there is a little 'play' in RTTY reception, say at around 1.9Hz around the main frequency.





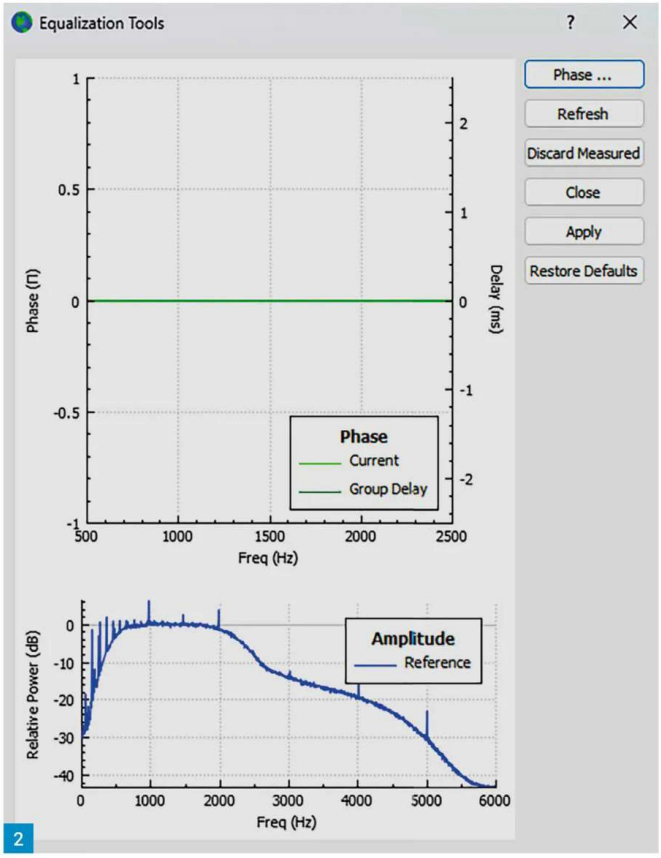
Bnd	Time	From	To	SNR	Broadcast message
20m	13:16				
20m	13:19				
20m	13:35	G4WNC	ALL	--	<FIND_PATH_TO:G3JNB>
20m	14:02	G4WNC	ALL	--	<FIND_PATH_TO:G3JNB>
20m	14:24	G4WNC	ALL	--	<FIND_PATH_TO:G3JNB>
6	14:24	EA7KOH	G4WNC	+02	<HEARD> G3JNB @ 2023-07-30 16:01:19 on 14.105.000 (SNR: -17)

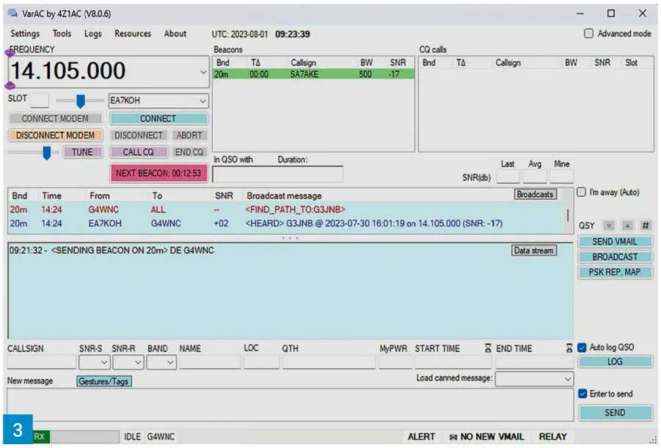
Also included with the installation is the rigctld program that enables rig control sharing via TCP (Transmission Control Protocol) sockets. The program provides a simple control interface with all rig requests sent on a single line. If the rig command generates a response, they appear on separate lines. This simple interface makes it easy for third party developers to use the application. One of the great benefits of using a specialist rig control engine like Hamlib is that you can control a wide range of rigs with a standard command set. Hamlib does all the hard work of converting the simple commands into the format required by the rig. For example, to set the frequency of any rig, you can use the command 'set_freq' followed by the desired frequency in Hertz. If you've ever tried directly programming rigs via the CAT link, you will appreciate just how simple that is! You may be asking why you would want to separately control your rig if it's already linked with WSJT-X. While essential band selection and tuning are handled well by WSJT-X, there are many other controls on your rig that you might want to change, such as bandwidth, antenna switching, etc. Imagine how useful it could be to have a customised panel on your PC where you could bring all your settings together. You can do just that thanks to rigctld and a little help from Node-RED. I'll show you how next time.

Software help

I'm currently compiling a list of Data Modes software and would appreciate your help. Just drop me an email with a list of your favourite DataModes software. I'm particularly interested in any software that automatically identifies and decodes data signals. **PW**

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





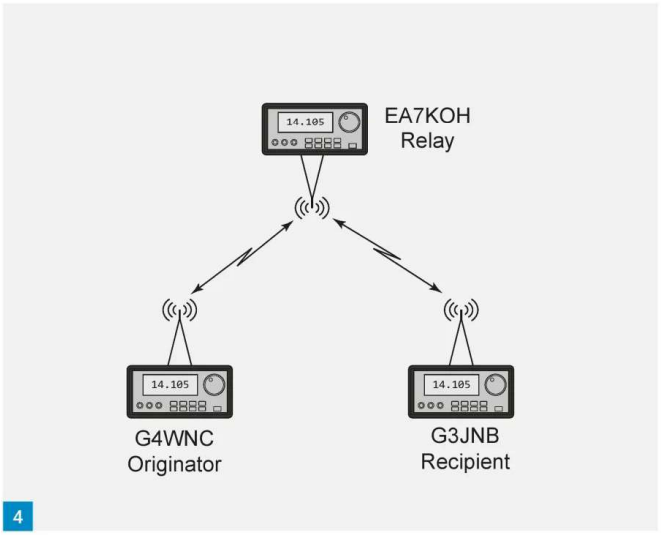


Fig. 1: WSJT-X phase equalisation signal measurement. Fig. 2: WSJT-X phase equalisation panel. Fig. 3: VarAC – Simple interface mode. Fig. 4: VarAC Vmail relay illustration. Fig. 5: VarAC Pathfinder panel. Fig. 6: VarAC Pathfinder response. Fig. 7: VarAC profile switching panel.

tion or add a new one. All you need to do is select where you want the software installed. When upgrading, you install in the same directory as your existing installation.

Another great addition is the Pathfinder tool that supports Vmail delivery. VarACs Vmail facilities can be very useful and include an option to relay Vmails via an intermediate station if you can't directly reach the intended recipient. For example, I recently wanted to send a Vmail to **Victor G3JNB**, but we didn't have a workable propagation path between us. The solution was for me to send the Vmail to an intermediate station that could receive us both and relay the message, **Fig. 4**.

The relay process operates automatically in the background, so the intermediate station operator doesn't need to take any action. You can even use an unattended station to relay the message. The problem has always been, how do you know which station to use as the intermediary? This is where the new Pathfinder tool comes to the rescue. Pathfinder will automatically find stations that have recently heard the target station. In my example, I clicked the Pathfinder option and entered G3JNB as the target callsign, **Fig. 5**. My Pathfinder request was then broadcast on the current calling channel. Any station recently hearing G3JNB automatically replied with a broadcast stating when the station was heard and its SNR result. In this example, EA7KOH responded, confirming that G3JNB had been heard the previous day with an SNR of -17dB, **Fig. 6**. That was good enough for me, so I initiated a connection with EA7KOH. Once the connection was established on the calling channel, I received an automated message saying the operator was away but allowed auto QSY. I sent a QSY signal to move down to Slot 1, so I could upload Victor's Vmail. Once the QSY was complete, I double-clicked on my Outbox to open it. Next, I right-clicked Victor's Vmail and selected relay through connected station. That caused the Vmail to upload to EA7KOH, and I received a confirmation message when the upload was complete. I then disconnected and returned to the calling channel.

The next time EA7KOH hears Victor's beacon, it will automatically send Victor a message to say that his Vmails are awaiting collection. This is a great way to arrange Vmails via an intermediary, and it worked very well for me. I also think this system has great potential for use in emergency communications.

As a final flourish on the new version, you can use the Appearance and Sounds option from the Settings menu to customise the appearance of the VarAC client software. This includes six pre-styled themes that are selected from the themes drop-down. You can also change most of the colours and fonts to suit your preferences. This flexibility is further extended with VarAC profiles that quickly switch between entirely different configurations. This can include using different rigs and soundcards as well as interface customisations. To do this, duplicate the main VarAC.ini file and give it another name for each new profile you want. To customise a profile, first, use the Switch Profile option from the Settings menu to select the required profile. You can then make all your customisations using VarAC's usual settings menus. All these settings are stored in your new .ini file and can be recalled using the Switch profile option, **Fig. 7**. This is a great way to customise VarAC to behave the way you want. You'll also be pleased to hear these customisations are preserved during updates. To learn more or download your free copy of VarAC, visit their website at:

https://varac-hamradio.com

WSJT-X rig control

WSJT-X uses the popular Hamlib library as its default rig control engine and includes an adapted version as part of the main installation package.

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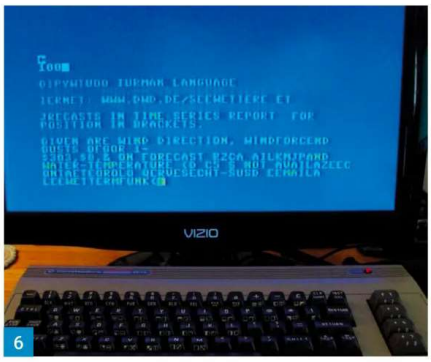

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screen itself has an 'onward-connection', older-type RSA232 port for hooking up a printer if you so wish – if you can still find one with the right ports …

All in all, it was a pleasure to operate these older decoders. I found that, with the AOR AR7030 connected, I was not always able to run both Microreaders at the same time on a given signal. I swapped the AOR for the *Deepelec DeepSDR101* and found that did the trick, **Fig. 8**, while also enabling me to run the ERA RS232 screen off the standard-version Microreader.

It has been a joy re-discovering these older decoders, and in particular, working with the relatively hard-to-come-by rare RS232 screen. Doing this, I have re-taught myself things I had long forgotten about data signals and made me want to explore more, especially as regards Morse code transmissions and contesting.

The antenna used for all my forays into this area was the Wellbrook ALA1500LN, **Fig. 9**.
www.wellbrook.uk.com/loopantennas

All photos are by the author except where otherwise stated.

8


9

Resources consulted

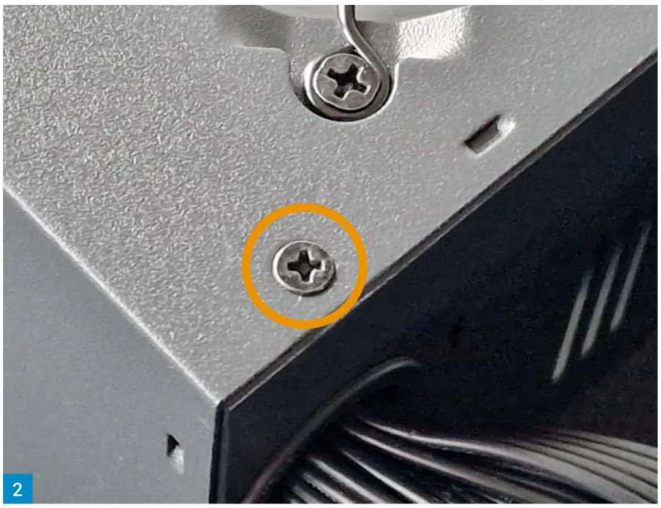
• Microreader Advert, *Practical Wireless* ('Weather-Special') December 1990 (p. 53)
https://tinyurl.com/zctxjzp7

• 2023/2024 Guide to Utility Radio Stations ('Klingenfuss', 'KF'), 32nd ed.

Radio Enthusiast: Marvellous Microreader:
https://tinyurl.com/29k8n42y

• **Rev C G Dobbs G3RJV**: *Review ERA Microreader: Short Wave Magazine, May 1989: 16*

• Microreader Review: *Short Wave Magazine*, February 1991. **PW**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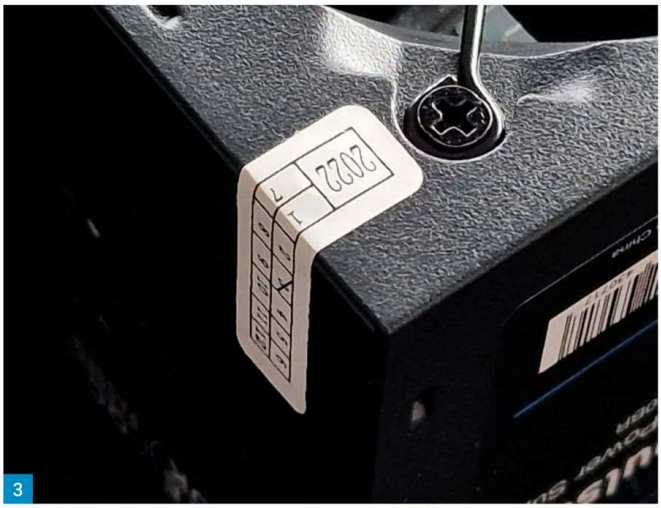

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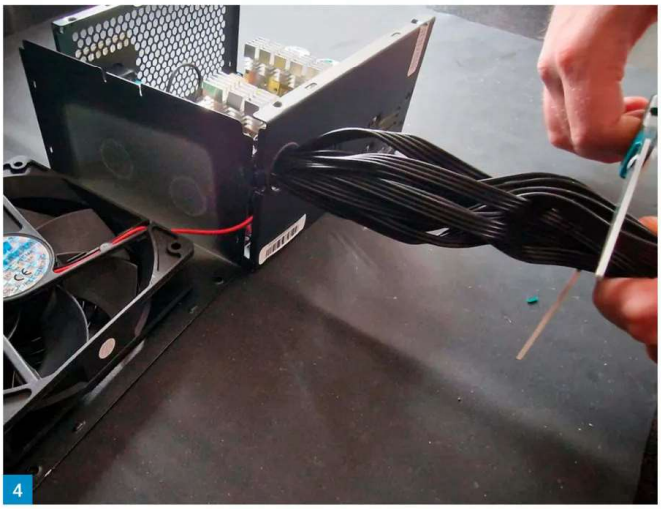
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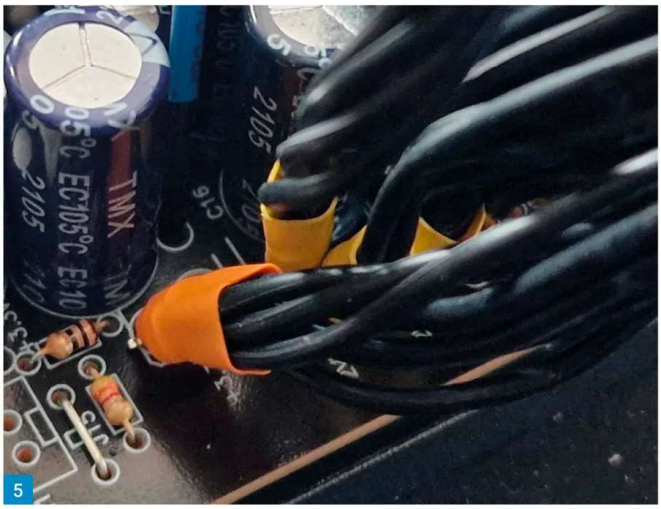
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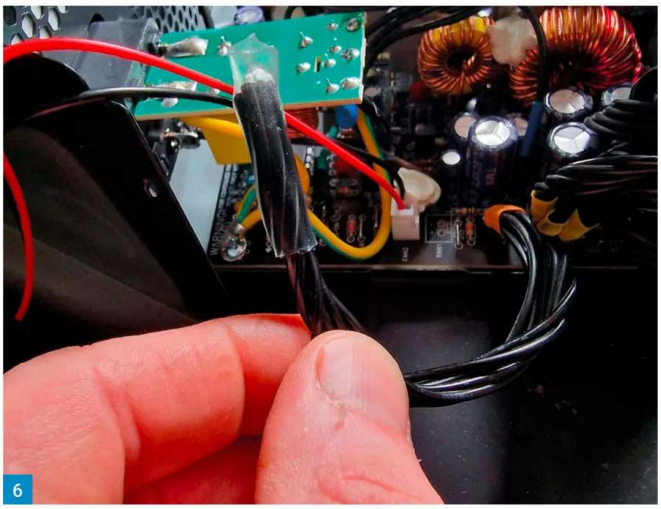
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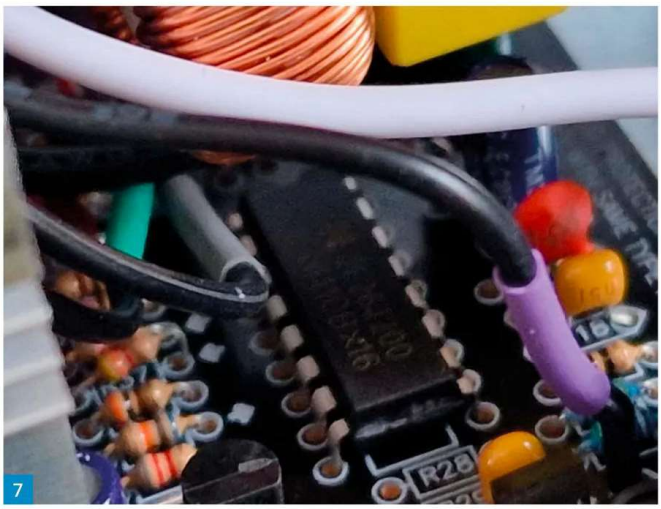
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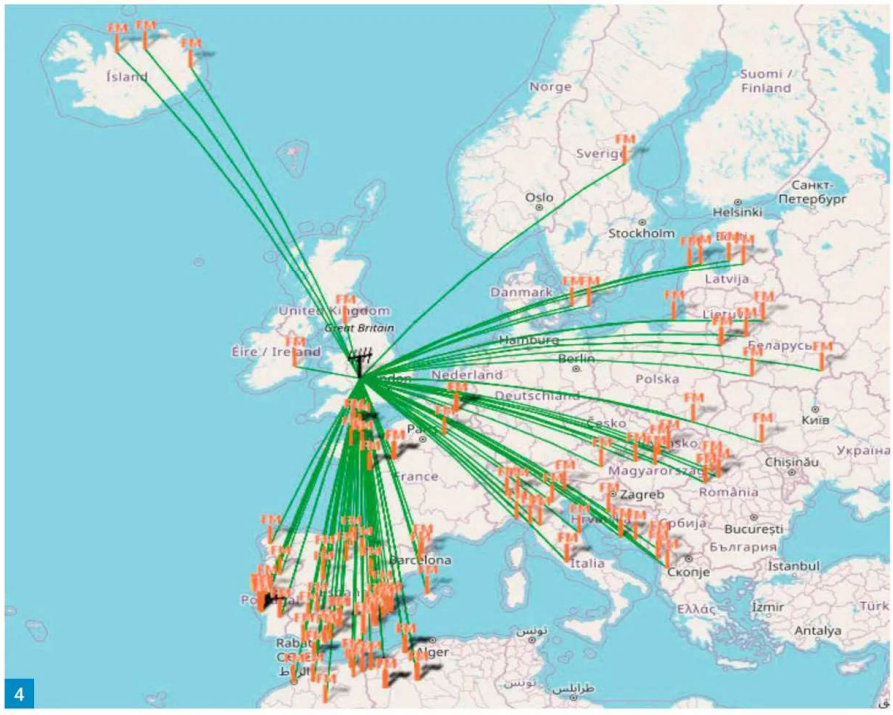
Fig. 1: Some of the parts needed for the project. Fig. 2: Remove the screws but not those holding the fan. Fig. 3: And cut the warranty seal. Fig. 4: Cut the wires, leaving about 150mm. Fig. 5: Heatshrink around each group of wires close to the PCB. Fig. 6: Making wires safe that are not going to be needed. Fig. 7: Identify the purple, green, blue and grey wires.

sure to leave some of the heatshrink sticking out the end and close over, as seen in **Fig. 6**. This will ensure that no ends of the wire can be touched. Do the same with the red heatshrink group of wires. We are going to use the yellow group of wires (these are +12V) and the black group of wires (DC ground). Put a piece of heatshrink around the yellow group but not at the ends, just near the base at the PCB, to hold all these wires together. A tip here is to leave the heatshrink long. If you use a short piece of heatshrink and heat it up close to the PCB all that happens is that you melt the cable and start to melt items that are on the PCB. Leaving the yellow and black cables for now find the single-

Fig. 1: The Quansheng UV-K5 – a very cheap way of getting on 4m FM.
Fig. 2: The Sony Cam – dating from 1966.
Fig. 3: G3VKV's QO-100 TV uplink system.
Fig. 4: 30 days of FMDX reception from Simon Evans in Gloucestershire. Fig. 5: Adam Wisher receiving Romania on 102.4MHz FM.



at least there is a route for genuine experimenters to work on the band.

Paul Farley G7PUV (Sussex) operating as **G9PUV** on 8m, writes, *"not too much to report on 40MHz although I have managed to work a few European stations when I've spotted some Es on the band. Monitoring activity is much lower this year I guess as the novelty has worn off and people return to their regular bands. On the 10th I did manage to get flagged by WW1L via Es, very late in the season for transatlantic openings but a taster (I hope) of things to come with the predicted F2 peak this autumn".*

The 6m band

Kevin Hewitt ZB2GI (Gibraltar) was active from home on the 6m band using his IC-7300 and monoband whip with counterpoise, poked out of his window. Stations worked include EA1CQ (IN83), EA1GCM (IN73), EA1HS (IN82), EA2AR (IN92), EA3DG (JN11), EA8DNT (IL38), EB1EB (IN83), F5LCU (JN03), F5OWT (JN18), HB9ALO (JN45), LA5LJA (JP50), LA8YJA (JP53), LA9BM (JP40), LB6D (JO59) and UT7UV (KO40).

Jef VanRaepenbusch ON8NT (Aalter) has a few notable loggings for the month, all on FT8, GJ6WRI (IN89), EA8W (IL38) and OY9JD (IP62).

It was really good to hear from **Hugh Goodwin GM8FXD** (Invernessshire) who wrote about his experience on 23 July; *"I have a modest 6m setup consisting of an IC-7300 and homebrew sloping folded dipole made from ladder line at maximum height of 5m, which I have used for about five years on the 'magic band'. I have never ever **heard** a JA on that band. At 0830UTC to my astonishment I heard several FT8 signals from Japan and when JF8QNF reached -5 dB, just for fun I called him and I was truly amazed when he gave me -15 dB and we completed the QSO. I then added JA7WSZ & JA7QVI to the log using an inverted-vee HF doublet - truly magic. By 0930 they had faded away. So, it's true when conditions are right you can work 6m DX on a few bits of wire"!*

Steve Telenius-Lowe PJ4DX wrote *"It seems as if the 6m Sporadic E season came to an abrupt end on 25 July. As of 9 August I have not decoded any FT8 signals (other than local ones) in the two weeks since then. This year's Sporadic E season does not seem to have been as good as those of the last few years, though I was away for the whole of June, so probably missed the best of it.*

"In the week before 25 July there were a couple of good openings, though. On the 18th I worked G7TPL, G0BNR, G0JHC, GI4SNA, GM1TGY, GM4WJA, GM7PKT, GW4FRX, M0CTP, MM5DWW, MM0AMW and MM0ZBH plus EI7IX, DG1CMZ and UW2ZM.

"There was another opening on the 24th when I worked G4IFX and G4RRA plus stations in France, Germany, the Czech Republic and Poland.

"Finally, on the 25th there was a brief opening in which GM8IEM, EI6FR and EI7BA were worked but, since then, absolutely nothing!

"Let's hope for some more propagation, perhaps even F2, around the equinox and into October".

Roger G3XBM reports he's received both the USA and Japan on FT8 on the band during the month.

Phil Oakley G0BVD (Great Torrington) hasn't had much time to get on the air this year, but has enjoyed some Es openings on the band, working into SM, OH, EA, ON, SP and YO as well as 4U1A.

Don G3XTT (Wells, Somerset) copied FR4OO on FT8 at good strength between 1610 and 1630UTC on 15 August.

Here at **GW4VXE** (Goodwick) it has definitely seemed a poorer Es season than recent years. I seem to remember a negative correlation between the solar cycle and Es season – the better the solar conditions, the poorer the Es. I am not sure if this is anecdotal or whether there is some scientific basis to it. Nevertheless, I've been happily picking off some new grid squares, mostly in Scandinavia and Eastern Europe. 1A0C from the Knights of Malta was a nice new DXCC for me from Wales, worked on FT8 on 29 July. There has been some occasional longer DX to work; FG8OJ (FK96) on 24 July, PY2XB (GG66) on 27 July, as well as WW1L (FN54) on the 28th. **Mek TF/SP7VC** has been travelling in Iceland and has activated a number of interesting squares by meteor scatter and Es.

The 4m band

Jef ON8NT worked EA7L (IM86) on the 4m band on 2 July. **Dave Thorpe G4FKI** (Ampthill) has been experimenting with a personal beacon, G4FKI/B on 70.095MHz. It runs 5W of CW and FT8 into a dipole from IO92SA. The beacon is based on an RF Zero board. Dave says that it's active most evenings, although he plans to have it on air more often in due course. Dave reports that the Buxton beacon, GB3BUX is still off the air (on 6m too).

The 2m band

During VHF NFD on 2 July, Jef ON8NT worked G3CKR/P (IO93) and GW3ZTT/P (IO82).

Ian Bontoft G4ELW (Bridgwater) caught the Es

Tim Kirby GW4VXE
gw4vxe@icloud.com

1

Four metres FM for £20?

Tim Kirby GW4VXE has plenty of VHF and above news, despite an apparent downturn in Sporadic E activity during July.

Readers may recall that a couple of months ago, I mentioned the Quansheng UV-K5 handheld, **Fig. 1**, obtainable for between around £9 and £30 *(and reviewed in this issue – **ed**.)*. I recently discovered that it is possible to upload modified firmware into it, which enables transmit, ostensibly, between around 18 and 1300MHz. On the 4m band, it produces around 4W of output, and looking at the spectrum, the output is quite reasonable. Obviously the supplied 2m/70cm rubber duck that comes with the rig does not perform very well at all on 4m. I tried the rig with a Spectrum Communications Flexiwhip for the band and it worked well. Receive sensitivity seemed quite reasonable and I was able to receive **Ken G3LVP** a couple of miles away across town in Cheltenham. Although Ken couldn't hear me in return, I was inside, so I suspect, given a clearer path, it would have worked OK. If you fancy a very cheap handheld for 4m, this could be something fun to try. Actually, the rig works on 6m FM as well, but I haven't checked the output or signal quality so far – and like 4m, you will need to improve the antenna.

There are some videos around, which describe where to get the firmware from and how you upload it. In summary, you'll need to get the firmware update tool from:

http://qsfj.com/support/downloads/3002

You can get the updated firmware from Github:

https://github.com/piotr022/UV_K5_playground

If you are comfortable with computers/firmware, this is probably all you need! If you're less comfortable, then have a look through some of the videos that describe the process – put 'quansheng uv-k5 extended firmware' into your favourite search engine.

SDRConnect preview release

Users of the SDRPlay receivers and perhaps others, will be aware that SDRPlay have been working on a new piece of software, SDRConnect to work in conjunction with their receivers.

SDRConnect has been billed as being 'cross-platform' – in other words, it will run on Windows, Linux or Mac OS (OS X). Another big advantage of the software is that you will be able to run it as a server – perhaps at a remote location – and then you can run a SDRConnect client at home – allowing you to tune the receiver as if you were on site. Both locations will require an internet connection of course! SDRConnect will run on a Raspberry Pi computer, which could be very useful for keeping the 'main' shack computer free for other things. I've yet to determine how powerful a Raspberry Pi will be required for the software to run well.

SDRPlay have released a preview release of the software, which they say is early in the development process. Nevertheless, based on a quick test of the software on my MacBook, what it does, it does very well. I was able to listen to the FM broadcast band in good quality as well as tuning across the 20m amateur band on CW, during the Worked All Europe CW contest. If you are curious, then SDRPlay have produced some videos introducing SDRConnect, which are well worth a look. You can find the videos at:

www.sdrplay.com/sdrconnectvidguides

The existing Windows based, SDRUno continues to be available and indeed, can run on the same machine as SDRConnect.

I'm looking forward to seeing the software develop, but even now, it looks a useful option, especially for non-Windows users.

The VHF DX podcast

If you are interested in FM DXing, you may enjoy the VHF DX podcast, available on your favourite podcast platform. Presented by **Nick Langan** and **Bryce Foster**, this is predominantly US focused, although there is some European content. It makes a good listen – I listened to a several episodes on a long drive recently.

The 8m band

Roger Lapthorn G3XBM (Cambridge) is back on FT8 using his FT-817 with 2.5W and a dipole. He's recently been spotted in Eire, Poland and Portugal. Roger is looking forward to the F2 season with an eye on making contacts with the Caribbean, USA and Canada. Roger also notes that the Belgian PTT have agreed to a 40MHz allocation – great news for everyone interested in this fascinating part of the spectrum.

Incidentally, for UK amateurs interested in 40MHz, the recent OFCOM consultation made it clear that they have no plans for an amateur allocation at 40MHz. I could say a great deal about this, but it is what it is. However, OFCOM do make it clear that they are happy to issue Innovation and Trial licences to those interested in 40MHz. Unfortunately, the licence costs £50 per year, but

1

Billy McFarland GM6DX
gm6dx@outlook.com

Makeshift PSU

Billy McFarland GM6DX describes how to repurpose a PC power supply for amateur radio use.

When it comes to Power Supply Units (PSUs) to power your transceiver there are various types to choose from, whether fixed voltage, variable voltage and low or high amperage. Depending on what your needs are will determine which you purchase but of late even the basic 26A PSUs seem to cost a small fortune. I am unsure if this is a result of the Covid virus or merely the cost of the living. For most people a power supply of up to 30A continuous covering 12-13.8V will suit their needs. One way in which we can keep the cost of this hobby down is to construct or adapt a PSU for your own needs. I have done exactly that many times using a PSU for a personal computer and in this article we will look at how I adapted one of these PSUs for amateur radio use. Like any project you will need a few items:

- A PC ATX PSU anywhere between 650W to 800W.
- A 'kettle' lead to connect the PSU to the mains
- A premade (or make your own) fused power lead that suits your transceiver
- Some solder and heatshrink
- 1 x massive cable tie

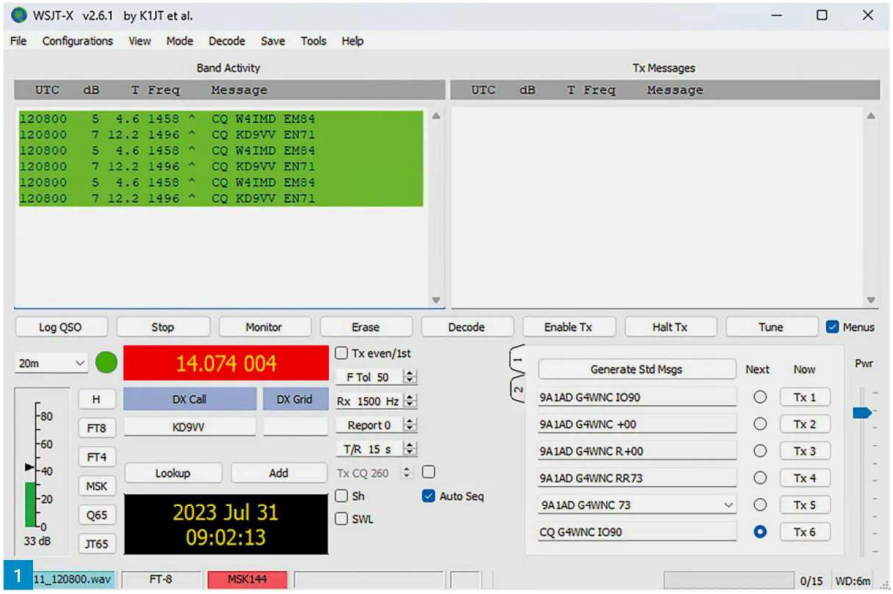
Some of these parts can be seen in **Fig. 1**.

Putting it Together

Before we progress ensure that the PSU is NOT connected to the mains electrical supply, i.e. the kettle lead is not connected and plugged in. The first step is to open up the cover of the PSU. Remove the screws on the upper cover. Be sure you select the correct screws and that you are not unscrewing the ones holding the fan in place. These screws can be seen in **Fig. 2**. Now you need to cut the warranty seal as seen in **Fig. 3.** Some PSUs have the DC power leads going to the fan on one side of the PCB meaning you can lift the cover off and sit it to the side allowing access to the PCB within the PSU. Others have the transformer on one side and fan power cables on the other. This means that you need to cut the power cables to the fan and re-join later in order to remove the cover to one side for PCB access. This will really depend on which make and model of PSU you have purchased.

Once the top cover has been removed the next step is to cut all the cables coming out of the PSU. Take some sharp scissors or snips and cut the wires leaving about 150mm of cable protruding out of the box as seen in **Fig. 4**. After you have trimmed the cable feed these back through the hole on the case and into the PSU housing. If you are lucky enough (or smarter than me) you will have purchased a PSU in which the cables are multi-coloured meaning they are easy to identify. If, however, like me, you are unlucky and the PSU has arrived all with black wires then you need to look for the coloured heatshrink around the group of wires leaving the PCB as seen in **Fig. 5**. We don't need all of these wires so we need to make them safe within the PSU housing. In order to do this, group all the wires together that are contained within the orange heatshrink. Twist the wires around each other and place a piece of heatshrink at the end. Be

Mike Richards G4WNC
practicalwireless@warnersgroup.co.uk



More on WSJT-X and VarAC

Mike Richards G4WNC continues his look at WSJT-X measurement tools and the new VarAC release.

I'll start this month by concluding my look at the measurement and calibration tools built into WSJT-X. You will find complete guidance on these tools in chapter 13 of the WSJT-X online *User Guide*. The final tool to cover is phase measurement and equalisation. You may be thinking, do I need to bother with this? The simple answer is that most users don't, as this tool is specifically for advanced operators using MFSK144. You may recall that MFSK144 is the specialist high-speed mode used primarily for meteor scatter QSOs where the path is only open for a fraction of a second. Standard MFSK144 uses a message structure similar to FT8, but each message frame completes in just 72ms using a keying rate of 2,000 baud and occupying a bandwidth of 2.4kHz.

There is also a short message variant of MSK144 that completes its message frame in just 20ms. Sending this high-speed, relatively wide bandwidth data means we will use all the transceiver's audio bandwidth. This is not usually a problem for those using modern SDRs as it's relatively easy to configure most SDRs to provide a flat transmit and receive bandwidth. However, those using analogue transceivers will find that the audio passband is anything but flat. The audio stages are designed to optimise speech signals, so the audio response will usually fall away at the top and bottom ends of the spectrum. This response tailoring has an adverse effect on fast data signals because the reactive components will alter the propagation time for different frequencies.

This effect is commonly known as group delay distortion. In my time with BT installing data circuits, we had to measure and equalise-out group delay effects to support the faster data services. With high-speed complex signals such as MFSK144, group delay distortion will alter the arrival times of different frequencies and so increase the signal's error rate.

The only way to correct the distortion is to add a frequency-dependent phase delay to slow down the faster frequencies to align with the slowest. In my BT days, this was achieved by adding reactive components. However, WSJT-X can provide digital correction to equalise-out the distortion.

The first step in phase equalisation is to receive some clean MFSK144 signals from a reference station. Ideally, this should be a station with a properly configured SDR transceiver, and the signal must be free from multipath propagation effects. The best way is to find a local amateur with a modern SDR rig that can send you some clean reference signals. Before receiving these signals, go to the Save menu in WSJT-X and choose Save All. This will save all received signals as WAV files. You can find these by going to the File menu and choosing Open log directory. You will see the Save directory; your saved WAV files will be inside. Before you start, it's probably worth erasing or relocating other WAV files in this directory. That way, you'll only have valid MFSK144 signals in the directory.

You can begin the two-step equalisation process once you have recorded a few transmissions. The first step measures your receiver's phase response using the recorded signals, and the second builds the equalisation curve. Here's a step-by-step guide to using the phase equalisation:

- With MFSK144 selected as the mode, enter the callsign of your reference station in the DX Call box.
- Go to Tools and select Measure Phase Response. You will see a pop-up announcing that Phase Training is enabled. This acts as a toggle to turn phase training on and off.
- With phase training enabled, go to the File menu, select Open and choose one of your recorded MFSK144 files.
- You should see the decode of your reference station with the hat (^) symbol showing, **Fig. 1**. This indicates that the phase response is being calculated and will change to & when complete.
- Next, open and play another recording from your reference station.
- When all sample processing concludes, the results are saved in .pcoef files in the log directory.
- The next step is to check and apply the phase equalisation as follows:
- Go to the Tools menu and select Equalization Tools, **Fig. 2**, and click Phase…
- This will open the file browser, where you can select the appropriate .pcoef file. You should see a time-stamped .pcoef file for each recorded reference signal.
- Once selected, you will see a proposed equalisation curve on the graph. Repeat this for each sample to ensure you have consistency between samples.
- If you're happy with the curves, click the Apply curve to complete the phase equalisation.

That finishes the phase equalisation process, so your station will be at its best for meteor scatter operation.

VarAC new version 8

VarAC is enjoying increasing popularity and is gradually working its way up the activity charts as more operators start enjoying this very effective keyboard-to-keyboard mode. As VarAC grows and includes ever more features, there's a risk that the interface could get over complicated and become an obstacle for new users. The VarAC development team have tackled that issue in the latest release by introducing Simple/Advanced UI (User Interface) modes. On the first installation of version 8, VarAC starts in simple mode, only showing the essential controls and displays, **Fig. 3**. Experienced users can switch to the advanced mode by ticking the box at the top right of the screen. This welcome addition will let the program grow without overcomplicating the interface for new users.

Version 8 has introduced a new executable installation file to simplify installation and upgrades. No more copying files; you just run the installer, which will either upgrade your existing installa-

opening on the evening of 12 August and was pleased to work OE1ILW/P (JN88) while running 15W and a 5-element Yagi.

Stewart Wilkinson G0LGS (Cheltenham) kindly alerted me to the same opening during which he worked HA1FV (JN87) and heard HA1VQ and YO2BBT. I was out when Stewart messaged, but I was able to remote into my 2m station and could see a couple of YU and YO stations coming through on FT8 here at GW4VXE. On 6 August, I was pleased to work GM0HBK (IO77) while I was using 50W of FT8 to a vertical.

The 70cm band

During the 70cm FT8 Activity session on 12 July Jef ON8NT worked GW4HDF (IO81). Jef also mentions that a proposal exists in the Netherlands to use 430-440MHz for short range communication on a non-interference basis. Needless to say, the Dutch national society, VERON want protection across the primary allocation, especially in the weak signal areas 432-433 and 435 – 436MHz. Hopefully this proposal will be resisted, but it is a reminder that other people have an eye on the bands, which perhaps we are inclined to take for granted.

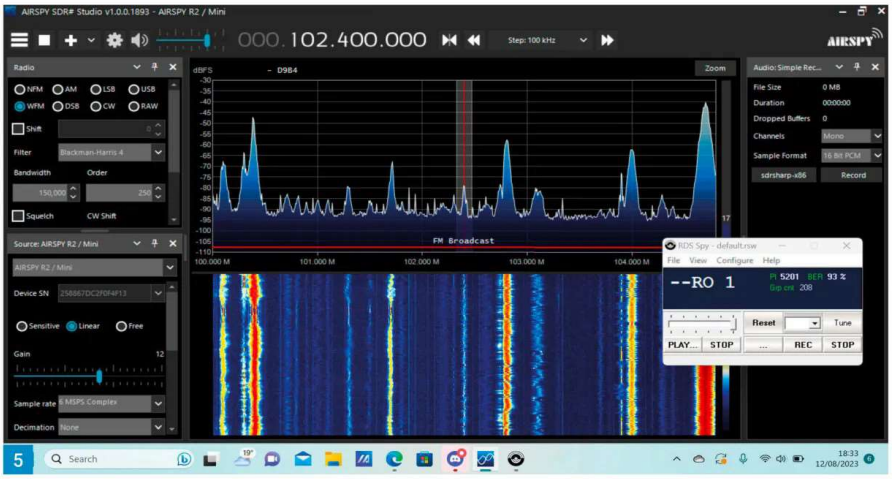
Satellites

Kev ZB2GI writes that he was active on the Tevel satellites for the first time working G0IIQ (IO93), EA1PA (IN71), EA7JHK (IM66), IK7FMQ (JN90), EA3CJ (JN01), EA3EA (JN01), DL5GAC (JN47), M5JFS (IO90), G6UST (IO92), DK9JC (JN39), F5RRS (JN36), EA4CYQ (IM78) and EA8ARI (IL18).

Jef ON8NT monitored the ISS Schools contact on 21 July at 1755UTC.

Patrick Stoddard WD9EWK (Phoenix) also mentions the TEVEL satellites and says that weekends normally see three of the TEVEL satellites active. Patrick says that he has heard that some European amateurs have successfully tried using D-STAR on these satellites, something that Patrick and **Endaf N6UTC** have done in the USA.

Patrick writes, "*GreenCube (IO-117) has been working for a few weeks. There have been times where the digipeater is off, and the command station in Italy is not able to reactivate it. Thankfully, it is working, and has helped satellite operators work more countries, and seen more awards like the DXCC or WAS going to those operators. **Burt FG8OJ** is near the end of a Caribbean trip, operating from different islands (St. Barts/FJ, Saba/PJ6, and the jointly-administered island of St. Martin/FS and PJ7) after a trip to France a little while back - mostly on GreenCube. Others are making road trips to rarely heard US states for GreenCube activations. And there is now a resident satellite operator in Hawaii - **Eric KH6WI**, near Honolulu on the island of Oahu. KH6WI has gone out to other Oahu locations, for better views of the sky to work GreenCube. I am not aware of anyone in Alaska working GreenCube right now, but it is really nice to have someone in Hawaii who is happy to work satellite DX via GreenCube".*



Television

Graham Jones G3VKV (Cheltenham) writes that he was looking in the loft recently and found a SonyCam, **Fig. 2.** It was made in 1966 by Sony and is complete with its case and tripod. Apparently, it was the first consumer camera to be marketed and it still works after 57 years. The monitor, pictured with the camera is a little more modern. Graham still says he uses a Sony camera on the QO-100 satellite. Graham kindly sent a picture of his QO-100 uplink equipment, **Fig. 3**.

Microwaves

On a recent visit to Cheltenham, I was able to visit the shack of **John Hawes G8CQX** to try out my Adalm Pluto SDR along with a PCB antenna, which John had kindly made. John has a shack window that faces north across Cheltenham and we were able to test my receiver using the GB3ZME beacon in Shropshire. I was delighted to find that using the receiver and antenna, I could receive the beacon on both 2.3 and 3.4GHz at good strength. The receiver was slightly off frequency and there was some drift but it was great to find that the everything was working on 13 and 9cm. We did try listening for GB3ZME on 5.7GHz but weren't able to hear anything. Thanks to John for the interesting tests.

Another test with Graham G3VKV and **Andy M0JLY** saw us on 23cm FM. I wanted to try out the modified Quansheng UV-K5 handheld, which once updated firmware has been installed, as I mentioned earlier, is supposed to work, on receive, at least, between around 18 and 1300MHz. Unfortunately, the little rig could not receive either Graham or Andy on 23cm FM! I will investigate further.

Dave G4FKI says that he has been doing some portable beacon monitoring on 10GHz using a G4HJW converter which uses an LNB for an antenna. Dave reports good reception of the Leicester and Cambridge beacons even inside a vehicle. I hadn't heard of the G4HJW converter before but a quick search revealed a video, which explains a little more:

https://archive.org/details/youtube-xTXu3xkBG7o

Dave tells me that the kits are no longer available.

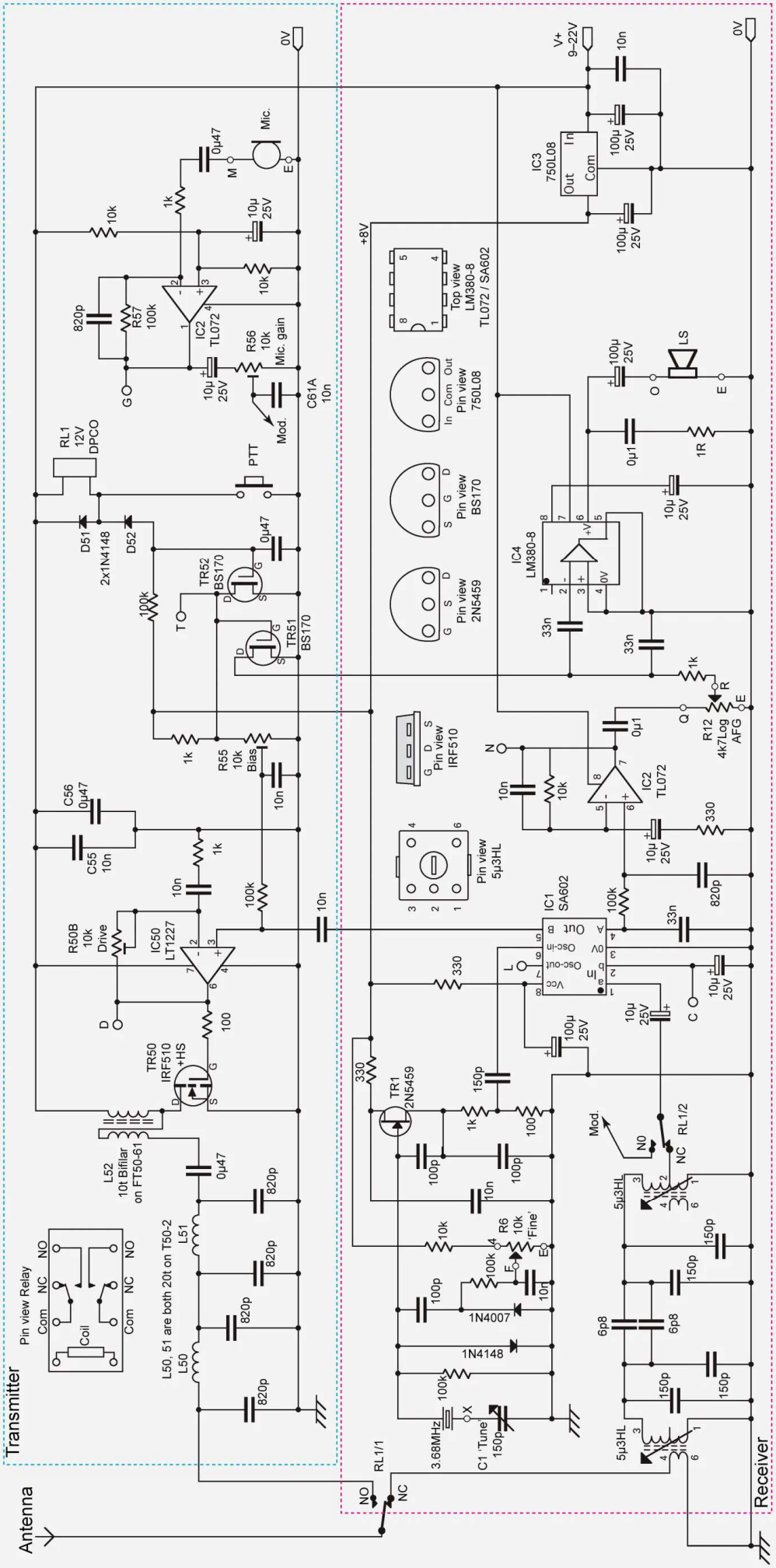
FM and DAB

Simon Evans (Twyning) feels there have been fewer Es openings during July, but even so, his map of stations heard over 30 days is still impressive, **Fig. 4**. Simon has also been spending some time looking at DAB signals and writes, "*after the tropo opening in June there has been little to affect Band 3. I use a program called QIRX on my main PC with an RTL-SDR fed via a DAB only filter [to keep band 2 out]. Each day I do a scan of the whole band 175-240MHz using my 2m/70cm collinear. My collinear, which is a Comet GP3, is very good as a general vertical polarised antenna for VHF/UHF reception. By the way all DAB transmitters use vertical polarisation. If any unusual DAB mux is found, I then investigate. In the loft I have a Triax 5 el beam facing East and on the mast a Blake 5 el beam. The QIRX program reads all the TII codes within a MUX and displays them on a map".*

Adam Wisher (Cheltenham) writes, "*It's been another fairly quiet month for Es in band 2, but yesterday (12/08) it suddenly came alive with the best opening to central Europe that I've ever experienced. Lots of stations from Czechia, Slovakia, Hungary, Romania, Poland and even Austria and Germany, all the way up the band to 108MHz for a lot of the time. A highlight was getting SRo 1 from Slovakia on 102.4 and Radio România Actualitați on 102.5* (**Fig 5**)*, both with RDS, when the local Heart station on 102.4 from Churchdown Hill decided to drop completely off air for a while!*"

On holiday in south Devon, Adam had some tropo success, seeing signals from the RNE transmitters at Liérganes in Cantabria and Quirós in Asturias on 8 August. Adam also received two new French DAB MUXes from Brest (9A) and Rennes (10A/10D).

That's it for this month. Thanks to everyone who's been in touch. See you next time. **PW**


Transmitter
Receiver
Antenna
0V
V+ 9–22V
+8V
Mic.
0µ47
1k
10k
10µ 25V
820p
R57 100k
IC2 TL072
R56 10k Mic. gain
C61A 10n
Mod.
PTT
RL1 12V DPCO
D51 2x1N4148
D52
TR52 BS170
TR51 BS170
100k
R55 10k Bias
10n
C56 0µ47
C55 10n
R50B 10k Drive
IC50 LT1227
100
TR50 IRF510 +HS
L52 10t Bifilar on FT50-61
L51
L50, 51 are both 20t on T50-2
L50
Pin view Relay
Coil
RL1/1
RL1/2
IC3 750L08
100µ 25V
Top view LM380-8 TL072 / SA602
Pin view 750L08
Pin view BS170
Pin view 2N5459
Pin view IRF510
Pin view 5µ3HL
IC4 LM380-8
LS
0µ1
1R
33n
R12 4k7Log AFG
IC1 SA602
330
150p
TR1 2N5459
100p
R6 10k 'Fine'
1N4007
1N4148
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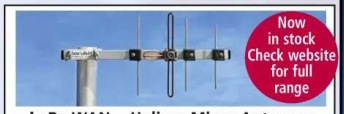

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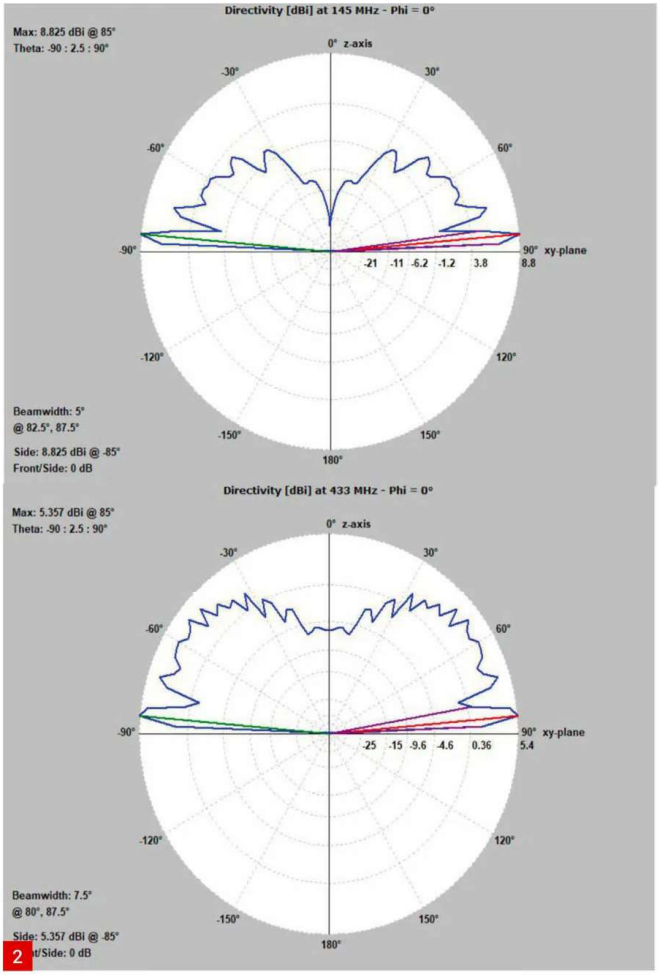
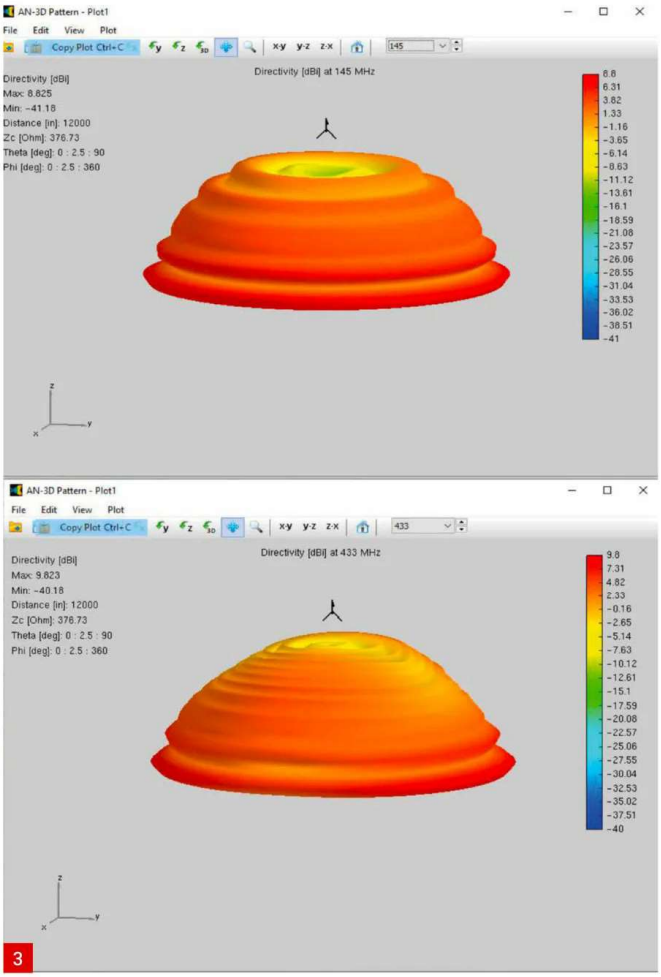




The next part was to add the radials with a downward angle of 45º. This is simple to do in AN-SOF. I entered the coordinates for the radials as horizontal lines of the required length, that is two at 19.5in and two at 6.5in. Then I selected the wires in turn and used the 'Edit'-'Rotate Wires' command to rotate the individual wires downward by entering -45º in the 'Rotation Amount (deg)' input box. To make life easier when building the model I started at 0in as a datum in the Z axis. This means that the antenna base would be sitting on 'ground' with the radials below it.

Clearly we don't want this, so I dragged a box over the whole design to select all of the wires, went to 'Edit' 'Move Wires' and raised the model by 240in on the Z axis to put the base 20ft above ground.

The model was then run and the simulation suggested that both the 2m and 70cm matching was rather low in frequency. I then spent some considerable time just playing with the model trying lots of 'what ifs?' experimenting to see what happened when dimensions were changed and/or the stub moved.

The final simulated dimensions were not too far off the original design except that AN-SOF suggested the overall length of the vertical section should be nearer 15¾in rather than 19½in.

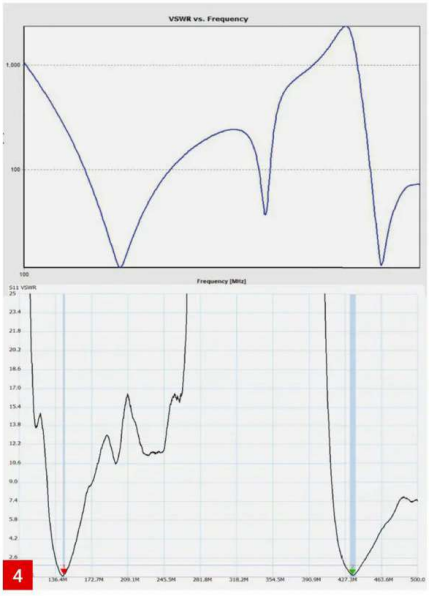
Fig. 1: AN-SOF design screen with dimensions added. Fig. 2: AN-SOF predicted 2D plots. 2m top,70cm bottom. Fig. 3: AN-SOF predicted 3D plots. 2m top,70cm bottom. Fig. 4: SWR Plots. AN-SOF predicted top. VNA-3G actual, bottom. Fig. 5: Loop made on the end of the 70cm stub. Fig. 6: Completed base mounted on SO-239. Fig. 7: Completed antenna under test.

This was a significant difference, so which was correct?

With the dimensions shown in Fig. 1 the 2D Radiation Pattern can be seen in **Fig. 2** with the 2m pattern at the top and the 70cm at the bottom. Similarly, the 3D plot may be seen in **Fig. 3** where again the 2m plot is at the top and the 70cm at the bottom. **Fig. 4** demonstrates the SWR plot at the top where you can see that the predicted matching looked spot on. So, it looks as though we have a decent modelled design but a virtual antenna made of binary digits is one thing, a physical one made of copper, zinc, tin and lead is another!

Construction

The intention was to mount the antenna on the Panorama mount; therefore, it needed a PL259 to form its base. I had the idea to 3D print a bush



that would act as an insulator that would fit inside the plug thus enabling me to solder the vertical section directly to the PL259 pin. The next thing to consider was cutting and attaching the radials.

I decided to machine a ring that would fit over the body of the PL259 and drill four cross holes

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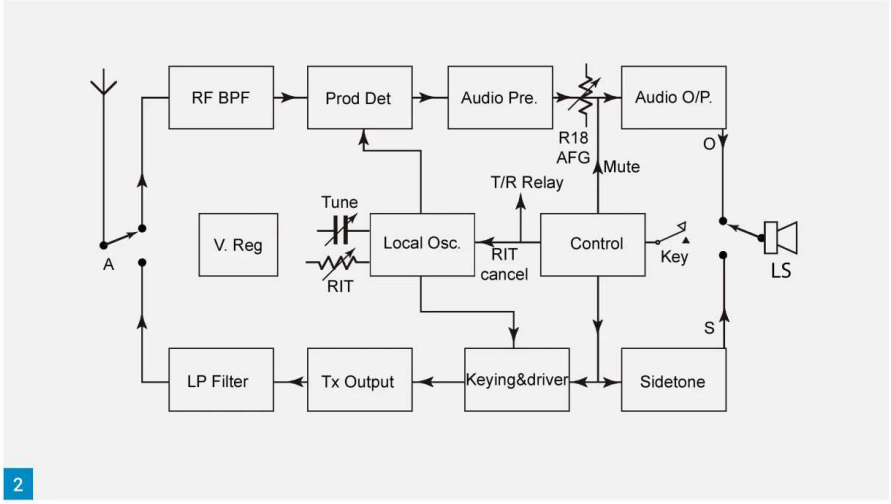
Fig. 1: Sheppy TCVR.
Fig. 2: Sheppy Block diagram.
Fig. 3: Quantock TCVR.
Fig. 4: Quantock circuit.

irrespective of slider position, so the frequency is then only determined by the Main control. The tuning procedure is to leave the RIT control centred when tuning around the band with the Main tuning, and adjust it for zero beat of wanted station; then with the RIT control, tune either way for whichever sideband beat note has least interference. The high gain (x400) of the LM386 makes it almost impossible to prevent supply transients causing key clicks/thumps; so the audio output is first muted electronically very quickly after key down before any relay transient occurs, and then the relay changes the output to the sidetone oscillator (which is transient free) for the rest of the transmission. The sequence is reversed after the final key up, with a delay to allow for more CW characters, then the relay drops out with its transient being masked by the electronic muting that is eventually removed after the transients have all subsided!

The transmitter uses digital keying in the RF drive chain by two of the NOR gates working in parallel, their inputs are from the VFO and key; they drive a pair of BS170 MOSFETs in parallel for the output stage. The load on their drains is 50Ω direct from the AMU/antenna (so giving 1.5W on 13.8V) with low pass filtering to remove the unwanted harmonics. The use of a double-pi low pass output filter (cutting off from just above the band) with square wave drive (containing only odd harmonics that also decrease with order), leads to a clean RF output. Apart from the T/R control sequence described above, key closure allows the twin-T sidetone audio oscillator to start (at about 725Hz) without a click/thump because it controls the audio gain and not the DC conditions. This oscillator feeds a level preset followed by a power buffer stage, which the T/R relay connects to the LS/phones. There are regulated supplies for the tuning diode, product detector and digital chip. The simple physical format is fine for bench use but can be 'cased' provided there is good ventilation. Do make certain the LS socket and the AFG pot do NOT share the same earth lead – this WILL cause howling!

The Quantock TCVR

The Quantock, **Fig. 3**, is an 80m double sideband (DSB) suppressed carrier (SC) TCVR with a peak output of 5W on a 13.8V supply. It should appeal to those wanting to get on air quickly without the necessity to learn Morse code. Its mode of transmission is entirely compatible with other stations



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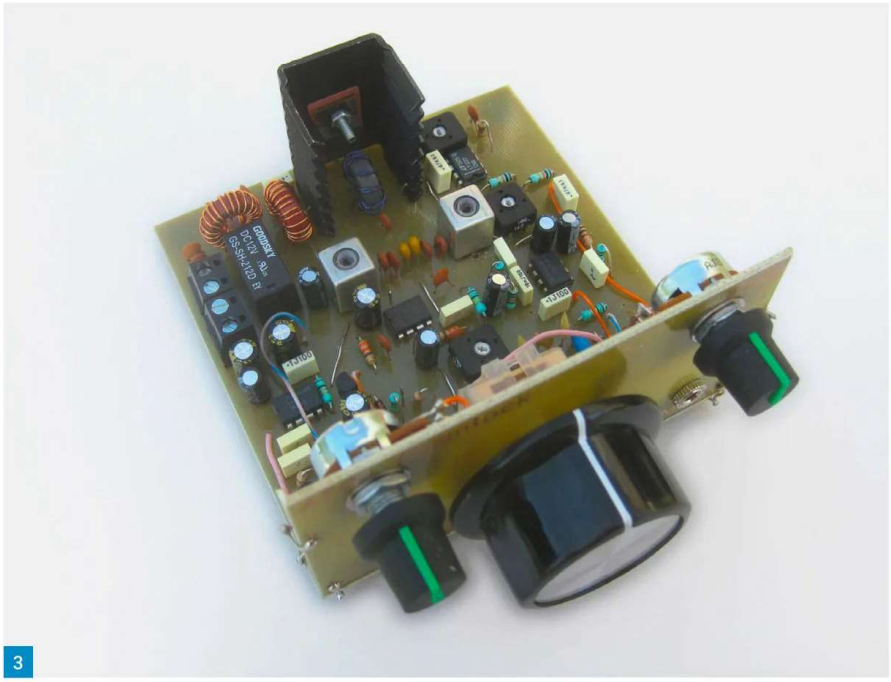
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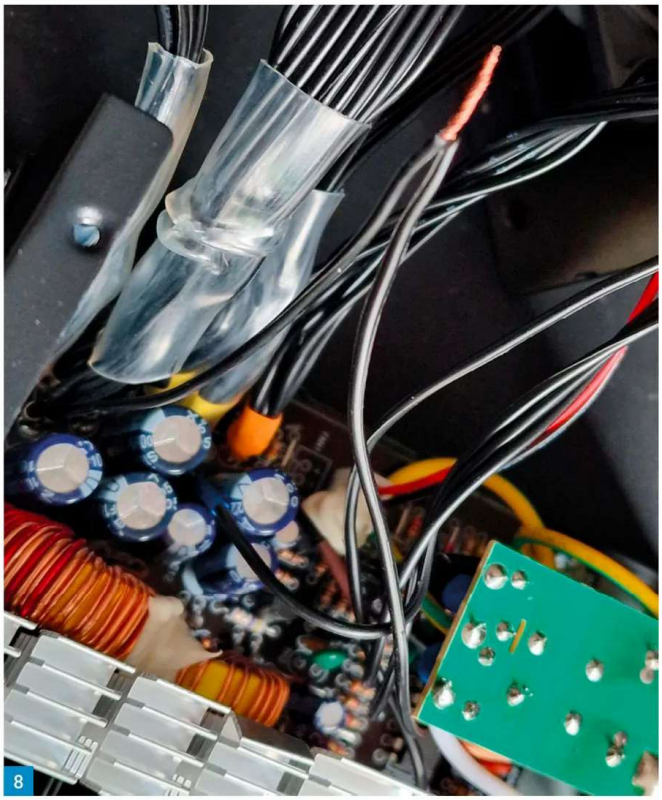
using SSB. It transmits both sidebands and the receiving station can use either – both sound just like a normal SSB signal. In the same way, the receiver hears either sideband just like any simple direct conversion receiver. Some people consider DSB a little unfriendly since it uses twice the bandwidth of an SSB signal, but its bandwidth is no worse than an AM transmission, and it does not have the unwelcome AM carrier!

Fig. 4 shows the complete circuit of the Quantock TCVR. The receive section (in the bottom half of the diagram) is conventional – it starts with a double-tuned RF filter, which is connected to the SA602 product detector IC1 via the T/R relay's contacts. Its audio output is amplified in one half of a dual TL072 IC2 low noise op-amp whose gain is set for x31. There are three C/R time constants to improve the rejection above the normal bandwidth of about 2.5kHz for phone operation. The AFG control follows with electronic muting during transmission by applying a short at its output, but the absence of a spare relay contact (for extra muting) means the lower gain LM380 IC4 has to be used in the output stage. (This does have the minor advantage of removing the supply voltage restriction of the LM386 that applies to the Sheppy.) The VFO of the Quantock uses the 3.69MHz ceramic resonator in the standard Colpitts configuration around a 2N5459 JFET TR1 with Main tuning by the PolyVarcon and an 'always on' Fine tuning potentiometer to adjust the reverse voltage (hence capacitance) across a 1N4007 power diode. This permits the necessary tuning precision required for SSB/DSB while still having a few tens of kilohertz range with the PolyVaricon.

During transmission, the SA602 IC1 becomes



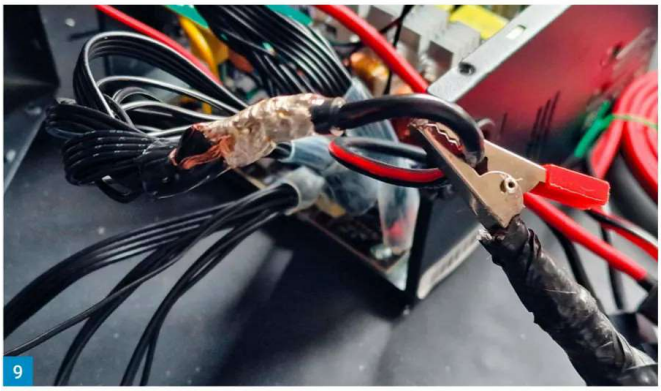


Fig. 8: Connect the green (power on) wire to one of the DC ground wires. Fig. 9: Heatshrink the final pair of wires after soldering. Fig. 10: Use a heavy-duty cable tie to secure the main DC power leads. Fig. 11: And resecure the top cover.

coloured wires, purple, green, blue and grey as seen in **Fig. 7**. Connect the green (pwr on) wire with one of the DC ground (black) wires. Solder and then heatshrink as seen in **Fig. 8**. This allows the PSU to start once power is applied. Without this stage the PSU will not work.

Final Stages

That is all the prep work done so now onto the final stages. Take your DC power lead and feed the end into the hole of the PSU housing. Strip back the ends of the black (DC ground) and red (+12V) wires. Take your group of DC ground wires from the PCB and strip the ends of these back also. Place a piece of heatshrink over the power lead. Take the black power lead cable and twist connect it to the DC ground wires from the PCB. Apply some solder connecting both wires together and finish off with some heatshrink over the connection as seen in **Fig. 9**. You will need a decent soldering iron with enough heat as the PSU housing becomes a big heatsink and draws a lot of the heat away from the solder. Once you have done this stage then repeat it for the red wire connecting it to the group of yellow wires from the PCB. Take a small cable tie and group the wires together within the housing. Take a massive cable tie and fit this around the DC power leads from within the housing. This will prevent the cables from being pulled and protect the PCB, as seen in **Fig. 10.** Finally fit the top cover of the PSU housing. Be sure to tuck the cables away from the fan. This can be a bit tricky but really it doesn't matter where the cables go as long as they don't stick up through the fan. Finally secure the top cover by refitting the four screws and the finished product will be similar to that seen in **Fig. 11**.

A final safety note: Within these PSUs there can be high voltages. Ensure the PSU that you are going to use wasn't turned on before you start work as the capacitors can store voltages for many hours after having been turned off. This is a very simple project and only requires basic soldering skills. As always, any questions please email me at **gm6dx@outlook.com**

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to take the radials, which would then be soldered in place. I had a suitable piece of brass to use for this. Initially I thought that I would be able to solder the ring to the body but to do this would require a lot of heat and probably make it difficult to stop the radials from de-soldering and falling out, so I decided to drill a fifth hole in the ring and tap it M3 to take a locking screw. I quickly designed and 3D printed the insert and then machined the ring.

Things then went a bit Pete Tong as I attempted to drill the 1.5mm dia cross holes on my bench drill. Just as I started the drill the belt snapped and I didn't have a spare. Thinking back, I have had the drill since the early 1970s and it's never had a new belt so I can't complain! Due to this, I attempted to drill the cross holes with a battery drill and promptly broke the drill bit! The only other bit I had was left-handed so I reversed the drill and, rather trickily, drilled the holes. Being more careful this time I succeeded without any further problems, including drilling and tapping the M3 hole.

I cut the elements at 19.5, 6.5 and 8in for the stub (to allow for trimming) and then began to solder the antenna together. I found it necessary to thoroughly clean the rod before soldering but overall the joints soldered well. A loop was formed on the stub section where it fitted to the main vertical element so it would slide over the brazing rod. This was to make it easy to move the stub up or down for matching, **Fig 5**. I apologise for the fuzzy photo but I didn't realise how bad it was until I came to compile the column. A close view of the finished item, which I hope explains the construction details of the base, can be seen in **Fig. 6**. Here you can see I have bent the radials down to approximately 45º.

Adjustment

The antenna was mounted on a short pole for adjustment as can be seen in **Fig. 7**.

Using a VNA-3G to make the measurement's I initially found that as suggested by AN-SOF the antenna was much too low in frequency. I tried adjusting the 70cm stub first, but this only made a slight difference to the 70cm readings. Trimming the vertical section 19.5in in length did make a difference on both bands so I continued by gradually cutting off a couple of mm at a time.

Eventually, with the stub at the designed position at 13in, and a main element length trimmed to a tad over 15.75in I achieved the SWR plot as seen at the bottom of Fig. 4.

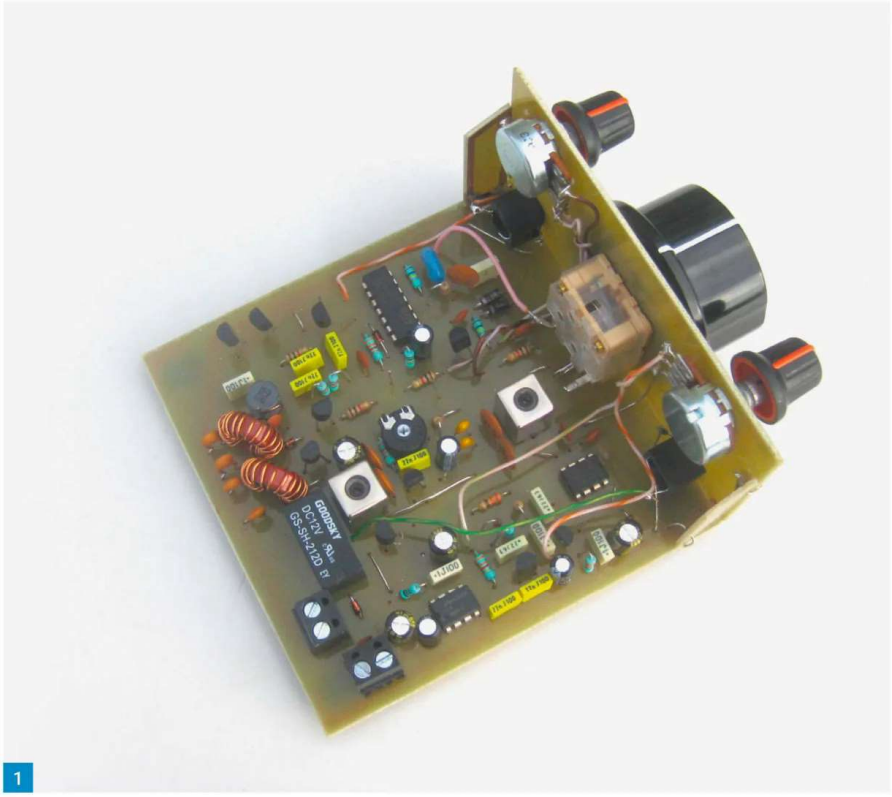
As you can see it follows the simulated plot very closely and also the simulated dimensions were extremely close to the actual antenna when constructed too. Excellent!

In the few months since it has been made it has worked well and seems reasonably happy receiving civil airband too. As already stated the antenna can be mounted on a socket, either SO239 or a BNC for example, and the elements soldered directly to the socket. It is, of course, not essential to use the construction method I used. As in the original design, if it was used on an SO239 mobile mount on a car, then the radials could probably be dispensed with. However, I'm not sure how the construction would stand up to excessive wind speed!

Email me for a ready build model of this design, which will run on the demo version of AN-SOF.

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

Tim Walford G3PCJ
Tim@walfords.net



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Build your own gear? (Pt.II)

In Part 2, **Tim Walford G3PCJ** completes his discussion of home construction by describing two typical low-cost kits.

In the first article I explained that much equipment can be built without drilled and etched circuit boards by using dead bug construction on a plain copper sheet. Over many years, I have built several trial models of complex projects like this. They are great for exploring ideas; but as complexity increases, making a proprietary kit is more practical. In this article I will describe a couple of such projects.

Design factors

Many builders start by assembling a simple receiver or a transmitter and then later add whichever 'part' they did not build, but here reality steps in and they find that although they work as intended, they are difficult to use and a lack of contacts leads to disappointment! The main difficulty of 'separate' receivers and transmitters is the awkwardness of getting them on the same frequency and then staying together! This is true for simple CW and phone rigs. A design with a single main tuning control is a huge improvement, which allows you to explore up and down the band without having to send 'listening 3kHz down' and then waiting in vain. Simple rigs often use a crystal to control transmit frequency because the circuitry is simple and they don't drift; they also avoid problems of chirp (or FMing), which arise when output stage currents get back into a rig's VFO running at the same frequency. Their drawback is a trivial tuning range so they need much patience and a fair bit of luck! Ceramic resonators are a partial solution because they can usually be simply tuned over a few tens of kilohertz and their *Q*, while not as high as crystals, is still high enough to prevent chirp or FMing. Higher frequency versions are prone to drift with temperature, which limits their practical use to below about 5MHz. Luckily there are two readily available low cost 'standard frequency' ceramic resonators at 3.58 and 3.69MHz that are ideal for the CW and SSB sections of the 80m band. My simpler transceivers (TCVRs) use these for 80m – the higher bands need more complex tuning schemes, maybe using a superhet format, but the direct conversion concept in both receiver and transmitter is often the preferred choice for kits.

There are other aspects that can be included to make operation pleasant and easier; for example, changeover between reception and transmission (and back) without nasty ear shattering thumps, inclusion of semi break-in transmit to receive delay for CW, automatic removal of tuning offsets (up or down) needed to obtain a reception beat note, keyed sidetone audio for CW (again without clicks or thumps), sufficient sensitivity for reasonable antennas, narrower audio bandwidths for CW, robust design to cater for component and supply tolerances, etc! To reduce the cost, single-sided PCB material is often use but this usually needs a more complex earth track layout and probably several earth wire straps to replicate the highly desirable ground plane, especially for a transmitter. With these relatively simple TCVRs, the only test gear required is likely to be a multimeter and standard antenna adjustment accessories – a 50Ω dummy load and matching indicator. A general coverage receiver is helpful but once a direct conversion receiver is set up, it can be used easily to set up others!

The Sheppy TCVR

The Sheppy, **Fig. 1**, is an 80m CW TCVR producing 1.5W on the normal 13.8V supply. I suspect there is more interest in phone designs so I have only included the smaller block diagram to save page space, **Fig. 2**. The Sheppy receiver is very similar to that of the Quantock described next, except for the VFO; the Sheppy's VFO uses one quarter of a high-speed CMOS NOR gate as a digital oscillator working with a 3.58MHz ceramic resonator. The operating frequency is controlled by the series value of the capacitors effectively across the resonator – one fixed and the other being the 150pF section of the PolyVaricon tuning variable. The VFO output is a 0 – 5V square wave for the transmitter, but a capacitive attenuator provides a smaller signal for the receiver's SA602 product detector. The weak RF antenna signals are filtered by an 80m top-coupled twin resonator filter, which feeds the signal input of the SA602. For CW, the audio output is limited to about 1kHz in the audio preamplifier, which drives the AF gain potentiometer and then the main LM386 audio power amplifier. The CW mode needs the VFO to tune slightly either side of the nominal frequency of the distant station to obtain an audio beat note; this is done by a potentiometer (the RIT – receiver incremental tuning – control) altering the reverse voltage across a power diode acting as a tuning diode. When transmitting, a BS170 switch applies a short across the RIT potentiometer, which makes its output voltage change to the mid-point value

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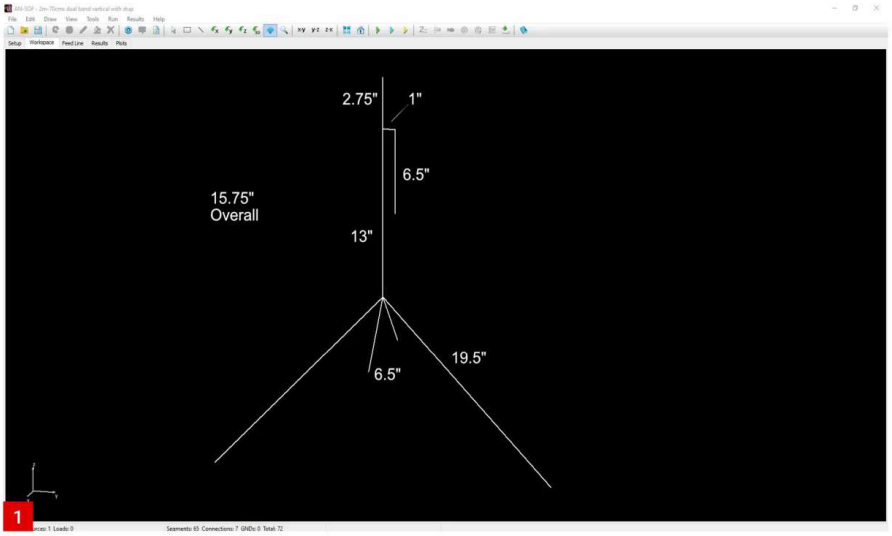

An adaption of a simple 2m/70cm vertical for temporary use

Keith Rawlings G4MIU talks readers through the design of a two-band vertical for the 2m and 70cm bands.

After a house move there can be an urge to get 'anything' up in the way of antennas to get back on the air, in fact it can be irresistible, and this was the case with my son when he moved home earlier this year.

Their new place is a delightful barn conversion of modest size but, unfortunately, has very little scope for vast antenna arrays. There is nowhere to place antennas at the back and there are neighbours either side so the only face of the building available is to the front and this in itself is limited. Nonetheless a quick fix was needed to at least get back onto 2m/70cm. A number of options were discussed and eventually we both decided to replicate what was a temporary design I made up when I first moved to my present location some 22 years ago. It was a dual-band vertical for 2/70 fabricated from brazing rod. The design may have come from an ARRL antenna handbook, although looking through the editions I have here I can't find the details.

Luckily, in a box folder full of notes and scraps of paper I have on antennas, I found a rough drawing I had made of it. It is simply made up of a λ/4 vertical element of some 19.5in long with a stub fixed 13in up from the base. The stub consists of another piece of rod bent so that it sits at 90° and spaced 1in off from the vertical element and then is bent down towards the base for 6.5in.

The original ARRL model was for mounting on a magnetic base, presumably to go on a car roof as there is no ground plane in the design. As it was my intention to hang one in the loft space I added a couple of λ/4 radials for 2m and a further two for 70cm. Construction was made on a square chassis mounting SO239 socket with the vertical element soldered to the centre pin and the radials soldered to the four corners of the socket. A piece of string was tied to the top of the main element and pinned to one of the rafters where it was hung. A length of feeder was attached to a PL259, which plugged into the SO239 that formed the base.

At the time I had a large pack of 1.5mm dia brazing rod sitting around my workshop so it was a convenient design for me to make. As I have since had little need to do any brazing and never throw anything away, unsurprisingly I still have some! This was a deciding factor in once again using this design. In addition, we couldn't ignore the fact that it worked surprisingly well for what it is and I ended up using it for local contacts for a number of years.

As stated, my version was intended to be hung in the attic but this second version was going to be a bit more 'mobile' in that it could be mounted inside on the exposed beams upstairs or clipped onto an open upstairs window, both of which were close to the intended operating position. Indeed, it could be mounted anywhere that was convenient.

To achieve this 'portability' I had a very well-made clip-on mobile mount manufactured by Panorama Antennas. The original antenna fitted on this was a dipole intended for use on the police airwave frequencies, however, and very conveniently, it utilised an SO239 mount, so antennas can be removed very easily enabling virtually any commercially made whip to be fitted.

Incidentally we had discussed using a commercial whip (which could simply screw onto this mount) but the lack of a suitable ground plane in our application would be a drawback (and what's the fun of buying something anyway!).

One thing that stuck in my mind from when I made my first antenna was that the original design was for the American bands and that I believe the addition of radials may well have led to changes in the final dimensions as I remembered having fun and games making the adjustments to get a good match. This time around I thought I would model the design in AN-SOF first and see what dimensions it thought it should be. The design can be seen in **Fig. 1**, which is the AN-SOF design page with additional dimensions added. (These are my final modelled dimensions.)

Simulating the design

So, the first thing to do in AN-SOF was to set my preferences for the 'Project'. Using 'Tools' 'Preferences' I set frequency as MHz and dimensions were in inches to match those on my sketch. Cross Section I kept in mm as the brazing rod was 1.5mm diameter. All other settings were left at default.

Then going to the main settings tab I set a frequency sweep from 100-500MHz, Sommerfield Ground/Moderate, Input Power 10W with everything else default settings.

Setting such a wide frequency sweep increases the simulation time greatly; however, for the sake of this description I can reproduce a single plot showing both the 2m and 70cm responses together.

I then entered the antenna dimensions into the editor starting with the vertical section, which were X0, Y0, Z0 to X0, Y0, Z13 for the first section to the stub position, then I added another section on top of that as X0, Y0, Z19.5. I did not enter a single 19.5in section for the main element as I wanted an intersection at the 13in point where the stub will be mounted. For the stub a wire was entered at X0, Y1, Z13 and then another at X0, Y1, Z-6.5.

Initially I set segments as six per wire to see what the results would be when using the free version of AN-SOF (which is restricted to 50 segments). I later increased the segment count and found that even with the reduced segment count results were still very accurate for this particular model.

a modulator, with the audio from the speech amplifier (using the other half of the TL072 IC2 op-amp arranged for the common CB style dynamic mic) being applied to its signal input via one set of the T/R relay's contacts. The other set of relay contacts switches the antenna to the transmitter's output, leading to the chance of unwanted RF feedback to the SA602 whose output is driving the transmit amplifier. This is why there is RF filtering on the longish track from the Mic gain preset (after the speech amplifier) that feeds the SA602 in transmit. The modulated RF from the SA602 IC1 feeds an LT1227 high speed op-amp IC50 whose gain is adjusted by a Drive preset to just prevent the undesired flat topping of the peak RF output if the transmitter final were to be over-driven. The output IRF510 TR50 is directly coupled to the LT1227 so that the standing current of the IRF510 is set by the bias preset at the LT1227's input – this enables both to be shut down during reception to help with their cooling and stability. The IRF510 feeds the transmitter's harmonic filters through a 1:2 RF transformer so that the peak output is up to 5W on a 13.8V supply. With a standing DC current of maybe up to half an Amp, dissipation in the heatsink is significant so if you expect long 'overs', then extra heatsinking is desirable. (As a comment on the pricing of electronics, that of simple mechanical things such as heatsinks has gone through the roof!) Closure of the microphone's Push-to-Talk (PTT) switch removes the short across the transmit bias supply, and activates the receiver muting before the unwelcome supply transient caused by the relay can be heard through the receive chain. A CR delay also masks the similar thump that would occur on changing back to reception.

For more adventurous constructors, there is a huge range of available kit designs from many sources. Remember, though, that you usually get only what you are prepared to pay for, whether it be the electronics, the documentation or after sales service. In these articles, I have given you a glimpse of my simpler offerings, which extend to multiband superhets for 10m – see:

www.walfords.wordpress.com

As your building experience increases, and is supplemented by the comprehensive handbooks of the RSGB/ARRL/Web etc, you will soon be able to personalise your 'creations' even further! My thanks to **Tex Swann** (late of *PW*) for tidying up my diagrams and to members of Yeovil ARC for helping to prove it works! Finally, I hope you have the same pleasure from building and using your own gear as I have had, whether it be an ugly but effective dead-bug construction, or an elaborate kit! **PW**

NEWS EXTRA

RTL-SDR RELEASES V4 SDR DONGLE: RTL-SDR has released their latest V4 model of their USB software defined radio dongle. Updates include: Improved HF reception with use of built-in upconverter.
Out of band interference from strong broadcast stations is less likely to cause desensitization.
Consumes less current and produces less heat.
The RTL-SDR V4 SDR will be priced around $40.
https://tinyurl.com/4nxj8aak

FISTS CW CLUB – ENCOURAGING CW ON THE AIR SINCE 1987: *Key Note* is the regular magazine of FISTS CW Club. The September 2023 issue will be dropping through the letter boxes of FISTS members just about now. For others, it's time to download the digital magazine from the FISTS website at:
www.fists.co.uk
As usual, Key Note mixes items on practical projects – homebrew and equipment renovation – plus pages of stories from members, as well as club news. Our welcome to new members shows the continuing popularity of FISTS. It is still the largest and longest-established open-membership CW club in the world. Alongside FISTS Europe, based in Britain where it all began in 1987, the club has a large North America chapter, plus FISTS Down Under and FISTS East Asia Chapter.
For members and non-members alike, there are on-air activities every month: take a look in Key Note or our Upcoming Events page:
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You can contact G4YVM, our Activities Manager:
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BRITISH RAILWAYS ARS: The British Railways ARS using the club call GX4LMR is marking 185 years since the opening of Preston railway station in 1838. BRARS member **Mark G1PIE** will be on during October, operation will be centred on 40m SSB and the QSL is via the bureau. More info on qrz.com and the website:
www.brars.info

THE RADIO AMATEUR OLD TIMERS' ASSOCIATION - AUGUST 2023: The Autumn 2023 of our quarterly magazine (*OTNews*) has been sent to our printers for a 'proof' and also (for those with limited vision) to our reader of the audio version. The aim being that printed and audio versions arrive with members at the same time, in the near future. The issue starts with the President's and Editor's reports, followed by members' opinions, news, and comments. Then we have the annual reports from President and Treasurer. VK6CSW provided an article about the VK air-force phonetic alphabet, and then there is Part 2 of G3ZST's article about an end loaded fan dipole for 160m that is no longer than a G5RV. G4EAN has an overview of this year's J28 rally and G8VVY starts his article about the setting up and use of three SDR software packages for windows that can all be used with a low cost dongle. G4PVB outlines meteor scatter propagation, while GM4FZH stimulates the grey cells with another quiz and G4GQL continues his explanation of how he got into the hobby.
There is a persistent myth that membership of RAOTA requires 25 years on the air, which is not the case. Even newly licensed amateurs and SWLs with an interest in how the hobby got to be where it is can join. But although we are interested in the history and traditions of amateur radio we are equally interested the future too, and have plenty of members using the latest equipment and modes of transmission.
To find out more, visit our website at:
www.raota.org
Write to: RAOTA Membership Secretary, 65 Montgomery Street, Hove, East Sussex, BN3 5BE.

CENTRAL RADIO AMATEUR CIRCLE / MARCONI RADIO CIRCLE (MALTA): The Marconi Radio Circle and Central Radio Amateur Circle will be setting up a joint station in Imtarfa Malta for five days from 2 to 6 October 2023. The callsign will be 9H6XPO. There is still time to join in, all you need to do is turn up. The operating times are flexible, and they are planning on running two HF stations at a time plus FT8.
If you wish to take part all you need to do is book a flight to Malta, sort your hotel, and then let them know when you wish to operate. They are planning on being active every day between 09:00 & 17:00 local time, but if you wish to stay later or start earlier this can be arranged with notice.
If you are interested just drop them a line at
radio-circle@live.co.uk,
and they can send you more information. Treat it like a holiday where you get to play radio during your vacation.

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

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Steve Telenius-Lowe PJ4DX
teleniuslowe@gmail.com


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The summer doldrums?

While propagation may have been down during the summer period, **Steve Telenius-Lowe PJ4DX** has plenty to report.

As is often the case during the summer months, the HF bands seemed quiet during July and into August. These are the so-called 'summer doldrums' and the team that activated 1A0C (see below) is to be thanked for providing at least some DX interest during the month.

Despite some excellent propagation earlier in the year, the 28MHz band was often 'dead' on SSB and CW, although there was nearly always something to be found for those using FT8. However, things should improve soon, as **Neil Clarke G0CAS** explains in his regular 28MHz beacon report:

This year's summer Sporadic E season was well down compared to the last couple of years. The daily average number of beacons heard during July was only 13 per day compared to around 20 for the same month last year. The most heard beacon in July was OE3XAC 28188, which is a bit unusual in itself because that honour normally goes to a beacon in Italy or Spain. Looking towards Scandinavia the most frequently logged beacon was SK7GH 28298 on 16 days. IZ8RVA 28240, which is always a good indicator of Sporadic E in that direction, was heard on 23 days along with ED4YBA 28263 on 20 days. IT9EJW 28225, SV2HNE 28202, SV2RSS 28266 and SV6DBG – heard almost daily during the winter months but only very rarely during the summer – appeared on 16 July, which may suggest that F layer propagation was responsible or was it just a case of double-hop Sporadic E? Looking now at 28200, which is the worldwide beacon network frequency, the most frequently heard beacons were 4X6TU, OH2B and CS3B, which were logged on 20, 16 and 17 days respectively. Looking further afield, ZS6DN was heard on five days. South America fared much better with LU4AA, OA4B and YV5B logged on 20, five and one day respectively. Nothing was heard from any other continent – but that is about to change, hopefully by the time you are reading this.

The month on the air

The Sovereign Military Order of Malta (SMOM) is, as its name suggests, a sovereign entity based in two extraterritorial buildings within Rome (**Fig. 1**) and counts as a separate DXCC entity from both Italy itself and the nearby Vatican City. SMOM is activated irregularly either as 1A0KM ('Knights of Malta') or as 1A0C (representing CISOM, SMOM's charitable organisation) and it was the latter callsign that was on the air from 26 July to 2 August. 1A0C operated from 1.8 to 50MHz on CW, SSB and digi (mainly FT8) with a large multinational team of operators and made almost 80,000 QSOs.

1a0c.com

The RSGB's most popular contest of the year, Islands On The Air (IOTA), took place on 29/30 July and attracted many portable island operations, large and small. I entered the 12-hour SSB-only section and made 564 QSOs, mainly with Europe (it was a pleasure to contact *HF Highlights* reporter **Etienne OS8D**, taking a break from his usual Belgian castles activations!). From here in Bonaire there was little to no propagation on either 3.5 or 28MHz, and 7MHz was not much better, so almost all QSOs were made on 14 and 21MHz.

The power of FT8

I had an interesting QSO at the end of July. An old friend, **Shoji Yoshihiro JG7AMD**, was on a business trip to Minnesota and wanted to try a sked on FT8 from his rental car, **Fig. 2**. (I've known Shoji since 1991 when we were both working in Papua New Guinea: I was licensed as P29DX and Shoji was P29JA.) Operating with his US callsign AB7TA and using a FLEX-1500, we easily completed the QSO on 17m, **Fig. 3**, and Shoji went on to work stations on all continents other than Oceania. He wrote: *"I didn't use full 5W output, I estimate 3 to 4W output. All setup, rig, antenna, coax and power supply will fit in a 13 x 26 x 20cm box (except PC)... 1 metre high dipole put between tree and car. Dipole antenna works good. I know the higher the better but even low still works... I didn't want to damage any trees so I didn't climb up trees!"* While intercontinental contacts using QRP are nothing new, I doubt such QSOs would have been possible on SSB or even CW using less than 5W to such a compromise antenna.

Club Log milestone

A post on the CDXC members' email reflector by **Darren Collins G0TSM** pointed out the amazing statistic that more than 1 *billion* QSOs have now been uploaded to the Club Log database. The brainchild of **Michael Wells G7VJR** and run by him and a small team of volunteers, Club Log provides a vast amount of data and statistics to users. It really is one of those things that if you don't use it, you cannot imagine how useful it is! I check Club Log on an almost daily basis and can't recommend it highly enough. It's free of charge to use and all amateurs are encouraged to upload their logs. See:

clublog.org

Coronation award

Remember the coronation of **HM King Charles III** on 6 May? (Yes, it already seems a long time ago!) The RSGB issued awards for contacting special event stations celebrating the king's coronation in May and June. **Lindsay Pennell G8PMA**, the RSGB Operating Awards Manager, sent a note with my certificate, **Fig. 4**, saying that so far he had issued 158 awards.

October DXpeditions

The bands normally liven up in September/October and it looks as if this year will be no exception. There's a huge amount to look forward to, far too many operations to be included here, but we can mention a few. The *DX-World* website and *425DX News* bulletins are great sources of news about forthcoming DXpeditions:

dx-world.net
www.425dxn.org

Top DXpeditioner **Yuris YL2GM** has announced a one-man operation as ZD9W from Tristan da Cunha between 25 September and 22 October.

Fig. 1: Villa Magistral, home of 1A0C (Photo: orderofmalta.int website). Fig. 2: AB7TA QRP portable setup from rental car. Fig. 3: QSOs made by AB7TA on 30 July using under 5W to a 1m-high dipole. Fig. 4: RSGB King Charles III Coronation certificate. Fig. 5: New J88PI QSL for October 2023 operation. Fig. 6: Etienne OS8D/P prays for good propagation on another Belgian castle activation. Fig. 7: The ZB2GI 5m wire antenna at the top of the Rock of Gibraltar.

lral.lv/zd9w

Uganda is quite a rare one these days so look for 5X3K, which will be activated by a Czech group, between 28 September and 8 October.

Brian Price GW4DVB will be active as J88PI from Palm Island in St Vincent and the Grenadines from 2 to 10 October. He'll use 100W on SSB, SSTV and FT8 to verticals and dipoles. Brian sent an image of the new J88PI QSL card, **Fig. 5**.

www.g4dvb.co.uk/dxpedition-2023

There are several Pacific DXpeditions being organised in October, the time of year when propagation can be expected to be at its best. The 'big one', with ten experienced European and American operators, is W8S from Swains Island (IOTA OC-200) scheduled for 4 – 17 October. Part of American Samoa, but a separate entity for DXCC, Swains is only rarely activated (so there are likely to be big pile-ups!).

https://swains2020.lldxt.eu

Jacek SP5EAQ plans to operate on SSB only as ZL7/SP5EAQ from the Chatham Islands for two weeks from 20 October. Despite the distance, because the Chatham Islands are almost antipodal to Britain ZL7 signals are often good in the UK.

The Intrepid DX Group plans activity as H40WA from Temotu (a province of the Solomon Islands, but a separate DXCC entity) from 26 October to 9 November with up to five stations on the air simultaneously.

https://intrepid-dx.com/temotu2023
www.facebook.com/groups/h40wa

There are also operations planned from Tahiti, Tuvalu, Niue and Vanuatu among others. Good luck with working these DXpeditions. If you are successful (or even if you're not!), please let us know for the next *HF Highlights* column. Photos of you, your shack, your antennas or anything connected with your HF operating are always welcome too.

Readers' news

Jim Bovill PA3FDR bucked the trend and was one of the few who found that *"propagation on HF was much better than usual, giving me more DX contacts than any month for the past four years on FT8/FT4. The majority were as usual from Japan, Brazil and the USA. While most from the USA were from eastern states, I also had QSOs down the western coast of both North and South American continents, from Alaska in the north (KL7HRO) to Colombia*

(HK3J) and Ecuador (HC5F) in the south. Despite the good propagation on most bands activity was very poor on the 10m band, with only two contacts on FT8, both with Brazil. New DXCC entities this month were Timor-Leste (4W6RU) operated by yet another Russian DXpedition group, Nepal (9N7AA), St Vincent and the Grenadines (J88IH), the Philippines (DU6/PE1NSQ) and the newest country in Europe, the Republic of Kosovo (Z62NS). Also worth mentioning were West Malaysia (9W2BAF), only the second time in my log of more than 40 years in amateur radio, and quite a rare one for me, Mongolia (JT1BV)."

Despite Jim finding propagation better than usual, in next-door Belgium **Etienne Vrebos OS8D** found the opposite. *"Couldn't find anything special on the bands. Propagation wasn't that great, even on 7MHz it was sometimes difficult to reach my 50 QSOs to make my castle activation valid... Hope to give you more spectacular results next month."* As usual most of Etienne's activity was as OS8D/P: this year he has made 14,000 QSOs, activating around 160 castles: *"Wanna get the 200 castles this year. It seems not contagious in Belgium, only some Germans and British and of course our*

Italian friends are active in the WCA. Fauna & Flora attracts more active participants [but it's] a little bit more difficult as you have not always access with your car." **Fig. 6** shows Etienne on another Belgian castle activation in July.

Tim Kirby GW4VXE operating as **GW4MM** also found that conditions were definitely in the summer doldrums. He had a quiet month, having been away from home, but said that the 1A0C expedition was very welcome, allowing him to work that DXCC entity for the first time from Wales. Tim worked the station on 20, 17 and 15m CW. He added, *"I don't normally get a chance to do the*

its generator. If the station was a relay set-up, then double that!

Controls are as follows – top line, tone control, then tuning scale. This has alternative dark and clear backgrounds, to help one see the correct scale for the chosen band. The middle is the logging scale, then the LH is either a meter, not fitted to most sets, or an RCA logo and model number. Each has illumination. The RH control is noise limiter threshold. Next line: antennae trimmer, big knob predictably tuning, and RH BFO. Bottom line: mains on/off, on being by selecting any other position than off, then Trans(mit), in other words stand-by, then receive modulated, then receive CW. Below is the phones socket. Then range select switch, then RF gain, audio gain, selectivity, with five positions, finally noise limiter and AVC, offering manual control, without limiter, then with limiter, then AVC with noise limiter, finally AVC without NL.

The rear has the mains-in and the mains voltage selector, the multi-pole plug and socket for use with external power if that was used, the 3-pin aerial connector, and the audio output terminals. These are all screwed, and on our set the corrosion was such that even the speaker connections were open circuit until worked on: I knew the set was receiving because I heard chatter from the output transformer. There is access to several adjustments for the aerial input tuned circuits and the IF trap. There is also a diversity terminal where more than one set is used. This just connects the AVC lines of two or more sets together, so that the strongest signal mutes the others, the audio line outputs being mixed. For those unfamiliar with diversity reception, one has two or more sets tuned to the same signal, but using separate and spaced antennas. This limits fading as one of them, one hopes, is in the right place to get a good signal when the others don't. Expensive! And requires a lot of land to space the antennas out. There was a modification to allow one set's LO to run the others in the arrangement, and some had a facility for crystal control with a socket on the front panel.

Trying out

The set didn't go bang, but was seriously deaf, a couple of weak signals on MW being our lot.

Moving the aerial to the grid of the second RFA brought in a few more stations, and moving it to the mixer grid gave very many more. At about this time someone who was with me noted a thin stream of smoke from one of the RF amplifiers – the screen-grid decoupling capacitor. This was a 'Micamould' type. These tend to leak, strange for a mica, but I was tipped off by one of our extremely knowledgeable members (see footnote) that the Micamoulds are not necessarily mica, but waxed-paper. Measuring the screen volts on all three above mentioned valves, they were very low. All three capacitors leaked, and all three screen grid resistors were very high, so the valves were more attenuators than amplifiers. Surprise, surprise, after replacing this

6

lot, the set worked much better. But nothing as it should be. The audio was low, but many stations, so the fault was not in the RF section, and checking with a 'scope showed many volts of AF from the detector diode, which then promptly went AWOL.

This problem perhaps foxed me more than it should, though I can claim that the signal path to the volume control is not straightforward. The signal disappeared in the series of resistors around the noise-limiter, and the problem turned out to be the 660kΩ potentiometer, which was open-circuit. Replacing this was not so straightforward either, as it is not a standard value. It turned out all my 470kΩ pots were on the low side, and all my 1MΩ pots on the high side. So I finished up using a 1MΩ with resistors between ends and wiper. Perhaps I could have got away with simply using the 1MΩ pot. Anyway, it worked and the set was now pretty good: though resistors around the 6SJ7 audio pre-amp were high, and someone had been doing modifications, including adding a cathode bias resistor to the output valve, of too high a value even if it wasn't grid-biased, so the output was low before distortion. The output valve was wrong anyway, a 6V6GT, but that was OK – it is a perfectly good valve. So, with circuit de-modified, some more new resistors, and replaced capacitors, it was back to what it should be. It was found to be up to specification on signal-to noise ratio, and AVC threshold: which was about 0.5μV when run from a 50Ω generator. Some of the mentioned hermetically sealed capacitors were leaky and were replaced.

Conclusions

An absolutely high-grade radio of the 'no expense spared' type, even though originally for the Amateur service. Its size means that many, including myself, will say I have not space for it. In my case I have had the pleasure of working on one and having a play, and then putting it in the Museum's collection. A great radio, more complex than most and perhaps a little harder to service for the less experienced, but well worth the effort.

Band	AR88-D	AR88-LF
1	535kHz - 1.6MHz	73kHz – 205kHz
2	1.57MHz - 4.55MHz	195kHz – 550kHz
3	4.45MHz - 12.15MHz	1.48MHz - 4.4MHz
4	11.9MHz - 16.6MHz	4.25MHz - 12.15MHz
5	16.1MHz - 22.7MHz	11.9MHz - 19.5MHz
6	22.0MHz - 32MHz	19.0MHz - 30.5MHz

Table 1: Frequency ranges of the two AR88 variants

Acknowledgements

The very knowledgeable member concerned is **Dave Grant**, who may be known to you. He is the originator of the 'Circuit Dungeon' and Murphy.co websites dedicated to Murphy radios. He is, however, very knowledgeable about a wide range of both vintage and modern electronics.

Much of the information used here was derived from **Louis Meulstee's** *Wireless for the Warrior Vol 3, Reception Sets*. This contains circuit, layout, and some of its uses, including the Wireless Station No 63, for 'semi-static' (moving it would be fun...) Line Communications using teleprinter. Four AR88s are used. The system was known as Silver Arrow.

The DVD referred to is *Vintage Radio Service Data,* **Paul Stenning: www.service-data.com**

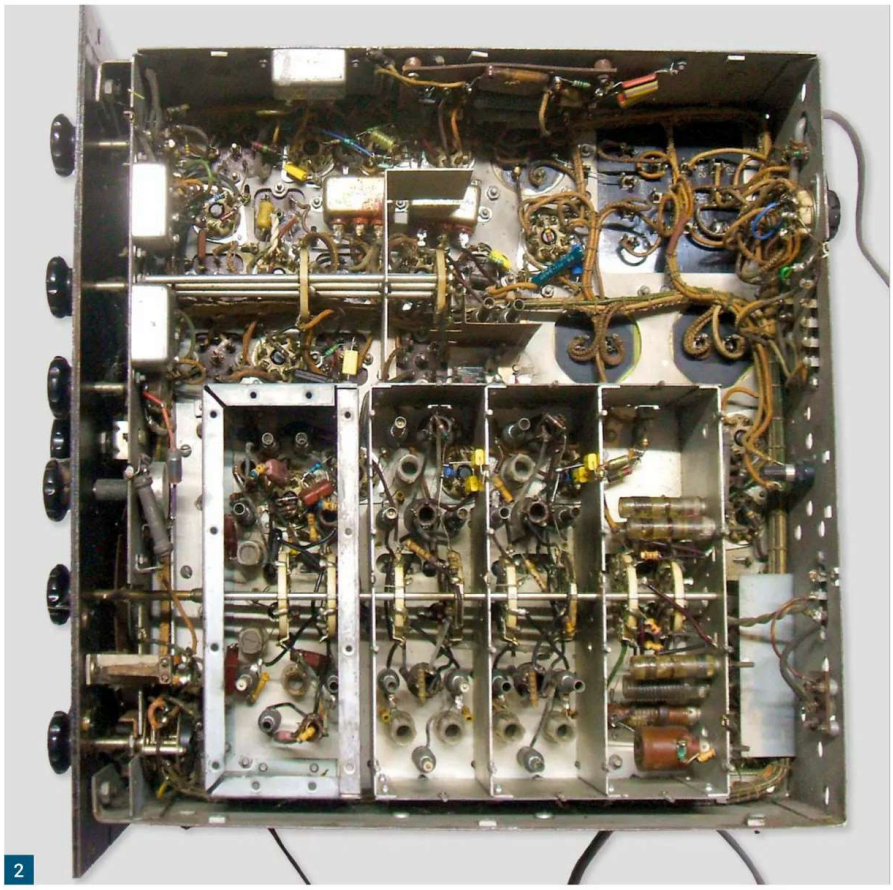
Fig. 1: The AR88.
Fig. 2: Under chassis view.
Fig. 3: Under chassis view with covers in place.
Fig. 4: Above chassis view.

at the base. These appear to be ceramic tubes, silver plated. A special tool is needed to adjust them, which along with another for the inductors, was supplied, clipped to the top of a cover over much of the set's front-end, and was predictably missing. The aerial input circuits are all balanced from earth on double-wound transformers. A three-terminal strip has a shorting bar attached to earth one side for unbalanced inputs. Most of the switch wafers are ceramic. Sadly, in our set one of them makes poor contact in one position and attempts to rectify this have failed. After all these years and in a set not well stored plenty of corrosion was evident; see the picture of the chassis top, **Fig. 4**. One cannot really complain. I have noted an unfortunate habit of people to put comms sets in damp places, perhaps assuming they were all made for field use.

The build quality is very high: I doubt if any modifications were needed to meet military specifications. The two smoothing chokes, mains transformer and output transformer are all encapsulated. The mains transformer is multi-tapped for a wide range of mains voltages. The set uses only paper capacitors for the HT smoothing, again in a metal box, this being a triple 4µF device. Ours leaks grease, but works perfectly well. Most of the papers are in hermetically sealed boxes too, though after all these years that does not mean they won't leak. To avoid the need for bypass capacitors in the cathodes of the two audio valves, fixed bias is used from a negative supply. There is a plug on the back containing links when used on the mains and is intended for use with external power if needed. A negative supply for bias is derived by having a chain of three resistors between the HT centre-tap and chassis. The highest voltage goes to the top of the RF gain control, and as the RF valves don't have cathode resistors, a small resistor in the earthy end of the gain pot ensures that there is always a slight voltage on the pot's slider and hence the AVC line. The next tap on the divider biases the output valve, and finally the lowest voltage biases the AF preamp. If the external PSU is used, its negative line goes to the top of the bias chain, not chassis, to maintain this arrangement.

According to **Meulstee** (see acknowledgement) the set dates to 1941, but that is when it arrived here from America for military use. It was described as a high-grade general-purpose receiver. There were two versions. The -D covered 535 to 32.0MHz, and the -LF 73 – 550kHz, and then 1.48 - 30.5MHz.

The IFs were -D 455kHz and the -LF 735kHz. Both have six frequency ranges. They weigh 100lb, and if one has the external vibrator pack for 6V battery, that is another 7lb. Surprisingly perhaps the mains voltage ranges are a little different. The D version



2

3

is 100-165 or 190-265, 50/60Hz, and the LF 115 or 230 25 - 60Hz. One may have expected that the only difference between sets were the coil-packs fitted, and IF transformers. It seems the original AR88 without suffix was not used, though it is very similar. The bands for each variant are shown in **Table 1.**:

The uses of the sets were many – as a standalone receiver, as part of a receive/transmit arrangement, and as IF amplifiers in the enormous microwave digital pulse-position-modulated, multi-channel teleprinter links across Europe as the Allied advance progressed. Twelve sets were used in that, two being spare. The receive station occupied one lorry, with its own generator towed behind, and the transmit station another lorry, with

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6

0700UTC CWT session on a Thursday morning, but on 3 August I'd finished my morning's jobs a little earlier than normal and it was fun to find 20m CW well open to the west coast of the USA and Oceania. Not much DX on 15m, although 9A150TESLA was a fun callsign!"

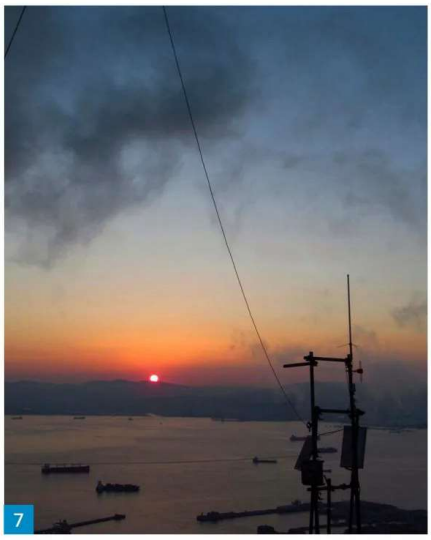
Carl Mason GW0VSW agreed with Tim: *"Band conditions have been pretty poor this month for QRP. I spent a good deal of time sorting out the shack and setting up the Signalink USB for data modes using my FT-857. After a long time searching I managed to find a DSP-2 unit after my original gave up... The 857 is now my main data transceiver running 5 watts into the inverted G5RV.*

"I last operated PSK in February 2011 and I was interested to see how things had changed since then. Despite QSB most days and occasional CQs I logged 60 QSOs with Austria, Denmark, Italy, Poland, Romania, Spain, Sweden, European Russia and, best DX, Australia! Calling CQ for about 15 minutes one Saturday there were no stations to be heard. Next minute VI25AREG was seen calling CQ so I gave him a call. Gregg replied giving his location as Modbury, a suburb of Adelaide, South Australia. I put them on the Cluster but they received no other calls and he was the only signal I heard that evening. Nice to make it with just the 5 watts."

Kev Hewitt ZB2GI sent a short note with his list of stations contacted. He wrote that during the month he operated portable on two occasions from the top of the Rock of Gibraltar, **Fig. 7**. He and **John ZB2JK** used a converted President Lincoln 11m CB transceiver mounted in a backpack with a 7Ah SLA battery and a 2.5m telescopic 'flag pole' antenna with a base loading coil. Kev added that John has been busy constructing a T-match tuner for the 10m backpack radio.

Owen Williams G0PHY reckoned that *"It was an interesting month with the tail-end of the Italian DXpedtion to 9Q, the 1A0C operation and the IOTA Contest. I managed to work 1A0C on all bands from 7MHz up to 28MHz and it was good to have a DXpedition devoting a lot of time to SSB for a change. The IOTA contest was a bit of a disappointment in that the vast majority of islands that I worked were in Europe with only two stations worked on Madeira, one in the Canaries and two in North America. I did hear some YB stations on 21MHz on Saturday afternoon but could not break the pile-ups... One of the attractions of the IOTA contest is the possibility of bagging new IOTAs. This year I managed one, VB2M, though I'd managed to work him on both 14 and 7MHz before the contest. Incidentally, during the contest VB2M were 59+ with me but before the contest the signals were at 'ESP' levels. One interesting QSO was with **Amir ES5TTT**; he was in a hotel near Oxford operating remotely using his iPhone."*

Ken Churms EA5/G4VZV was active in July, working pedestrian mobile with his sack trolley station. Conditions have been much better during the late evenings and into the early hours and Ken spent most of his sessions working by torchlight, sometimes going out at midnight until 5.00am. There was little chance of daytime sessions because of the intense heat. Ken worked many VK, ZL and W6 stations with 59+ signals and will be active again in September.


7

Band highlights

Jim PA3FDR: 7MHz FT8: CM7JAA. **10MHz FT8:** 4L7T, HI3A, HP2NG, VK1MA. **14MHz FT4:** 9N7AA, 9W2BAF, HC5F, HZ1CY, J88IH, JA6FIO, JI4POR, KL7HRO, PY7OO, W6IWW, YB1PT. **14MHz FT8:** BD4UN, CO7FR, HK3J, JR7COP, RA9H, UN7AM, VK3PIA. **18MHz FT4:** JA3EQC, JA8DIV, N5EE. **18MHz FT8:** 3W3B, BG5FCH, BW2/JP1RIW, CO8LY, DU6/PE1NSQ, FG5FI, HS0ZOY, JA4FDZ, NG7E, PT7AZ, RZ9UO, VA1RJR, WP4KMB. **21MHz FT4:** 3C3CA, CX1AAX, FG5GP, JA8ECS, PY2XZ, RW9MZ, W6NWS, YC7AAE, ZS4JAN. **21MHz FT8:** 4W6RU, 7Q7EMH, 9K2OF, BA4OO, HS0ZOY, JH2BUF, JT1BV, K0TC, LU3HFS, PT2OP, PU5YSV, RG0S, YC3BVG, YH4FO, YH8VK, YV5DRN. **24MHz FT8:** CX1VH, PY7VI, R9RT, PY2XB. **28MHz FT8:** PY7VI.

Etienne OS8D: 7MHz SSB: 1A0C. **14MHz SSB:** 3V8CB, 9M2SYG, BH7FFR, FO/F4FJH, VB2M, W1AW/KH6. **18MHz SSB:** 1A0C, 9Q1AA, CO8LY. **21MHz SSB:** 1A0C, PJ2/DL8OBQ, PJ4DX, YB2MVD, YH3AL. **24MHz SSB:** 1A0C, 9Q1AA. **28MHz SSB:** 1A0C.

Kev ZB2GI: 14MHz SSB: 1A0C, CT9/WT3J, JE1KEY. **18MHz SSB:** BD7BM, HZ1NN, JA6GGD, KE9L, TI2SD, VE7SNC. **21MHz SSB:** SP3AYA/P (FF-030). **21MHz FT8:** BG5GLV, FW1JG, JA3FHL, JR5XPG, JY4CH, PU5JVA, W6RJM, XE1GLL. **28MHz SSB:** UN0PA. **28MHz FT8:** CD3DJL, CE1LEW, CX3DAC, HI8ILK, HK7JA, KD9ATF, LU1HB, OA4DOS, PP1XX, PR7DZ, PT2ARR, PU5FLP, SU1SK, VE3DV.

Owen G0PHY: 7MHz SSB: 1A0C, VB2M. **14MHz SSB:** 1A0C, 9Q1AA, VB2M. **18MHz SSB:** 1A0C. **21MHz SSB:** CT3HF. **24MHz SSB:** 1A0C. **28MHz SSB:** 1A0C.

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 December issue the deadline is 11 October. 73, **Steve PJ4DX**. PW

Philip Moss M0PBM
practicalwireless@warnersgroup.co.uk

1

RCA-Victor AR88 receiver

Philip Moss M0PBM gets his hands on a true classic – the AR88.

The AR88 is a very famous set, rightly so, and as such is probably known to most of you, even if not 'in the metal', **Fig. 1** (note the liftable lid). It wasn't to me until I g ot to meet this one. It was donated to the British Vintage Wireless & Television Museum, Dulwich. A member spotted two of them plus two HRO Seniors, and an Eddystone 680X on a skip! The Museum has not traditionally kept comms receivers, as its founder, **Gerry Wells** did not like them. My influence has changed that; we have a growing number now.

Something that has endeared them to us is that fortuitously just after we had one, a film company rang up to ask for one, the Monday after it arrived on the Friday! We hire out sets for film and TV, most notably Downton Abbey. It is a useful source of income. Attitudes to comms sets changed a bit after that...

The set was not designed for the Military. The AR is for Amateur Radio. As far as I can find, they were made from 1937 or 38. With the exception of the rectifier, output valve and voltage stabiliser, they used the then all-new metal octal range. One may assume however that the vast majority of these sets were used by the Military, as the set was very suitable as a very high-grade radio covering the whole short wave, with a very high specification and build quality. They were used by France, GB, Russia and possibly even Nationalist China, as well as obviously the USA and Canada, where some were also made. It was used here up to the late fifties.

Description

This is a complex set. The circuit is available on **Paul Stenning's** Vintage Radio Service Data DVD-ROM, as well as in *Wireless for the Warrior Vol 3: Reception sets*. These are a great source of circuits, and in some cases also of maker's manuals or service sheets. It would take up two full pages if reproduced here.

The set has two tuned RF amplifiers using not the predictable 6SK7, but 6SG7, with a slightly higher mutual conductance. A 6SA7 is the mixer, or in the old-fashioned and rather strange terminology, first detector, as used in the manufacturer's terminology. This is a polygrid valve, intended as a self-oscillating mixer, but used here as mixer only, with a 6J5 single triode local oscillator. The two RF amplifiers and the mixer are all screened from one-another, and have a cover over the bottom of their area. The LO is also covered, but has a separate one, I suspect to prevent circulating currents in this part of the circuit, and also to keep a further barrier between the LO and coupling to the aerial terminals: to prevent LO radiation up the aerial. This would be particularly useful in military service where one does not want the enemy to be able to direction-find using spurious radiation from one's equipment. In the picture of the bottom, the two covers are removed, see **Fig. 2,** and again with covers in place, **Fig. 3.** There are three IF amplifiers: all 6SG7s. From mixer to first IFA (intermediate frequency amplifier), then that to second IFA, then that to third IFA, there are double IF transformers. These have switched coupling between them, thus selecting the bandwidth. There is also a phased crystal in the coupling of the mixer to the first IFA, though the trimmer is not brought out to the front panel, perhaps an obvious modification for those mainly interested in CW reception as it can be used to vary the bandwidth, and peak the response. There are five bandwidths: 13, 7, 3, 1.5 and 0.4kc/s. The last three use the crystal. 13kc/s seems very wide, even for a domestic set. After all, by International Convention, below 30MHz, AM should be no wider than ±4.5kHz, or 9kHz total. There are slight differences in bandwidths between models. The only conventional IF coupling is the output of the third amplifier: where the loading of the detector would probably negate the attempt to make a hi-*Q* factor. In any event if three stages of double transformers has not given a sharp enough response, another one probably wouldn't make much difference. A 6H6 double-diode is used for detector and AVC, then follows another 6H6 as noise-limiter. Note that I refer to 'AVC', that is Automatic Volume Control. Nowadays AGC, Automatic Gain Control, is more commonly used and is more correct. AVC is more likely to be used in conjunction with audio gear. This has a variable threshold. Despite all the gain at HF, there is a 6SJ7 pentode AF preamplifier, followed by a 6K6GT output pentode in the D-version, and a 6V6GT valve in the LF version of the set. Very unusually for a comms set, and indeed for valve radios generally, negative feedback is applied across the audio section from a tap on the secondary of the output transformer to the cathode of the 6SJ7. A 6J5 is used as BFO. The rectifier is a directly heated 5Y3GT. A VR150 stabiliser feeds the LO, BFO and the screen grids of the three IFAs and the mixer. When reading the circuit, there is a peculiarity. Instead of 'k' for kilo, they use 'M', suggesting some extraordinary values of resistor are used such as 560 meg-ohms. One soon gets used to this. Megohms are marked as meg. on the circuit. What is harder, especially on a copied circuit, is the drawing of many valves upside-down: with the cathode and heater at the top, the anode at the bottom, and the HT line somewhere in the middle of the circuit, not at the top.

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CW Bandpass Filter Design

In the first of a two-part article **Alpar Cseley HA8KT** takes a look at designing a CW bandpass filter.

Alpar Cseley HA8KT
alpcseley@yahoo.com

When various direct conversion receivers were built, it was always felt that a kind of AF filter would be necessary to turn the receiver into a really pleasant sounding one. Without a well designed and implemented filter (should it be for CW or SSB) the radio is just another 'world receiver': brings in stations from a large spectrum.

After studying the available articles and books, it was decided to build a Multiple Feedback Bandpass Filter (**MFBF** in short) and see its performance, suitability and effectiveness. Numerous articles and books discuss the subject, some of with inadequate description, numerical errors, confusing variable naming. Having spent some time reading and pondering about the possible filter types, it now looks prudent to say (decide) the MFBF should be the filter for my next DC receiver project. In Part 1 of this article, I attempt to summarise the procedures of the filter design in a way that is easy to follow. Part 2 will describe the filters I built and how they were tested and evaluated.

Getting started

The MFBF is a second order filter (with two reactive elements) using one op-amp. A 'template' circuit: the normalised filter model serves as the basis of the design calculations. Normalisation means the circuit elements are 1Ω resistors and 1 Farad capacitors selected for 1 radian/sec frequency, (**Fig. 1**) Their actual values depend on the required filter passband center frequency, filter sharpness, expressed with *Q* (quality) factor. These 'normal' model components will be the starting values in the design calculations.

Selection of the filter parameters

a. Centre frequency f_c

Superhet receivers with BFO control or clarifier could have filters with really sharp responses. The clarifier in the FT-897, for example, tunes the beat 400-800Hz, and has the default of 700Hz. The bandpass filters published in the literature are designed (mostly) for 700 or 800Hz.

b. Bandwidth: there is seemingly no set rule for the bandwidth (BW), its selection is dictated by individual preference. However, if the bandwidth is too narrow, the filter tends to ring (similar to echoing), that is tiring to listen to after a while. Further, tuning (and retuning...) a receiver equipped with a sharp bandpass filter to a calling CW station may be difficult, needing fine reduction drive and a light hand. Therefore, the bandwidth of the filter built into a DC receiver is a compromise between selectivity and tuning accuracy.

c. Quality (effectiveness, sharpness)

The effectiveness of the filter is characterised by the ***Q*** (quality) factor. The higher the *Q*, the sharper the filter response. The commonly accepted rule is that for reducing the filter's ringing with CW signals, the *Q* for audio filters used in SW receivers should be kept between 2-10. Therefore, it is recommended to design single op-amp filter circuits with *Q* = 2-5. The relationship between the bandwidth (BW) and *Q* factor is:

$$Q = f_C/BW$$

An example: the bandwidth of a filter for 700Hz passband center frequency, and with mid-range Q = 5 becomes:

$$Q = f_C/BW \quad BW = f_C/Q = 700/5 = 140\ (Hz)$$

If a narrower bandwidth is needed, use of a multi-stage filter with cascaded low pass and high pass filter sections is recommended.

d. Gain

The gain relates to the in/out signal amplitudes at the passband centre frequency. The peak gain of a normalised multiple feedback bandpass filter model is:

$$G = -2Q^2$$

In order to avoid audio volume change when switching the filter in/out, the gain (G) of the filter circuit at the passband centre frequency should be ≈ 1.

The op-amps at moderate (audio-) frequencies have higher than unit gain. Therefore, the input signals need to be attenuated to get the G ≈ 1 level. While the gain is $G = -2Q^2$, the required attenuation is its reciprocal:

$$A = 1/2Q^2$$

The resistor R1 and the addition of R2 serve as attenuator in the unity-gain normalised filter circuit (see **Fig. 2**). By proper selection of their values, the gain could be set as required.

The calculations using the Thevenin method give the values of the resistors for unity gain as function of the *Q*:

$$R1 = Q\ [ohm]$$

$$R2 = Q / (2Q^2 - 1) \quad [ohm]$$

$$R3 = 2Q \quad [ohm]$$

The normalisation of the filter circuit uses 1 [rad/s] centre frequency, i.e. $f_0 = 1$ [rad/s]; (0.1592Hz), 1 Farad capacitors, and unity gain. An additional resistor R4 is for offset bias compensation, its value equals R3 (another compensation method is given in Part 2 of this article).

The functions of the components in the unity gain circuit:

R1 C1 low-pass response

R3 C2 high-pass

R1 R2 attenuation

R4 bias compensation

In order for the filter to function properly, the op-amp must provide enough gain at the centre frequency For example: with *Q* = 5 the required minimum amplification is $G=-2Q^2=2 \times 5^2 = 50$ (34dB). To ensure high stability of the circuit and keep the distortion low, using a design factor of 10 is suggested, i.e. we need an op-amp with minimum of 10 × 50 (54dB) open loop gain (at *Q* = 5). From the datasheet of the op-amp selected for the filter, we could find the minimum frequency at unity gain (f_{0dB}), and the gain of the required centre frequency of the filter. Diagrams with the f_{0dB} values are published by the IC manufacturers.

According to the above, the minimum acceptable frequency at unity gain should be expressed by the following inequality, where the design factor used is 10:

$$F_{0db} \geq 10 \times G \quad [Hz]$$

Example: with *Q* = 5 and design factor 10, for 700Hz centre frequency, the op-amp frequency at unity gain should be:

$$F_{min} = 10 \times f_c \times G = 10 \times 700 \times 50 = 3.5 \times 10^5 = 350 \quad [Hz]$$

The TL071 (built into my filter), open loop gain at 700Hz is >75 dB, the unity gain (0dB) frequency is 5MHz, thus perfectly suitable for audio frequency (CW) filters designed with *Q* = 5.

Design of the filter

There are two calculation methods available for the filter design. Both are based on the same theory and the normalised model circuit.

The *'quick and easy'* one utilises a straightforward calculation process with set capacitors providing component (resistor) values for a given passband centre frequency. The *'normalisation and scaling'* method offers flexibility in component and frequency selection at the price of more calculations.

Common for both design methods is that C1 must be equal to C2, and the ratios of R1, R2 and R3 are fixed, and should not be changed.

Fig. 1: UV-K5 outfit. Fig. 2: UV-K5 in the hand.
Fig. 3: Ben M3EUO using the UV-K5. Fig. 4: Screenshot of the Programming Software.

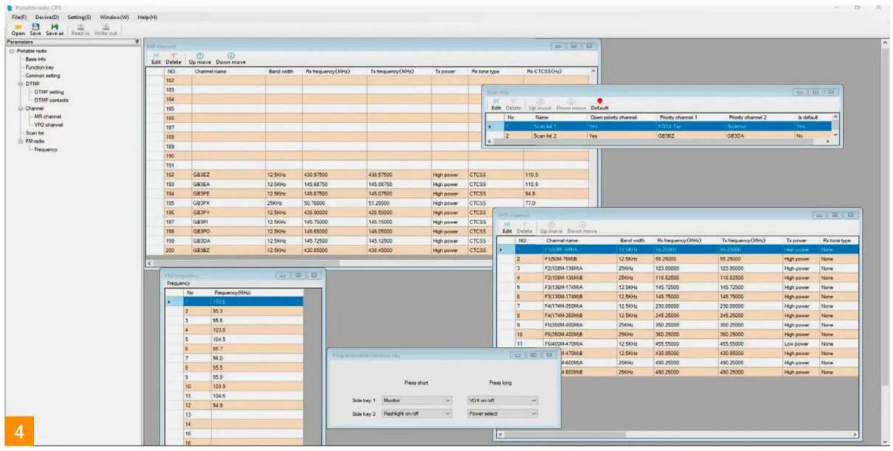
My son, who now has the radio, lives 3.5km away and we find it great for keeping in touch. It has adequate transmit power, a sensitive receiver and is relatively cheap. This needs to be tempered against transmit harmonics being a bit on the high side, so it's probably best not used on a main base station antenna, and the set cannot be recommended for air-band reception (which Mirfield acknowledge).

The item under review was purchased from Mirfield Electronics whose current price is £34.95 + p&p. It is also available from other UK suppliers.

www.mirfield-electronics.co.uk

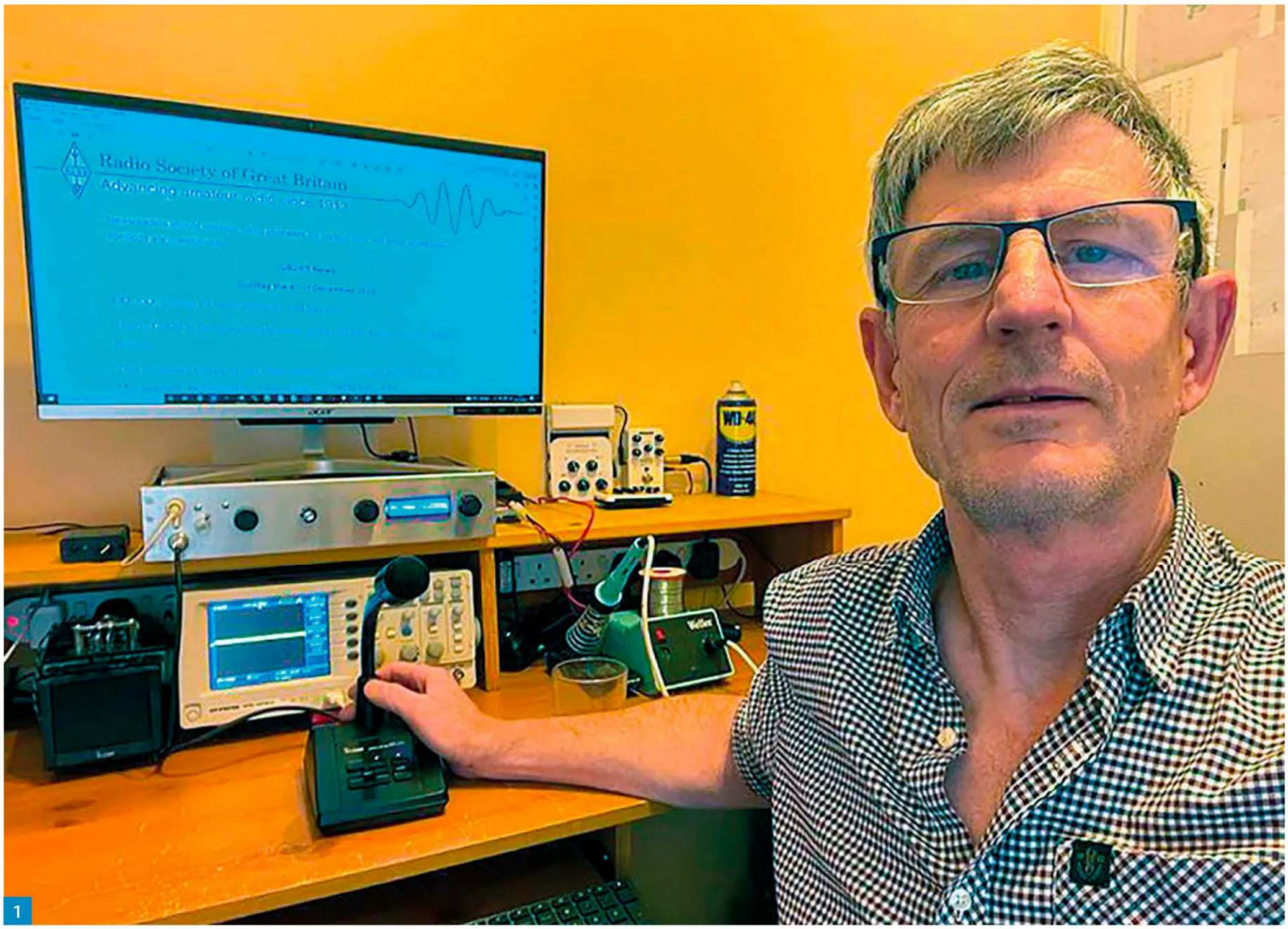
Software&Manual:

www.qsfj.com/support/downloads/3002



TX Power Output	**Low**	**Medium**	**High**			
145 MHz	2.6W	3.2W	4.5W			
433 MHz	2.8W	3.2W	4.4W			
Sensitivity @	**50MHz**	**70MHz**	**145MHz**	**160MHz**	**433MHz**	**450MHz**
dBm for 12dB SINAD	–120dBm	–126dBm	–127dBm	–127dBm	–126dBm	–126dBm
Harmonics	**2nd**	**3rd**				
145MHz	37dB down	40dB down				
433MHz	41dB down	47dB down				
TX Frequency Accuracy	**145MHz**	**433MHz**				
Measured	145.00005	433.0001				

Table 1: Measured Performance



1

NARC activity

Roger Cooke G3LDI has another broad selection of Morse-related news.

Roger J Cooke G3LDI
roger@g3ldi.co.uk

Locally here in Norfolk we are taking our summer vacation and classes will commence again at the beginning of October. We now conduct our classes on GB3NB, so the range is extended. We find that helps a lot.

Unfortunately, **Chris G4CCX**, who I reported last time as being in hospital, died there so we shall have to reorganise the tutoring schedule accordingly. Chris was very keen and took two classes per week. He will be greatly missed locally.

Volunteers for the GB2CW tutoring scheme are always wanted so if you would like to take on the role of a tutor for your club, please ask me for more details. It is simple and straightforward and will provide a lot of help to students. As the RSGB GB2CW Coordinator I do have to issue a letter of authorisation and then get the information onto the GB2CW page of the RSGB website. Volunteering is not such an onerous task as you might imagine and a lot of satisfaction can be obtained helping people to become good CW operators.

If you are a good operator yourself, don't just hide behind a bushel or a cloud of anonymity, leaving it to others. Put yourself forward and give an hour or two each week to a very good cause. You owe it to the hobby to train those who need to see the light! I would like to leave a legacy of at least one GB2CW volunteer tutor in every club in the UK! I am having trouble in achieving that target. Email me! I don't bite!

Having said that, I have had two new volunteers in the past few weeks. **Eric Arkinstall M0KZB** has signed up with several locals wishing to learn CW. I then heard that he had more than he could cope with, 12 students! So, another volunteer came along to help out and that was **Paul Bowen M0PNN**. Now if only that could happen in all the other clubs!

From M0KZB

Eric M0KZB sent me this recently: *"I am currently in contact with a young man (15 years old) in India. He is persistent and very enthusiastic, and has applied to take his RSGB Morse test. I asked him if he had a Key and an Oscillator.*

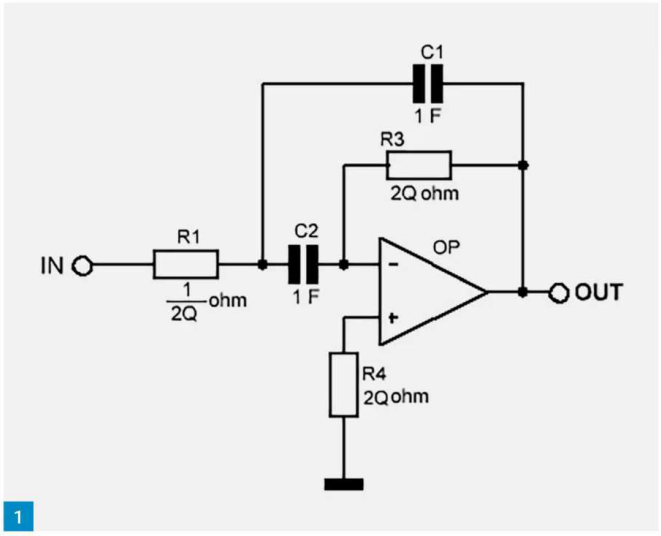
"He said he hadn't got a proper key, only one he made himself. I told him I was interested in his home made key and could he send me a photo, which he said he would do.

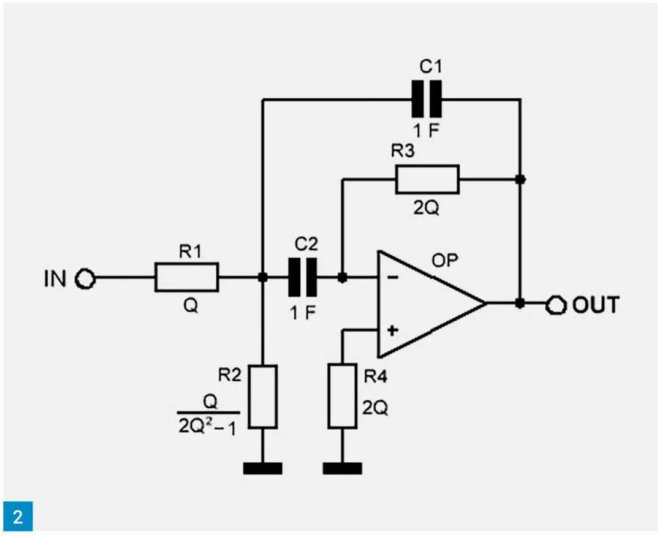
"I have attached the very short video he sent for you to look at, I am currently trying to sort out a simple key to send him, his video will explain why."

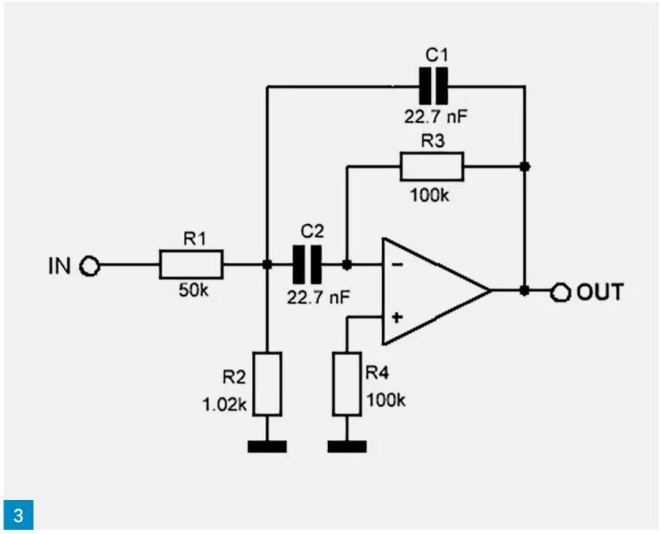
The video shows a small buzzer attached to a PP3 battery. Hopefully Eric can sort him out with a key of some sort. It's good to see a youngster willing to learn Morse however and very kind of Eric to sort a key for him.

Newbie in NARC

Along similar lines we had a newcomer to the Club who is very keen, has passed his Foundation licence and now sports his new call, M7EQR. His operating on the repeater is fine (some newbies exhibit poor operating when just licensed, despite a supposed training). He







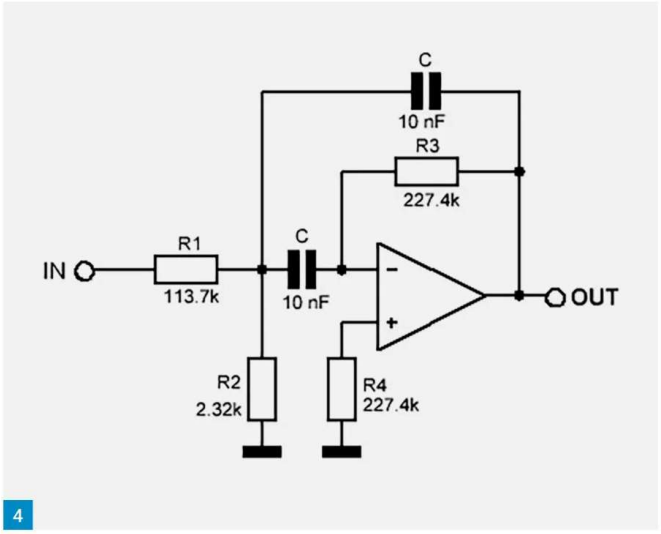


Fig. 1: Normalised filter model. Fig. 2: Normalised filter model with attenuation. Fig. 3: Filter scaled for resistors. Fig. 4: Filter scaled for capacitors.

The 'Quick & Easy' calculation

Based on the transfer functions of the MFBF circuit (published in [**Ref. 1**] – after some maths manipulation – a quick calculation method was developed. The process provides quite accurate results (see the example below). However, it lacks the flexibility of changing the resistors freely (as to available ones) after the capacitors are selected.

The adjustment to the required passband centre frequency and the set capacities are included in a numerical constant, thus no further 'scaling' is necessary.

The input data are:

- **f_0** required centre frequency of the passband, Hz
- **BW** passband width, Hz
- ***Q*** quality factor: calculated from above f_0 and BW
- **C** capacitors to be used (C1=C2), F
- **G** gain at the passband centre frequency, 1

The calculations are the following:

• Convert the centre frequency:

$$\omega = 2\pi \times f_c = 2\pi \times 700 = 4398 \quad [rad/s]$$

Define the **k** constant for further calculations:

$$k = \omega \times C$$

• Calculate the resistor values:

$$R1 = Q / (G \times k) \quad [ohm]$$

$$R2 = Q / ((2Q_2 - G) \times k) \quad [ohm]$$

$$R3 = 2Q / k \quad [ohm]$$

Example 1.

f_c = 700 [Hz]; BW = 140 [Hz]; circuit gain G = 1 [-]

Capacitors selected: C1 = C2 =10 [nF]; i.e. 10×10^{-9} [F]

$$Q = f_c / BW = 700 / 140 = 5$$

$$\omega = 2\pi \times fc = 2\pi \times 700 = 4398 \quad [rad/s]$$

$$k = \omega \times C = 4398 \times 10 \times 10^{-9} = 4.398 \times 10^{-5} \quad [rad/s \times F]$$

$$R1 = Q / (G \times k) = 5 / (1 \times 4.398 \times 10^{-5}) = 1.137 \times 10^{5} \quad [ohm] \quad 113.7k\Omega$$

$$R2 = (Q / ((2Q^2 - G) \times k)) = (5 / ((2 \times 5^2) - 1) \times 4.398 \times 10^{-5})) = 2.32 \times 10^{3} \quad [ohm] \quad 2.32k\Omega$$

$$R3 = 2Q / k = (2 \times 5) / (4.398 \times 10^{-5}) = 2.274 \times 10^{5} \quad [ohm] \quad 227.4k\Omega$$

$$R4 = R3$$

Checking the gain with the calculated resistor values confirms the design:

$$G = R3 / (2 \times R1) = 227.4 / (2 \times 113.7) = 1.0 \; [-]$$

The '**Normalisation and Scaling**' method

The procedure is based on the unity gain model circuit, designed (normalised) for 1 rad/s centre frequency with 1 ohm resistors, 1 Farad capacitors (see in **Ref.1).** The model circuit, (**Fig. 1**), should be scaled in steps to the required passband centre frequency, **Fig. 2**, and practical component values, **Figs 3** and **4**.

Example 2. The input data are $\mathbf{f_c}$ (700Hz), **BW** (140Hz), **G** (= 1) same as in **Example 1,** all of the component values will be calculated (**C** is not pre-set).

Fig. 1: Graham Laming G4JBD.
Fig. 2: Control panel for RSGB News on CW.

is learning CW – even better – and he is only 12 years young. He is attending the club and it will be a steep learning curve for him. I just hope he is not dissuaded by the fact that most club members are about 30+ years older! Youth is to be nurtured and I am sure he will do well. It sure is a great time to learn CW.

GB2RS news in CW

Just recently I was contacted by **Graham Laming G4JBD**. Graham is a GB2RS Newsreader with a leaning to CW, **Fig. 1.**

He has made available the RSGB News each week using CW. You will be able to go to the RSGB website, log on to this facility and copy the RSGB News at varying speeds, with varying parameters that you can set, such as QRN, QRM, QSB, Noise and so on, or just pure CW with no additions at all. Graham has also made available the text itself so that you can check your copy. Another nice addition is the modification of the text using CW abbreviations, thus giving you the practice that you should have for recognising abbreviations in real life. This is a really great facility and I do hope that you will take advantage of all the hard work that Graham has put in to make it available.

Graham would like to know just what you think and would also like to know if you have any ideas about how to improve it. He will also make available some normal groups for regular practice. He is trying to make the tone frequency variable to suit everybody. Personally, I prefer 400Hz, but then that is a sign of age. You normally find that frequency preference drops as age kicks in. Young guns can cope with 1kHz or thereabouts, but it is a personal preference so Graham is trying to cater for that choice.

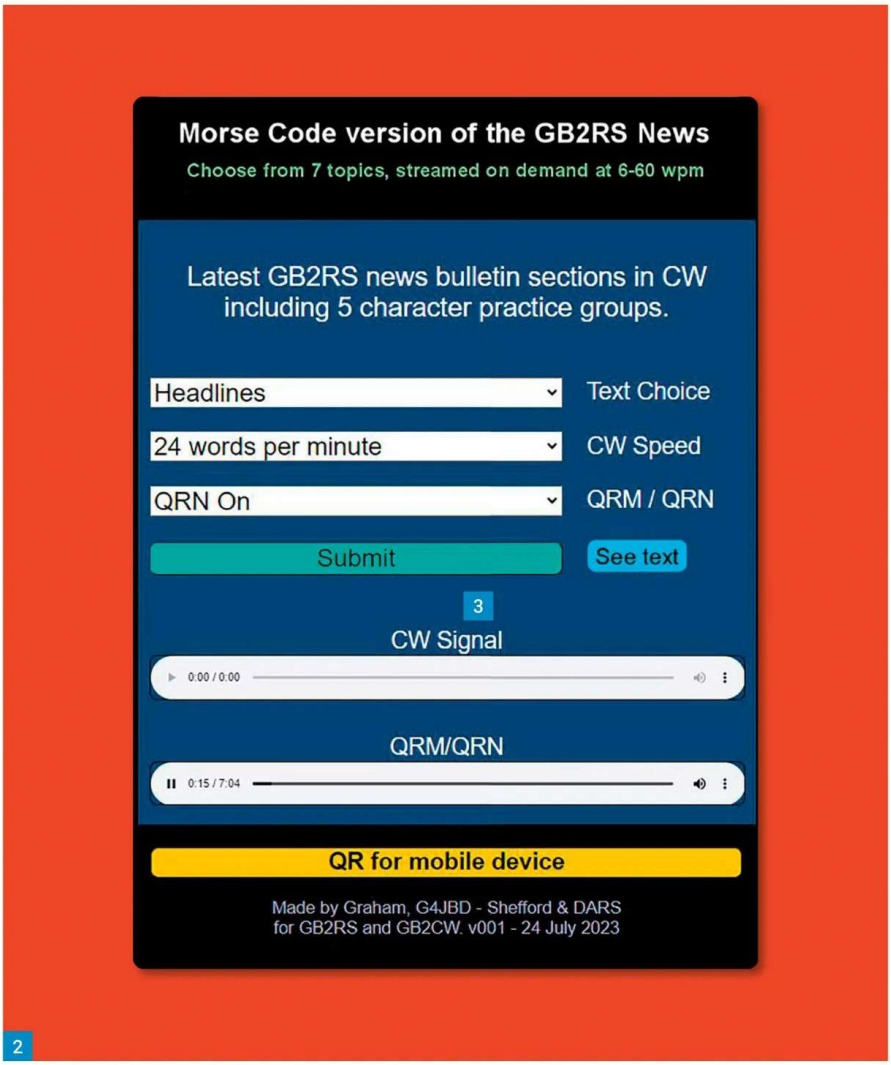
The availability on the RSGB website was announced on the GB2RS News so all you have to do is to click the link and start your practice session. You can also download it as an APP for local offline use.

If you get a chance, please check it out and do email Graham to (1) thank him for making it available in the first place, and (2) let him know if you have any suggestions for improvements.

This is much like that available on the ARRL website with the W1AW News Bulletins. However, I think the RSGB version is more versatile and user friendly. Check it out!

https://rsgb.org/main/gb2rs/gb2rs-in-morse

You are presented with the panel shown in **Fig. 2.** You can adjust the parameters to suit your needs and away you go!



Pile-up/contest procedures

There has been a varied discussion on procedures with regard to DXpedition pile-ups and also those relating to contests. There was a mixed bag concerning both and some were quite interesting.

I know this bit will attract **Gerald G3MCK**, so it will be interesting to hear his thoughts. I don't agree with all the developments, like leaving off a K at the end of a CQ for example. I guess that is because I am old school and do like to maintain a fairly standard form of operating.

This is one that I stick rigidly to: When I'm in ragchew mode, I send CQ no more than three times and my call no more than three times followed by 'K'. I also use 'DE' between callsigns and CQs and callsigns. Is it necessary? No. But, what's my hurry? It's not a contest. **Rob K6RB** said that and I agree.

However, in a contest I have shortened my 'run' call to CQ DE G3LDI and then I pause. I think most assume you are in the contest with that short call and accept it, having cut some of the dross out. The use of cut numbers is prevalent in the CWT sessions and one extreme is **Mark N5OT** who sends UAND for his membership number. That's fine if you are an experienced operator familiar with all cut numbers but a beginner might be perplexed by that. It's 2198 by the way. Even sending ENN can be off-putting for a newbie!

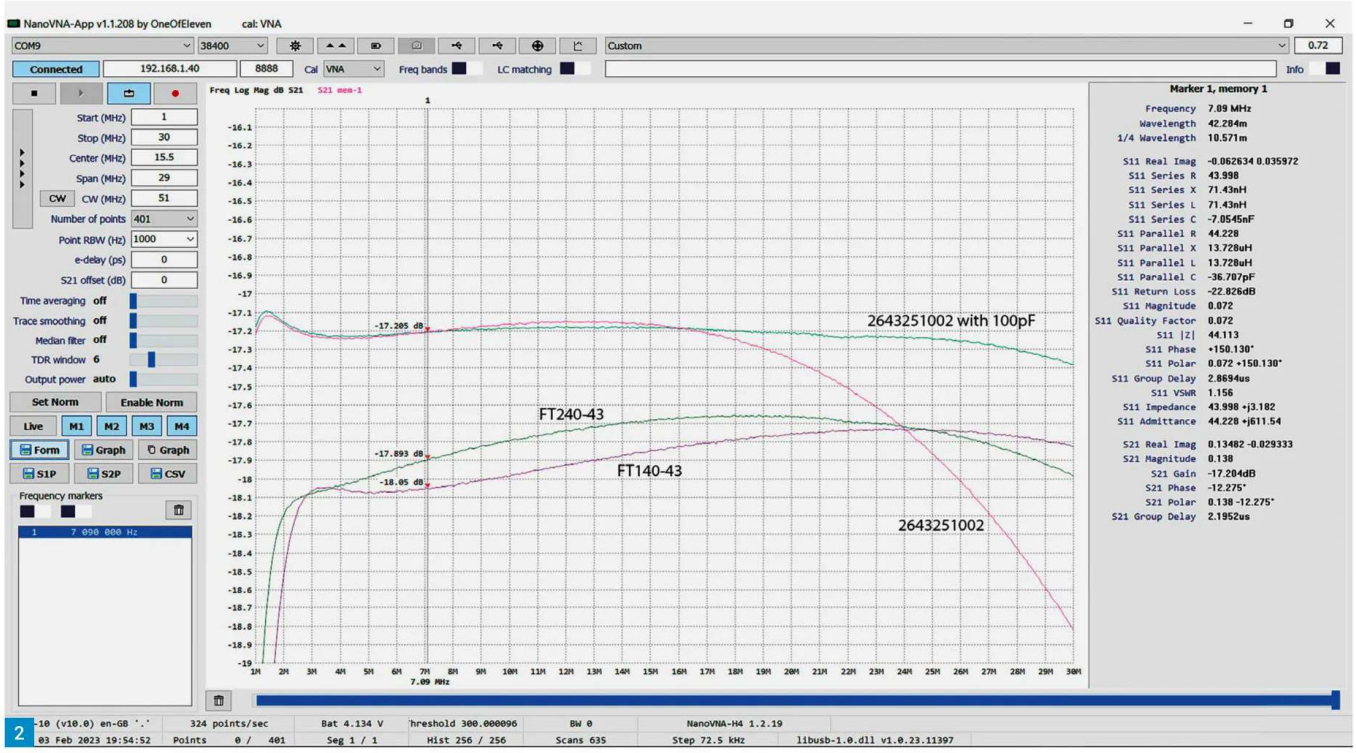
It's accepted practice when running with a pile-up calling to just send an acknowledgment (R TU) to a station and then stand by for another call. This is fine for two, possibly three QSOs, but continue that to more than five is poor in my opinion and I do not linger after the third one. Good operators ID after every QSO. It saves the usual '?' or 'CALL?' and leads to a good flow. It is impolite and unsportsmanlike anyway.

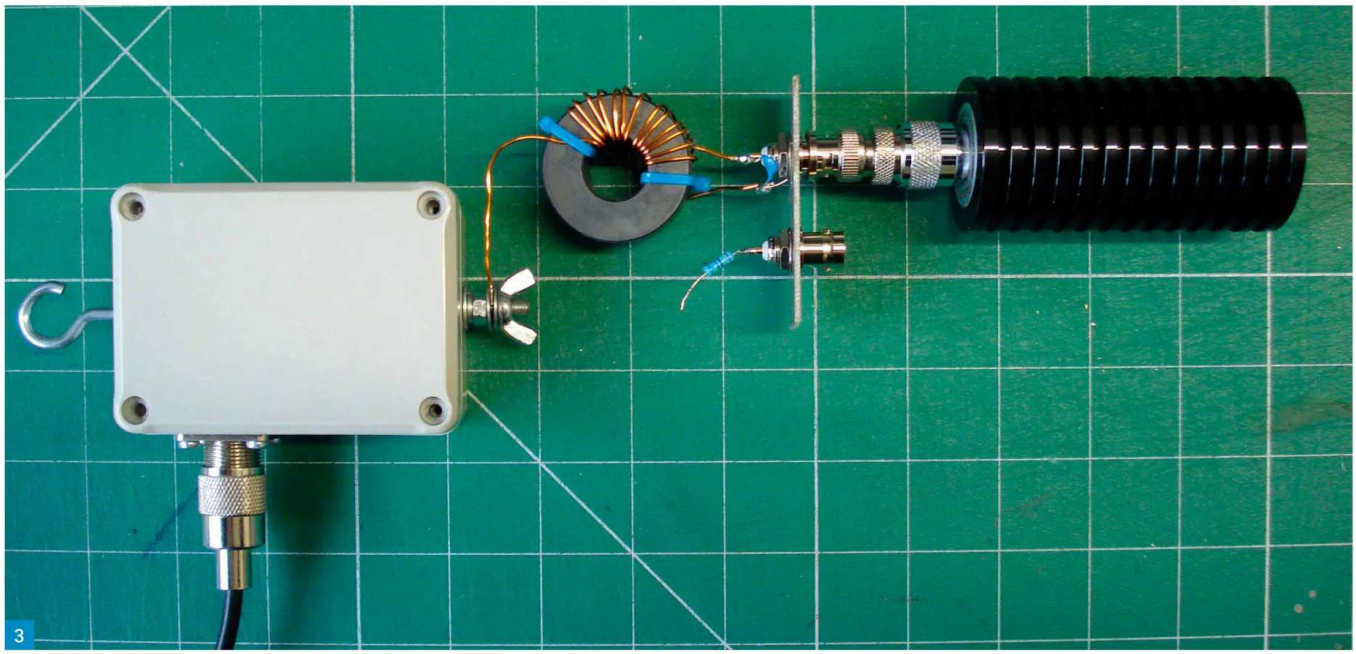
If you must wait three QSOs before sending ID, keep it regular by using the N1MM macro: F3 TU,{VARYMSG1&TU&TU G3LDI&3&}

One small saving of time I have found is that if somebody gets only part of my call, the full suffix, all I then send is G3. A lot of operators have caught on with that one, a neat way of saving time.

No doubt I shall receive some feedback on the above and your comments are, as usual, very welcome indeed.

Please send all your comments, offerings, information and especially pictures to: roger@g3ldi.co.uk 73 and may the Morse be with you! Roger G3LDI. **PW**





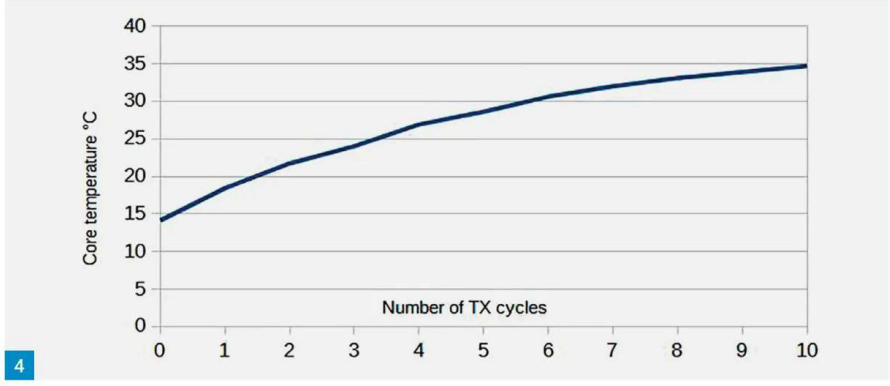


Fig. 1: The three types of toroid investigated.
Fig. 2: Measurements made using the NanoVNA.
Fig. 3: Test setup.
Fig. 4: Temperature readings with time.

Colin Redwood G6MXL
practicalwireless@warnersgroup.co.uk

Training courses

Colin Redwood G6MXL introduces readers to the various options for starting on or progressing with the amateur radio licence levels.

As the darker nights approach, many will be thinking of taking up a new hobby or developing an existing hobby. I thought it would be an idea to look at existing training providers for radio amateur exams in the UK.

Ofcom consultation

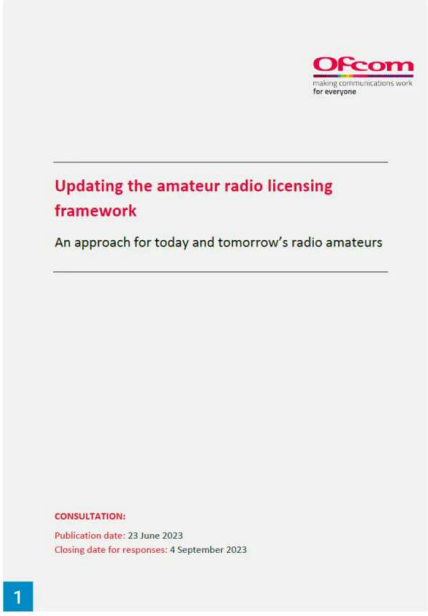
Now might be a very good time to get your licence. If the various changes to licence conditions proposed by Ofcom in their June 2023 consultation, **Fig. 1**, are implemented, the training community will need to update the exam syllabus, question banks, books and training materials for each of the exams etc., to reflect the new licence conditions:
https://tinyurl.com/3bdwkb6u

As might be expected, the main changes to exams are expected to be in the Licence Conditions part of the syllabus, with possible small changes to the Operating Practices and Safety parts of the syllabus where they are directly linked to Ofcom's proposed changes (e.g. power levels).

The RSGB exams team anticipate publishing a revised syllabus in late September/early October 2023, which will be based on the assumption that all Ofcom's proposed licence changes go ahead. The RSGB exams team will then review the questions in the exam question banks, removing, editing and replacing questions as necessary. Once Ofcom publish any final changes as a result of feedback to their proposals, the exams team will publish a final version of the syllabus (expected to be January 2024) and make any final changes to the question banks. If these time scales are met, then it is expected that the exam changes will be implemented in April 2024.

Essex Ham

Probably the best known of the online Foundation courses is Essex Ham, who have been running online training courses for those seeking to get a Foundation licence for many years. In addition to offering online training, they also provide a set of PowerPoint slides that other trainers can use to assist training candidates at local clubs. The online course is split into nine modules and typically runs for three weeks (although a 'fast track' option is available if you're in a rush). The course lets you study when it's suitable to you, there are no live lessons, and there is no need for a webcam. Each module contains a section-by-section breakdown of what you need to know for that module, and ends with a short quiz. Each module also has a full video, so you can watch and see demonstrations of how things work. You can take the modules whenever you want over the three weeks. Essex Ham recommends 1-2 hours of study per week at a time to suit you. You work in an online classroom with other students, and have the option to ask questions of the tutor and chat to other students. In common with many other courses there is an end of course mock test, to see if you're ready to sit the actual exam and to build your confidence by experiencing typical (but not actual) exam questions:
www.essexham.co.uk/train/foundation-online


Ofcom
making communications work for everyone

Updating the amateur radio licensing framework

An approach for today and tomorrow's radio amateurs

CONSULTATION:
Publication date: 23 June 2023
Closing date for responses: 4 September 2023

1

Billy McFarland

Occasional *PW* author **Billy McFarland GM6DX** provides an alternative to Essex Ham for Foundation training. The course is called 'Getting Tae Grips with the UK Foundation Licence'. The course materials include videos from a number of different sources. There are also five mock exams, which candidates can practice with. There is no charge for the course:
https://gm6dx.thinkific.com/courses/GTG-UKF

There is also an equivalent course for the Intermediate Licence called 'Getting Tae Grips with the UK Intermediate Licence'. Like the equivalent Foundation course, the course materials include videos from a number of different sources. There are nine mock exams available. According to the website, the course material will no longer be updated. If this remains the case, then it won't be updated to reflect any changes to the syllabus resulting from the current Ofcom consultation:
https://gm6dx.thinkific.com/courses/GTG-UKI

I think that both of the 'Getting Tae Grips' courses are excellent ways to supplement self-study of the RSGB books or to support training with any other provider. The range of mock exams I am sure will be welcomed by many candidates looking for additional practice.

OARC

The Online Amateur Radio Community (OARC) runs a fast-track online interactive Foundation course that typically takes place over four or five evenings during the space of two weeks! The course is free, but in common with other courses, you are expected to obtain and most importantly read an up-to-date copy of the Foundation course manual from the RSGB. You'll also need to download the EX207 reference booklet, which you can use in the exam.
www.oarc.uk/foundation

The Intermediate Course from OARC is a fast track online interactive course. It runs over 6-8 weeks lasting up to 90 minutes on Wednesday evenings.
www.oarc.uk/intermediate

OARC also run an intensive Full licence course, which they describe as a *"quite intense period of learning in order to pack in the full syllabus. You will only get out what you are prepared to put in"*. The course includes taking part in a weekly Zoom session with fellow learners, typically 1 x 1.5 hours (streams are available to candidates unable to attend), a number of activities or quizzes on the week's topics and regular chats on their Discord server (in the group's own chat channel), a weekly reading list of pages from your *Full Licence Manual* and additional support material, often in the form of YouTube videos, from a diverse range of sources. OARC offer ongoing support for two months+ after the course end date.
www.oarc.uk/full

Stevenage & District Club

Stevenage & District Club also runs Foundation and Intermediate training courses. These are run by **Bryan Harber G8DDK** over Zoom. The Foundation course consists of 4 x 2-hour sessions. The Intermediate course takes 8 x 2-hour sessions. For more details email **webmonkey@sadars.com**

First Q has to be calculated (or set its value) – same as before:

$$Q = f_c / BW = 700 / 140 = 5$$

Next step is scaling the unity gain normalised (and attenuated) filter model, (**Fig. 2.2**), to the required passband centre frequency f_c. The scaling means: divide and multiply component values according to R × C = constant to prevent frequency change.

The frequency scaling factor equals to the ratio of the filter's required centre frequency to 1 rad/s, that is practically equals the design frequency expressed in rad/s:

$$\omega = 2\pi \times f_c = 2\pi \times 700 = 4398 \quad [rad/s]$$

thus the scaling factor is SCF = 4398. Dividing the 1 F capacity by this factor results in:

$$C1 = C2 = 1F / SCF = 1/4398 = 2.274 \times 10^{-4} \quad [F] \quad 227.4\mu F$$

The resistor values - according to the unity gain model (**Fig. 2**) are a function of the Q (= 5):

$$R1 = 5, R2 = 0.102, R3 = 10, R4 = 10 \text{ [ohm]}$$

These are impractical values. Therefore, it is necessary to multiply the resistors with 10^4 (or with any other value) and divide the capacities with the same. We get, (**Fig. 3**):

$$R1 = 50k\Omega, R2 = 1.02k\Omega, R3 = 100k\Omega, R4 = 100k\Omega$$
$$\text{and } C = 22.74 \approx 22.7nF$$

So far so good, but we like to change the 22.74nF (non-standard value) capacitors to standard (or available) ones. In order to remain on the design centre frequency f_c, Q, and BW, the R × C product must not be changed!

Now, instead of 22.74nF, the intention is to use 10nF (for example). For re-scaling the capacitors, we should apply a different factor (MF, not 10^4 as above) both on resistors and capacitors. This factor is:

$$MF = 22.74 / 10 = 2.274$$

After multiplying the resistors and dividing the capacitors, the components become:

$$R1 = 50 \times 10^3 \times 2.274 = 113.7 \times 10^3 \quad 113.7k\Omega$$

$$R2 = 1.02 \times 10^3 \times 2.274 = 2.32 \times 10^3 \quad 2.32k\Omega$$

$$R3 = 100 \times 10^3 \times 2.274 = 227.4 \times 10^3 \quad 227.4k\Omega$$

$$R4 = R3$$

$$C = 22.74 / 2.274 = 10 \quad 10nF$$

These resistors are either listed in the E96 (1%) series (as 113kΩ; 2.32kΩ; 226kΩ) metal film ones, or combine some for the exact values.

Fig. 4 shows the filter circuit with the above calculated component values.

Note, the 'quick' and the 'norm and scale' calculations gave identical results. **PW**

(In Part 2 of this article the reader will see filters designed with above methods, built and evaluated using a PC-scope and sound generator. The method of measurements presented there could be used for checking the performance of other filters, amplifiers, and similar audio devices. See the references at the end of Part 2 of the article)

Fig. 1: The Ofcom consultation, published on 23 June 2023. Fig. 2: An Amateur Radio Foundation Licence Manual for Youngsters by John Hislop G7OHO. Fig. 3: An Amateur Radio Intermediate Licence Manual for Youngsters by John Hislop G7OHO.

Harwell

The Harwell club run Foundation and Intermediate courses over Zoom. Their next Foundation course takes place over the weekend of 2/3 December 2023. Their next Intermediate course takes place on four days 28/29 October and 18/19 November 2023.
www.g3pia.net/contact.php

Bath Based Distance Learning

The Bath Based Distance Learning (BBDL) team have an excellent reputation for their Intermediate and Full licence courses (they don't run Foundation courses).

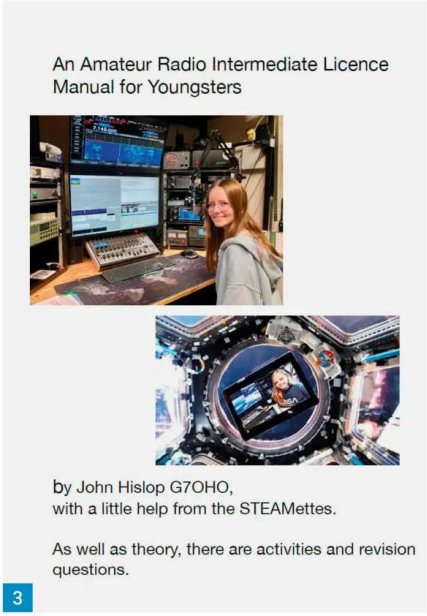
The Intermediate Licence course normally starts each January and runs to May. Enrolment takes place from mid-November to mid-December. All applicants must complete some work in a pre-course classroom to be eligible for a place on the course proper. This allows potential students to know that they can use the BBDL systems, and that the style of learning suits them. BBDL Intermediate training includes practical exercises using a multimeter to make measurements on some simple electronic circuits. The course includes live Zoom tutorials once a week. The recordings are shared for those who cannot make the live show.

The Full Licence course runs from the end of August to December each year. Enrolment runs from mid-June to mid-July. Unless they have completed the BBDL Intermediate course, all applicants must complete some work in a pre-course classroom to be eligible for a place on the course proper. This allows potential students to know that they can use the BBDL systems, and that the style of learning suits them. The course includes live Zoom tutorials once a week. The recordings are shared for those who cannot make the live show. The Bath group encourage those who passed the Intermediate exam before September 2019 to take their Intermediate course to bridge the gap between the old and new syllabus. This eases the step up to Full Licence training as it assumes you know the current Intermediate material. The contact is
Steve Hartley G0FUW:
g0fuw@tiscali.co.uk

Local clubs

A number of local clubs run classroom-based courses. Demand for these has dropped off post-pandemic due to the range of online courses now available. If you would prefer a classroom-based course, then I'd suggest contacting your local club. Some will only run a course if there are sufficient candidates to cover the cost of room hire. Even if they don't run a course themselves, they may know of another local club running courses.

2



3

John Hislop

Last year **John Hislop G7OHO** made available his excellent Foundation Book to download free of charge, **Fig. 2**. It was written for the girls in his school's STEM club. They feature a lot in the manual because they have done many of the activities. It is full of practical examples that help understanding. John has put a lot of thought into the sequence of topics. For example, the section on licence conditions comes towards the end, after the technical topics. By doing this the various terms used in the schedule (such as frequencies, powers, modes) are familiar terms, and not something abstract. I find this a very refreshing approach to training. Even if you are studying elsewhere, this book could be a useful supplement to help understanding a particular topic.
https://tinyurl.com/3thjmr38

More recently John has produced a similar book, again free of change to download, aimed at those working towards their Intermediate Exam, **Fig. 3**. The practical examples are just as good as in his Foundation book. In one example he suggests placing some marshmallows in a microwave oven, without the rotating table. After operating the microwave for a short period of time, the practical suggests measuring the distance between the marshmallows that haven't melted – which is half the wavelength of the microwaves in the oven.
https://g0hrs.org/Manuals/IntBookPDF.pdf

RSGB books

The RSGB books (there are separate books for Foundation, Intermediate and Full) should be mandatory reading for anyone working towards their licence exams. There is also an Exams Secrets book, which covers some of the more complex topics in a bit more depth and contains mock papers for each syllabus item. Make sure that you buy the most up-to-date version so that it includes the latest version of the syllabus. This will become particularly important with upcoming changes to the syllabus following Ofcom's proposed changes to licence conditions.

Direct to Full

In addition to the well-established Foundation, Intermediate and Full licence exams, which are taken in sequence, the RSGB have also introduced a new Direct-to-Full exam. This alternative route into the hobby is aimed primarily at those who already have a technical background or who are currently studying or have previously studied relevant science, technology, engineering and maths (STEM) subjects at A–Level or higher. In common with the current three-level exams, there are no mandatory practical requirements (no Morse assessments, construction or actual operating).

The new Direct-to-Full exam will also be an option for those who have already passed their Foundation or Foundation and Intermediate exams. The new exam does *not* replace the current Foundation, Intermediate and Full exams, and there are *no* plans to drop them. The RSGB have not produced any new training books for this way of obtaining a full licence, but instead recommend studying the three existing books. **PW**

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

Keith Rawlings G4MIU
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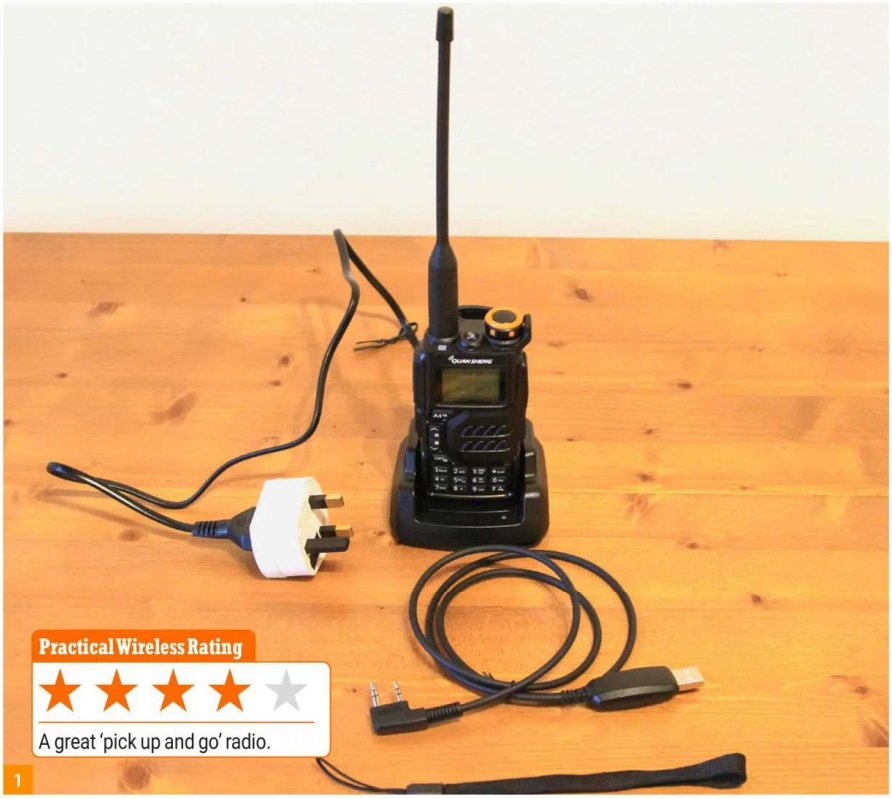

1

The Quansheng UV-K5

Keith Rawlings G4MIU reviews a bargain 2m/70cm handheld from China.

The UV-K5 is a 2m/70cm dual-band handheld with up to 5W RF output and wideband receive, including air band and broadcast FM. This set, **Fig. 1**, came with a drop in charger, fused (19 x 5mm 1A) two-pin/UK 13A adaptor, battery, antenna programming lead wrist strap and user manual.

With dimensions of 115 x 60 x 37mm and weighing around 230g with battery fitted the radio has a stylish design and fits comfortably in the hand, **Fig. 2**.

The front of the radio is pretty much standard for a handheld housing the display, keypad, speaker and microphone. The left-hand side houses the PTT and two programmable 'function' buttons and the right-hand side the speaker/microphone connectors and a USB C secondary charging socket. The 1600mAh battery covers the whole of the rear of the set, with the top housing the reverse SMA antenna connection, signal/programming LED and large On/Off volume control.

Features

Like most modern radios the UV-K5 has a lot of features:

- It may be operated in dual Watch mode VV+UU+VU.
- There are 200 memory channels available plus 20 FM broadcast band channels.
- Three power output levels are provided – High, Medium, and Low.
- DTMF, CTCSS and DCS tones are supported plus tone scan facility to search for received tones.
- UV-K5 radios may be easily 'cloned' by linking with each other 'over the air' such as on the 70cm band.
- NOAA weather channel scanning (no use in the UK) and Voice Announcement.

In use

The radio is simple and intuitive to use and it is possible to easily operate the radio one handed by using a thumb to press the buttons, all of which have a positive action. Frequency may be directly entered from the main keypad, which has a number of secondary functions selected by the 'F' key. The large orange rimmed volume control stands out, it is free turning with little friction, so easily moved especially when in a pocket.

The set has plenty of receive audio output although this can sound 'tinny' especially with the volume set to a moderate level. VHF air-band reception is disappointing, stronger signals suffer from distortion such that I believe there may be an AGC issue with the radio. In the military air-band, the set will receive NFM only. On broadcast WFM reception is good although understandably 'Lo-fi'. Reception is interrupted if a signal is received on one of the main bands, which then takes priority.

Battery life seemed good although I always topped up after use by utilising the drop-in charger.

The manual tells you much of what you need to know but is not up to Yaesu/Icom standard and takes a bit of interpretation.

Transmit audio quality was found to be good and the receiver sensitivity is excellent.

One morning I had a good Q5 QSO on 70cm, handheld to handheld with **Ben M3EUO** over a distance of 2km+, **Fig. 3**, while I walked along country footpaths. The same route on 2m was not quite as good, this I put down to lower efficiency of the handie antennas.

PC programming

While the radio may be programmed manually from the menu this is tedious and is more easily done via the free PC Programming software. The radio may be configured, memories programmed, CTCSS tones set, repeater shifts entered, power levels, channel names set and so forth. Configurations may be saved for later retrieval. The radio has to be switched on before the Baoefeng style cable is inserted. I noted that the radio still operates while the programming lead is connected and the blue LED illuminated. The software, **Fig. 4**, is simple to use and makes programming very easy.

Performance tests

I casually ran some performance tests on the radio and results may be seen in **Table 1**. The manual specifies sensitivity in dBm for 12dB, SINAD which I have emulated. RF power output was measured with a Bird 43 so will be ±5%. Sensitivity was checked using a Marconi 2019A and Sinadder Linear B SINAD meter. Harmonics were monitored on an HP 8559 spectrum analyser and frequency on a Racal Dana 9915 frequency meter, the latter locked to a precision reference signal.

Allowing for measurement uncertainties the set was found to be close to published figures. The level of transmitter harmonics, however, could be better.

Conclusions

The UV-K5 is a sturdy handheld, which is well made, compact and generally works well. It is a great 'pick-up-and-go' radio and fun to use.

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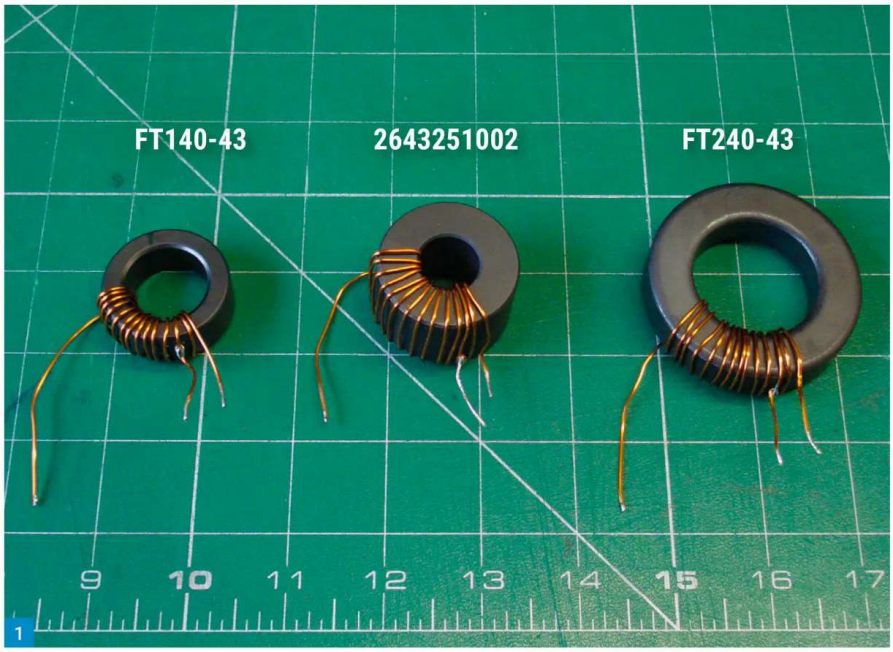


1

Building an UNUN for an EFHW Antenna

Mike Dunstan G8GYW explains how to build your own UNUN for an end-fed half-wave antenna.

The EFHW is a versatile multiband HF antenna, easy to erect for /P operation and useful as a base station antenna for a QTH with a small garden.

The EFHW is an extreme form of off-centre-fed dipole. The feedpoint impedance near the end of the wire is in the region of 2000 to 4000 ohms so an unbalanced-to-unbalanced transformer (unun) is needed to match it to 50Ω coaxial feeder. The quality of the unun is vital to the antenna's performance and although they can be bought off the shelf it is not always possible to determine the quality of components used. These are not difficult to make and by carefully selecting the right components you will get the best out of your antenna.

A common transformer ratio is 49:1 (64:1 can also be used) and a popular toroid is the FT240-43. However, this is not necessarily the best or most efficient as I will demonstrate. Also, most designs use a twisted coupled primary winding and a crossover turn but I have seen no evidence that this arrangement performs any better than a conventional autotransformer, which is easier to make. For a 49:1 impedance transformation simply wind 14 turns on the core with a tap two turns up from ground.

Which Toroid?

To establish the best toroid to use I made 49:1 ununs with three different Fair-Rite type 43 cores, 5943002701 (FT140-43), 5943003801 (FT240-43) and 2643251002, **Fig. 1**. The latter appears to be an unusual choice because it is marketed as a cable core but its performance is surprisingly good in this application. I made up a jig to connect the unun to a NanoVNA. The primary of the unun connects to the S11 port and the secondary to S21 via a resistance of 2400Ω. The latter in combination with the NanoVNA's 50Ω input impedance presents the unun with a load of 2450Ω, which it transforms to 50Ω at its input.

The NanoVNA was connected to a laptop running NanoVNA-App, and S11 Magnitude (Γ) and S21 Gain were recorded for each of the three cores, **Fig. 2**. The 2643251002 has considerably less loss than the other two cores, and although it rolls off above 17MHz this can be corrected by fitting a 100pF capacitor across the primary, Fig. 2 again. The capacitor, which can be silver mica or ceramic, needs a voltage rating appropriate to the transmitter power. 1kV or higher should be adequate.

The 2400Ω resistance forms a potential divider with the 50Ω input impedance of the NanoVNA leading to a loss of 10log(2400+50)/50 = 16.9dB (for best accuracy these values should be measured).

Now we have enough information to calculate the transformer loss and efficiency:

Mismatch Loss = $-10\log(1-\Gamma^2)$

Transformer loss = |S21| – 16.9 – mismatch loss

Transformer efficiency = 10^(–loss/10)

The results for each of the three different cores at 7.1MHz are given in **Table 1**.

As the cores are all type 43 material it is clear that the form factor has a big influence on efficiency. The small size of the FT140-43 makes it ideal for QRP operation, while the much larger FT240-43 is used for high power applications and data modes, especially if two or more cores are glued together.

So how can we make use of the superior efficiency of the 2643251002 core? Well, the average power equivalent of compressed SSB is approximately 10dB lower than PEP [1], which is 40W for a 400W output. With an efficiency of 94%, just 6% of the average input power (i.e. 2.4W) will be lost to the core.

To confirm the core's suitability for this power level I built a second identical transformer and connected the secondaries together. The primary of the unun being tested was connected to a 40W CW source and the output of the second transformer was terminated with a suitable 50Ω load, **Fig. 3**. To simulate an SSB QSO I transmitted 10 cycles of two minutes on and two minutes off with the lid of the enclosure fitted then used a thermocouple thermometer to take a temperature reading of the core, **Fig. 4**. Once the antenna is deployed a good way to tell if you are overheating the core is to monitor the VSWR during long periods of transmit. If it starts to increase, then the core is too small for the power level.

The 2643251002 core is available to buy from a number of UK stockists, including Mouser and Digikey.

Reference

[1] **https://owenduffy.net/blog/?p=15081**

Core Type	Core volume (in3)	Transformer Loss (dB)	Efficiency (%)
FT140-43	0.45	0.95	80.42
2643251002	1.33	0.24	94.56
FT240-43	1.49	0.87	81.83

Table 1: Results by core type.

Fig. 1: The DAB channels in use in Europe although the UK uses only seventeen of them.
Fig. 2: The best online resource that I have found to predict lifts in propagation.
Fig. 3: The Pi3B with the TFT installed before being put in the enclosure.
Fig. 4: One of many SDRs available. I have used this model for many years with good results.
Fig. 5: Selecting any of the parameters opens a numeric keypad to enter new settings.
Fig. 6: This DAB multiplex is a good indicator that the scanner is working correctly.
Fig. 7: This multiplex propagated 200km and shows that additional smoothing of the SDR samples is required for a more defined spectrum.
Fig. 8: QT-DAB, a decoder and analyzer program, provided the TII code to identify the transmitter site.

I purchased an alternative from Amazon that included a case for £27.00. There was a risk using another TFT screen because forum posts indicated that users using other manufacturers' equivalent units had experienced many issues.

The construction of the Pi 3B+, **Fig. 3**, with its main GPIO connector meant the addition of the TFT screen covered the general I/O pins (GPIO). Once the case is added then the GPIO pins are not accessible other than by modifying the case.

There is a link to a PDF copy of the installation instructions on this web page:
https://tinyurl.com/2p8c2bj7

I followed the instructions carefully and I had no problem with downloading and installing the various software libraries. On launch the main program (freqshow.py) crashed and I eventually worked out that I called the program using an old version (the default set on the Pi 3B) of the Python interpreter.

RTL-SDR scanner

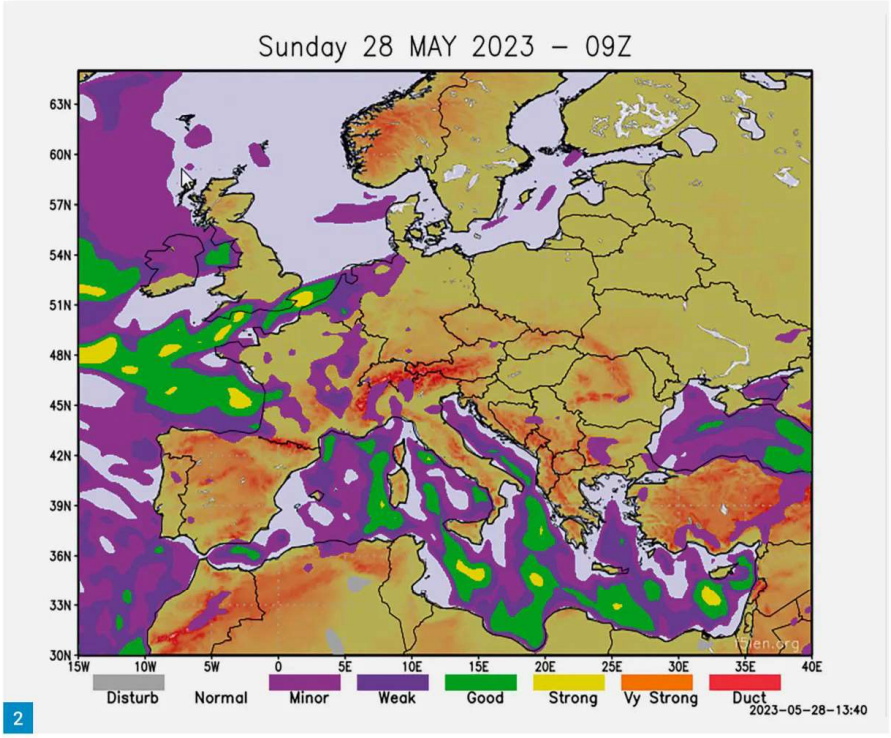
The system is called a scanner but after getting it working I found that it provided a 2.4MHz wide view of the frequency spectrum or a waterfall display centred on a default frequency of 90.3MHz. The program does not decode the signals so there is no RDS, DAB multiplex ID or audio output and is simply a display device.

Even though I had a display of the spectrum of the default frequency of 90.3MHz I couldn't access the configuration using the touchscreen or the mouse. It took a while to find the quite simple answer to this problem and I should have spotted it sooner. For the record the mouse was disabled in the code!

I found that both the TFT and the HDMI screen showed the spectrum simultaneously although the screen size was set by the TFT driver.

Receiver

My receiver is an NESDR Mini 2 SDR using the 2832U/R820T2 chip combination manufactured



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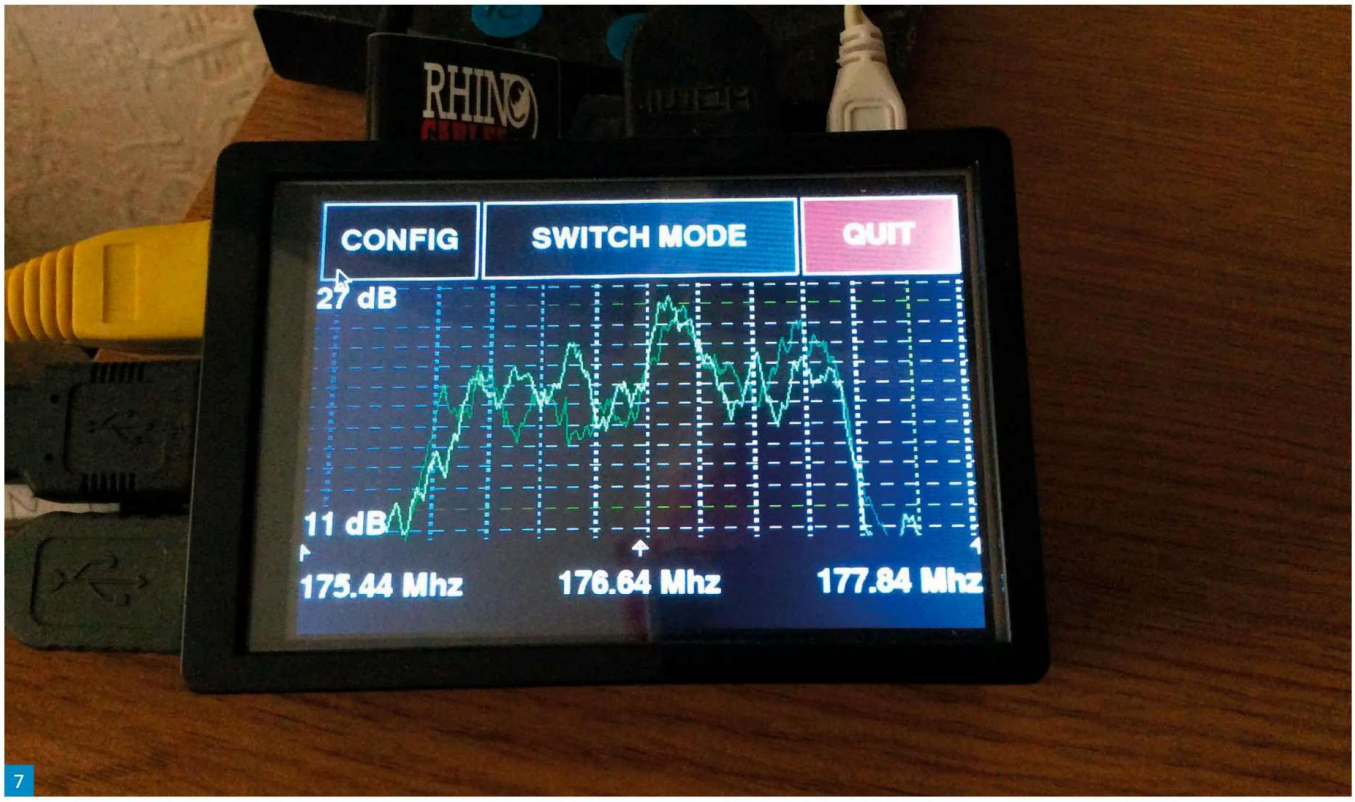

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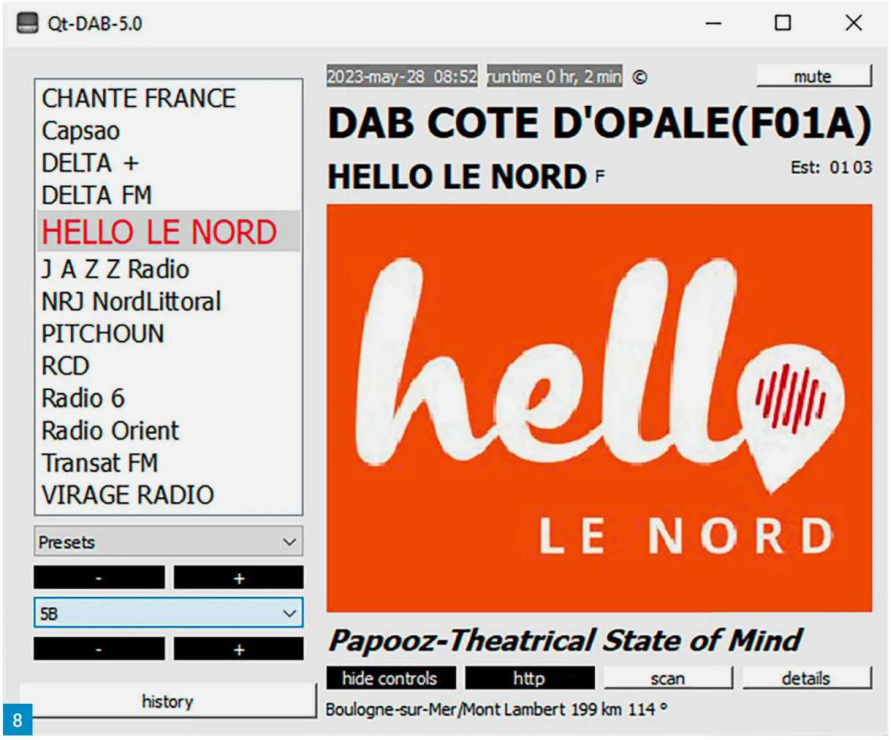

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The Winchester multiplex is also detectable on 206.352MHz (9C). A DAB signal has a characteristic flat-topped shape with sharply defined shoulders as laid out in its specification.

Device in action

I use a tropospheric propagation forecast website to alert me to a potential lift in VHF propagation and it indicated good conditions for the Bank Holiday weekend at the end of May. A manual scan of the lower channels (5A – 5D) on a DAB radio showing activity on 5A and 5B.

My DAB band-scanner showed possible DAB signals on several channels with the most definite on 176.640MHz (5B), **Fig. 7**. This turned out to be the Cote D'Opale multiplex, the local service for the Calais region. I then used QT-DAB for the PC to view the stations in the multiplex, **Fig. 8**, and the transmitter site was Boulogne-sur-Mer some 199km away. There was a second French multiplex on 188.928MHz (7A) that was weaker but was from Valenciennes about 75km further inland.

The only other European activity was from Belgium with DAB+ Vlaanderen 2 on 174.928MHz (5A) and Bruxelles 2 BXL-BW2 on 187.072MHz (6D). Aldershot and London trial multiplexes to the south of my location came in with enhanced signal levels.

Other channels had possible DAB activity but they didn't resolve to decodable multiplexes on either QT-DAB or my DAB receiver. The lift lasted about an hour.

Scanner settings

I had decided to set the gain to 35dB, minimum display level to 6dB and maximum display level to 30dB. In practice, I found that leaving the receiver gain, max and min display levels on Auto worked well in highlighting possible DAB activity. .

Future developments

I've learned the basics of Python and I would like to produce an even smoother looking display to make DAB signals stand out even more. It would also be of interest to store the signal samples in a database and review or play them back to see how long the lift lasted and whether other multiplexes had propagated briefly but weren't spotted by me. **PW**

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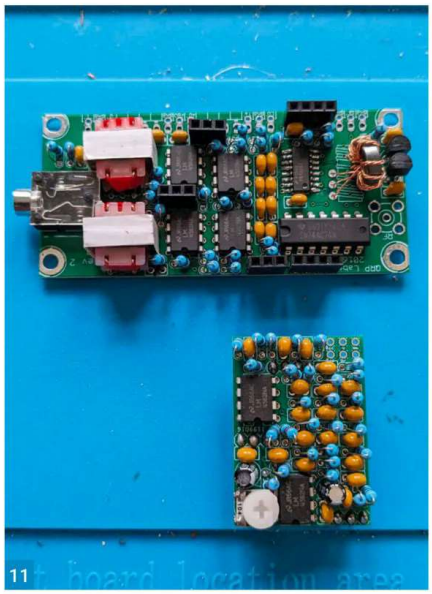
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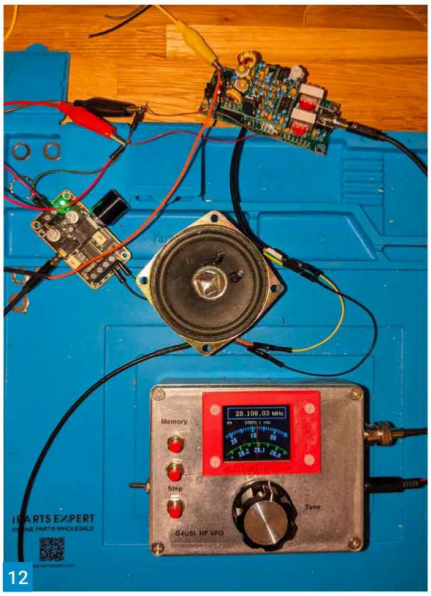
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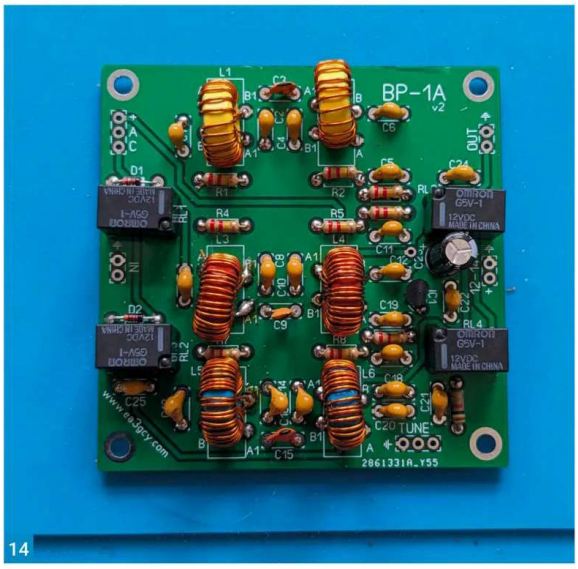

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peak, whereupon you are in the right position. If you tune the receiver too far, then you obviously need to re-tune the BPF. As alluded to earlier, this is not a problem during the day, but at night on a DC receiver, you can turn the potentiometer and hear BC stations all across the range!

In first use I was disappointed as I felt it was not effective at preventing BC breakthrough. However, with further experimentation I found the filter control to be much sharper than I had realised in daytime use. If you persevere you can notch out the breakthrough. That is where tuning the receiver to the FT8 frequency of the desired band helps, as you can really narrow down tuning the BPF on that to exclude the BC stations and listen to amateurs. If you wish, you could make a scale for the tuning control and mark the relevant positions for each band for ease of use later. Overall, I am really pleased with it, it is a convenient way of simply and easily achieving BP filtering for your frequency of choice. Placing the filter across the NanoVNA showed some very nice skirts across the whole range and it seems a shame the kit has been discontinued. I am just glad I got mine when I did. That said, there are still plenty of other BPF filter options out there if you go searching, but this was the only continuously variable one I found.

Otherideas

Although the Super Sudden receiver is out of stock, you may wish to take a look at the simpler Limerick Sudden Receiver kit from the G-QRP Club, who sell the kit to members for £40. This receiver can be built for any single amateur band from 160 – 20m and for the same price there are also matching transmitters and an ATU. Walford Electronics also offer a range of receiver kits, from simple DC to superhets, and are worth a look. For example, the simple DC Stathe receiver can be built for 80, 40 or 20m and costs £31.

I hope you have found this month's article interesting and that it inspires you to build your own relatively cheap but effective receiver – perhaps to complement the transmitter you built following my last instalment. Until next time – have fun and 73. **PW**

15

1

DAB band scanner

Kevin Ryan codes up an SDR dongle to scan the DAB frequencies for band openings.

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I bought a Raspberry Pi 3B+, a cheap one board computer that runs a tailored version of an operating system called Linux (the Ubuntu implementation) now called Raspberry Pi OS (originally Raspbian) to use for radio projects. I used the Pi 3B+ as a DAB receiver (*RadioUser* March 2021) that worked but was harder to use than a radio.

I've written in *RadioUser* July 2022 about wanting a compact detector to alert me to DAB signals coming in from Western Europe. An article in the MagPi magazine mentioned a radio scanner project for the Raspberry and it looked like a possible solution.

From experience I knew that there is no single DAB channel that could serve as an alert to a 'tropo' lift and any solution would have to either display a number of channels simultaneously or scan a range of frequencies.

DAB channels

The VHF Band is from 30 to 300MHz. In addition to the FM bands broadcasting, mainly DAB but still some TV, is allocated the frequencies from 174 - 230MHz, the old TV Band III. This 56MHz is divided into eight 7MHz channels (from channel 5 to channel 12) and each 7MHz channel is sub-divided into four 1.7MHz channels (from A to D) as shown in **Fig. 1**. A few countries (e.g. Norway and Denmark) also use DAB channel 13, which is the 10MHz from 230 - 240MHz divided into six 1.7MHz blocks, 13A to 13F.

In the UK land mobile services have exclusive access to 12MHz out of 56MHz available. Ofcom in its 2020 plan made six frequency 'blocks' (7D, 8A, 8B, 9A, 9B, 9C) available for small scale DAB multiplexes. This is in addition to blocks 10B to 12D currently used by existing local and national radio multiplex services.

DAB propagation anomalies

DAB DX typically happens with a high-pressure weather system that produces a temperature inversion in the troposphere. An inversion is where air sinks and warms trapping cooler air nearer the surface. The effect of these inversion layers is to create a partially reflecting layer. In addition to the usual direct and ground reflected signals there are now additional paths between the transmitter and receiver for both the direct and the ground reflected signals.

Inversion layers may occur at many heights in the troposphere and the effect varies continuously throughout the duration of the event. The maximum range of a signal reflected from the layer is around 300km where signals reflect off an inversion layer/ground/inversion layer.

Ducting and bending

High pressure or anticyclonic conditions can also create other ways for signals to propagate further. This phenomenon is more likely over sea paths rather than over land. When there is a sharp thermal contrast (high refractive index) in the atmosphere radio waves are refracted more than usual and travel further in a phenomenon called tropospheric bending, sometimes travelling up to 800km. Akin to this is tropospheric ducting where signals can travel up to 1,300km or more.

Some sources treat inversion layer propagation, bending and ducting as the same phenomenon but I think they are quite different. Band III signals can also be propagated further than usual during exceptional Sporadic E (E_s) conditions but needs a highly ionised cloud to make this happen and is pretty rare.

Predicting events

Both ducting and the creation of inversion layers happen with high pressure weather because the air is still and layers can form. Low pressure weather systems stir up the atmosphere too much. Over land paths there is little difference between summer and winter but the best times to catch this phenomenon is early morning and late evening during summer because daytime rises in temperature cause air turbulence that breaks down layer formation.

I use the website below as a guide (**Fig. 2**) to when there might be a lift in propagation but it is just a forecast and I combine it with surface pressure charts from the Met Office. I look for a high-pressure system positioned over both the British Isles and Europe. Again, this is just a guide and nothing may happen.

http://tropo.f5len.org/forecasts-for-europe

Freq show

The program I found online is titled 'Freq Show: Raspberry Pi RTL-SDR Scanner' and the main Python module is named freqshow.py, 'py' being the file extension for programs written in the Python coding language.

Tony DiCola wrote the original version of Freq Show for a Raspberry Pi 3B and an RTL-SDR receiver in 2014 using the Python programming language. The project is hosted online by Adafruit Industries that creates unique and fun DIY electronics and kits. Freq Show is referenced in their forum but is not classed as an active project.

https://www.adafruit.com
https://tinyurl.com/4jt94wka

System setup

The installation information is available on the Adafruit website. The hardware section is short but has some valuable information on the kit needed. I had everything but the 3.5in TFT screen and the recommended unit was unavailable.

So, $36 brought me the receiver module, the polyphase module and a single 40m BPF to enable a complete receiver to be built, minus the required VFO, **Photo 10**.

Once again, QRP Labs instructions are very detailed and clear and this helped build what were two very crowded PCBs. There is a need to solder a single SMD chip onto the receiver board, but this was not too difficult with a fine tip and fine solder, plus magnifying glasses. Density of through-hole components is very high and care must be taken to avoid unintended solder bridges.

The kits took a few hours to build and check and **Photo 11** shows the completed boards.

I finally got around to connecting all the required parts together just two days before the deadline for this article, so it was very much a lash-up at the time of writing. In **Photo 12** you can see this temporary test arrangement. At top right is the receiver with Polyphase kit and 40m BPF plugged in, underneath that is a loudspeaker and my homebrew VFO, and to the left of the loudspeaker is an audio amplifier module. You may see that the VFO is tuned to the 28MHz band. This is because the receiver requires a Local Oscillator input of four times the receive frequency, as I mentioned earlier, so I was actually tuning 40m!

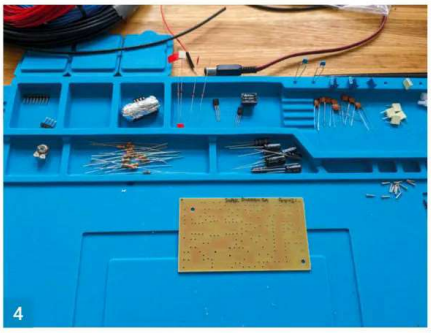
I first powered it up at 10pm local time and was pleased to see that the BPF performed well and there was no Broadcast Station breakthrough at all. Tuning through the band I could plainly hear plenty of CW, SSB and once into the Broadcast Bands, commercial stations, all of which could be resolved. There was no audio filtering so the front end was pretty wide open and my next job is to add the SotaBeams Laser Filter, which will allow me to switch between SSB and CW bandwidths, and I am looking forward to testing that in the next couple of days. Finally, I need to build the Band Pass Filters for the other HF bands and add them to a relay switching board.

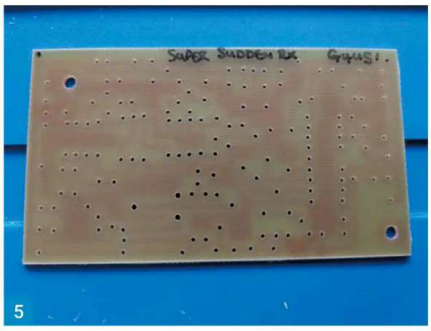
Long term

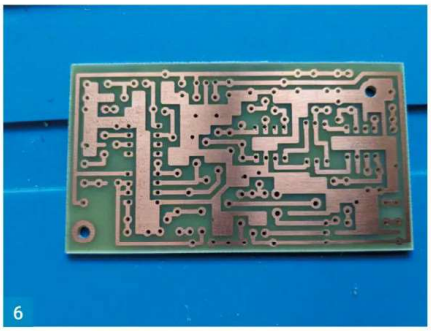
My long-term plan is to consolidate these modules into my homebrew HF CW transmitter by adding a second clock output on the Si5351 VFO for the receiver, giving me a 160 – 20m transceiver.

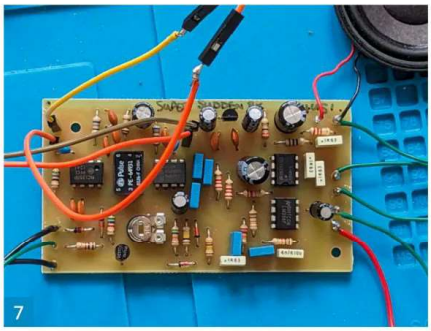
Overall, I am pleased with each of these receivers, they are all very different but effective in their own way. There is no doubt that the QRP labs kit with the Polyphase board is the best receiver of the lot, but it is also the most complex in design and to build. I look forward to keeping and using them all. Performance aside – the most fun is the tiny Little Roo because it is small, self-contained, novel, but also effective – great for a first receiver project.

Finally, let us take a look at something any effective receiver needs – some form of band pass filter.









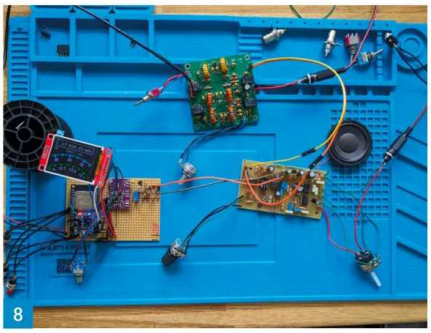


Photo 1: Little Roo parts. Photo 2: The completed Little Roo for the CW end of 40m. Photo 3: Completed and boxed Little Roo. Photo 4: Super Sudden parts. Photo 5: Super Sudden PCB, topside. Photo 6: Super Sudden PCB, copper side. Photo 7: Completed Super Sudden PCB. Photo 8: The Arduino VFO, adjustable BPF and Super Sudden receiver. Photo 9: The boxed Super Sudden (right) with boxed VFO and BPF. Photo 10: QRP Labs receiver and polyphase kits. Photo 11: The completed receiver and polyphase modules. Photo 12: The receiver 'lash up'. Photo 13: The BP-1a BPF kit. Photo 14: The completed BP-1a. Photo 15: The completed and boxed BP-1a.

QRP Ham Radio Kits BP-1a

The **QRP Ham Radio Kits BP-1a** continuously adjustable BPF kit is my final receiver build of this article, **Photo 13**. The company is run by a Spanish amateur who offers a range of kits, including several transceivers. The kit cost me around 45 Euros delivered, and it arrived and was built a month prior to writing this article. Last night I went back onto their website to check some information for this item, only to find they have discontinued the kit sadly.

In any event the kit is designed to cover 3.5 – 30MHz in three ranges. Switching between the three ranges is done by relays and these can be activated by either a three-way SPST toggle switch, or you could use a microcontroller if building as part of a rig, to automate range switching by band change. I may choose to build this into the same unit as a transceiver I am building, in which case I will use the Arduino to switch, but in the meantime I used a toggle switch and housed it in a plywood box I made on my laser engraver/cutter.

Photo 14 shows the completed PCB and **Photo 15** shows the boxed unit. On first test it was apparent that the middle range, covering about 6-10MHz was not working at all as intended. I double checked component placing, my toroid windings and continuity and the decided to check each capacitor using my capacitance meter. Lo and behold I found two capacitors that were marked as the value shown in the instructions but were way off that value. Replacing them fixed the mid-range nicely.

In use, you select the relevant range required and slowly turn the potentiometer for a noise

4

by NooElec, **Fig. 4**. This model has an MCX (micro coaxial connector) input. I found an mcx-TV adapter and then added a TV-F connector for ease of use.

https://tinyurl.com/2p8f854j

Any RTLSDR device should work with this software.

Program components

Freq Show comprises five modules – freqshow.py (main application and configuration), controller.py (controls the movement between views), model.py (sets the RTLSDR parameters and processes the samples returned by the SDR), views.py (creates the spectrogram and waterfall displays) and ui.py (sets up the soft keypad).

Configuration

The settings are accessed by the soft keyboard, **Fig. 5**, which lets you change the centre frequency, sample rate, gain and the minimum and maximum levels displayed on the screen. The Switch Mode button changes the display from the spectrum to the waterfall. The default settings are all AUTO and the screen dynamically adjusts itself to each signal.

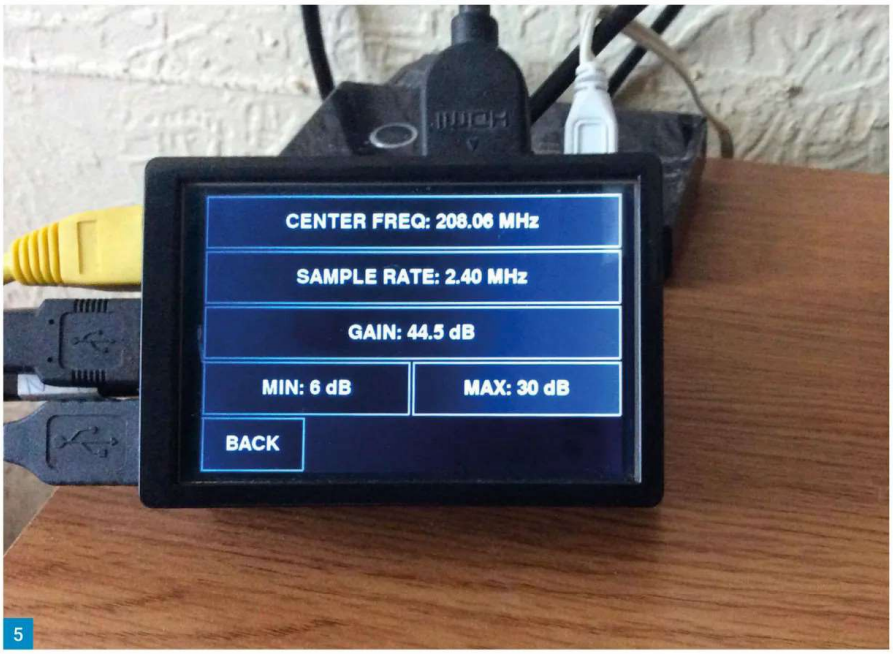
Other versions

To my way of thinking Freq Show was not exactly the band-scanner that I needed and I searched again for a modified version. I found one by WQ7T titled a 'panadapter' that had many more controls but displays just 30kHz of spectrum rather than the original 2.4MHz. This restricted view is likely useful for a detailed look at some signals but not for DAB.

R Grokett added a modification to the original version that added grid lines to the display and a smoother display of the signal peaks. This display uses functions in the SciPy (Scientific Python) library and in my opinion is better for identifying a DAB broadcast than the original.

The only other version I found was a University project by **Derek Aubin** that was much more than I needed but included a frequency scanner. The author didn't provide source code listings but included the print-outs for his additional Python modules as part of his PDF paper for his university coursework.

I spent quite some time trying to get the whole thing to work but couldn't set up the alternative database. I also encountered many errors generated by unavailable modules discontinued over the previous nine years and when combined with my lack of experience working with Python each solution became time-consuming.



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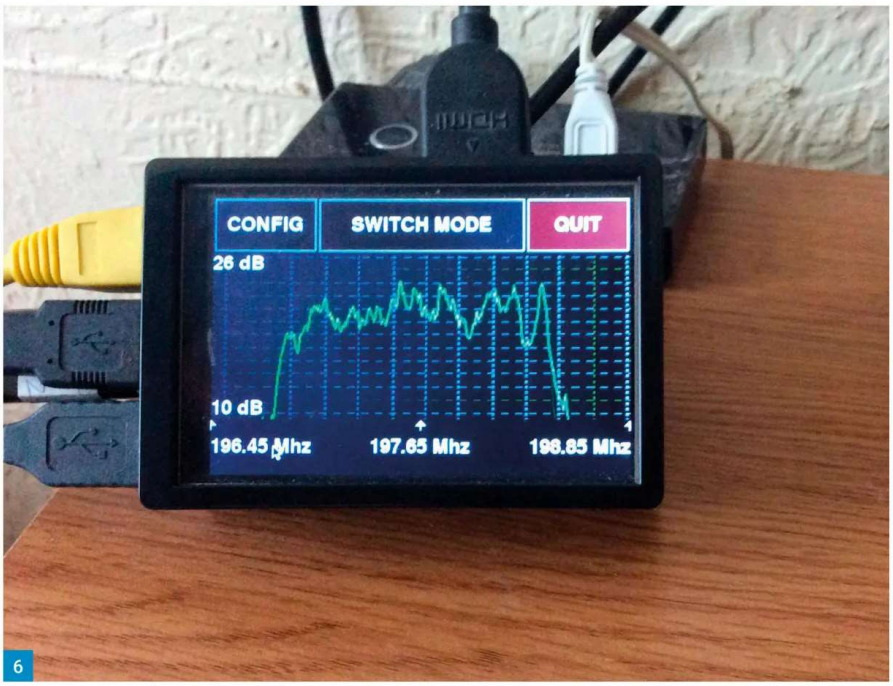


6

My version

First of all my version is a simple band-scanner that steps through a list of frequencies defined in the main module. The frequencies are stored in lists amalgamated into a single scan list making it possible to scan any frequencies supported by the RTL-SDR. With the correct antenna any range of frequencies can be scanned.

This basic system is just a visual alarm that there is activity on a portion of Band III not used in the UK. Once I think distant signals are propagating I plan to use a commercial DAB receiver or a DAB decoder app on a PC to carry out a full scan and start identifying the multiplexes.

I don't store the signal strength in a database because I haven't mastered those skills yet.

Band scanner

The frequency blocks still free of DAB signals in the UK are in use in countries in Europe. I set the scanner to tune from 5A to 10A (174.928 to 209.936MHz) that should pick any signals from Belgium, the Netherlands, France and possibly Germany. This range includes the Basingstoke multiplex on 197.648MHz (8B), **Fig. 6**, that I use as a 'pilot' signal to show that the scanner is working.

Daimon Tilley G4USI
practicalwireless@warnersgroup.co.uk

1

Building receivers from kits

To complement his last feature on transmitter kits, **Daimon Tilley G4USI** turns his attention to simple receivers.

In my last *On a Budget* I built some cheap yet effective transmitters for under £15. In this edition I am going to examine three receiver kits, plus a Band Pass Filter kit I have built recently. Although a little more expensive than the simple transmitters, at £30 - £50, these kits were fun to build and effective and I hope you might be encouraged to have a go.

I am going to divide the kits in terms of both cost and complexity to build. First, and the cheapest and simplest, was the **Little Roo** receiver from Kanga Products. Next came the **Super Sudden** receiver kit from Spectrum Communications, followed by the **QRP Labs Receiver** complete with other accessories. Additionally, I took the opportunity to build the **BP-1A Adjustable Band Pass Filter** (BPF) kit from QRP Ham Radio Kits in Spain.

The **Little Roo** receiver is available for £29 and comes with everything you need to build a high-quality Direct Conversion (DC) receiver, including a mint tin in which to house it, with a nice printed label. All you need do is add an antenna, earphones (or small speaker) and a power source – either a 9V battery, which fits inside the case, or an external supply.

All parts are supplied to build the receiver for *either* the CW portion or the SSB portion of the band. I elected to build it for the CW section, but there is a great video on the Kanga website of SSB reception, which sounds really nice. The instructions are clear and helpful and guide the build process nicely. It took me a bit less than an hour to build it and the instructions show you how to test each stage as you go, so that any faults can be spotted and dealt with.

Photos 1, **2** and **3** show the kit of parts and the completed build. But what is it like to use? The answer is very nice indeed! The receiver uses a combination of a crystal resonator, with varicap diodes and potentiometer for tuning. Once built there are two trimmer potentiometers, which can set the tuning bounds. This is because the receiver is capable of tuning outside the band edges. Typically, it tunes over about 100kHz of the portion of the band you choose. Once I built mine I discovered it could tune from quite a bit below 7MHz up to slightly above 7.074. Consequently, I tuned the receiver to 7MHz, with the aid of a nearby transmitter and dummy load, then tuned one of the two trimmers to start the coverage at that point.

In use I was pleased with the sensitivity and volume. The big test with DC receivers like this though is their susceptibility to Broadcast Station (BC) breakthrough, especially of an evening. The Little Roo has an inbuilt Band Pass Filter (BPF) for the band. There is no need to wind toroids as the inductors are moulded and look like resistors. So, when I first switched it on of an evening, I fully expected some breakthrough, but was very pleased indeed to hear next to none. I had just the very slightest hint right in the background from time to time and you had to strain to hear it. Even then, it was so weak as to be unintelligible and therefore very easily ignored. This was very impressive from such a simple small receiver.

In use

If you have never used a DC receiver before, you may not be aware of one of their foibles – they receive both sidebands! Therefore, as you tune, in my case, through the CW portion of the band, you will hear a single CW signal starting at a high pitch, dropping down in pitch to the point where you can't hear it, known as the zero-beat point, and rising again as you tune through. This means you will hear twice as many signals as there are stations transmitting, and on a really busy band, such as during a contest, this can cause difficulties, but that is the price you pay for simplicity. They are still very effective receivers. If building for SSB use, while you will hear both sidebands, you will only actually be able to understand the Lower Sideband (LSB) as that is the convention for transmitting on this band. If this is the version you build, the instructions advise you to tune the band from the 'bottom-up' so that the first sideband you hear is the one you want.

In summary this was a quick and simple build that produced a very effective little pocket receiver – great to use with a home-built transmitter or just for casual listening.

1

A replacement for London Heathrow's stand-by control tower

David Smith has the latest news, starting with news of a new control facility for Heathrow.

David Smith
dj.daviator@btinternet.com

Heathrow's back-up control tower was a world first in 2009. Based in an undisclosed location off the airport, it is a windowless recreation of the main control tower and would enable the airport to operate at around 70% of full capacity should it ever be required. Plans have now been agreed to replace it with a state-of-the-art facility due to become operational in 2025. Known as the Virtual Contingency Facility (VCF), it will initially match its predecessor's operational capacity.

However, the plan is to increase the capability of the VCF to enable it to operate at 100% during a second phase of the project. Live images from ultra-high-definition cameras would provide controllers with views allowing them to work as normal and keep the airport fully operational. While the original VCF has never been called on in the event of an incident, the NATS control tower team does have regular exercises designed to simulate closing down the operation in the main tower and transferring to the contingency facility. The aim is to be able to do so within a few hours of it being required.

Proposals to improve navigation for light aircraft in North-West England

The Manchester Low-Level Route (MLLR) provides light aircraft pilots with a direct route through the airspace where Manchester and Liverpool airspace adjoins, without the need to fly over the high terrain of the Pennines or the waters of Liverpool Bay. As part of its function to review airspace classification, the Civil Aviation Authority (CAA) has published its comprehensive report on the MLLR. The report offers valuable insights into the use of the MLLR and presents proposals for potential improvements to the airspace.

The MLLR is four nautical miles wide with a vertical extent from the surface up to 1300ft Above Mean Sea Level (AMSL). It provides a convenient north/south route for light aircraft and General Aviation pilots flying under Visual Flight Rules (VFR). Verbal communication with ATC is not required. Areas for further consideration include raising the upper vertical limit to 1500ft, amending the airspace classification, and the possible implementation of restricted airspace. Work continues and involves Manchester and Liverpool Airports and their air traffic control providers, as well as the local General Aviation community.

Callsign change

Aircraft operators involved in Search and Rescue (SAR) operations will now use the callsign 'British Rescue' when the safety of life is involved. It will be abbreviated to 'Rescue' by an Air Traffic unit after initial contact, when appropriate within UK airspace. Outside the UK Flight Information Regions, the full callsign is always to be used to avoid confusion with any other state rescue service which may be involved.

In order to highlight the nature of the task, Police, Helicopter Emergency Medical Services (HEMS) and SAR flights are allocated specific callsigns, as follows:

Police flights: The callsign for a Police flight consists of three elements: The prefix 'Police', the three-letter operator designator 'UKP' and a two-digit individual aircraft identifier. The identifier may be suffixed with a letter indicating a flight priority category. For a Police aircraft that has declared a 'Police Emergency' 'Alpha' is added.

The Super Sudden

The next build was the **Super Sudden Receiver**, which I brought as a kit from Spectrum Communications via eBay for about £32, although it has since sold out. I am unsure if there will be any future stock, so if you are interested in this kit, you should contact Spectrum directly, who incidentally also seem to sell two regenerative receiver kits.

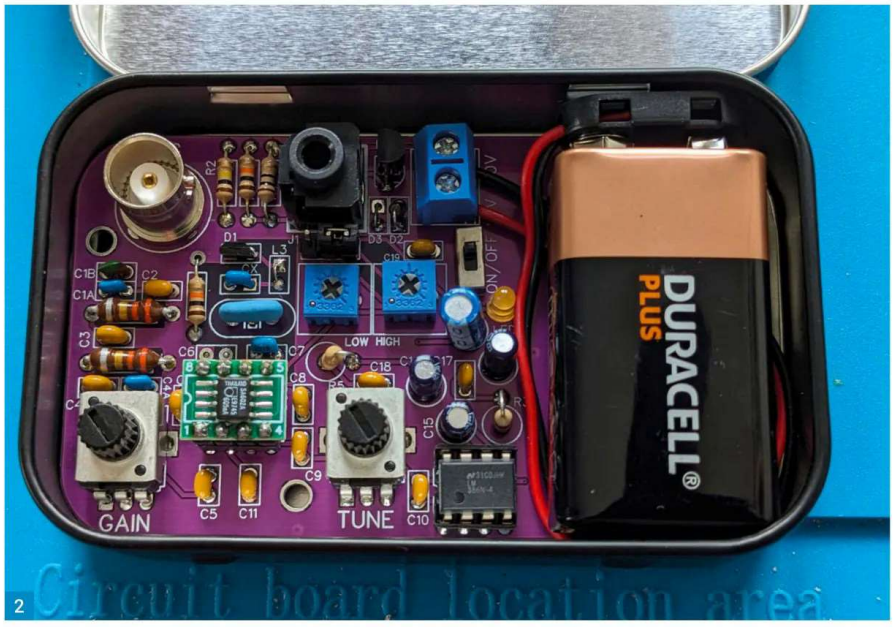
This DC receiver kit is a design that has featured in *Sprat*, the G-QRP Club journal, by G3TEX and Spectrum produced a PCB and kit of parts, **Photo 4**. It is a more challenging build for a number of reasons. First of all, on its own it is not a complete receiver. It requires a VFO to work. I enjoy building Arduino VFOs so this was not a problem in my case. Additionally, there is no band pass filtering, meaning that the receiver is 'wide-open' and might receive signals that are outside of the frequency you are tuning. In my case this was an opportunity to build and test a variable band pass filter, which I will discuss later in this article. Finally, the build is slightly complicated by the PCB having no silk screen printing to identify which component goes where, **Photos 5** and **6**. Consequently, you must be *very* careful to locate each component in the correct position by reference to the supplied diagram. It would be all too easy to make a mistake, but by thorough checking and double-checking, I managed to avoid this and the completed board is shown in **Photo 7**.

Those disadvantages aside, the big benefit of this design is that by using external VFOs and BPFs, you can cover any or all of the HF band, making it possible to make a true general coverage receiver. Again, this is a DC receiver so both sidebands can be heard as in the Little Roo.

I didn't time the build but it took several hours of painstaking checking of component locations and another couple of hours to put it in an enclosure (an old tin gift box). At the same time I built the external VFO and the adjustable BPF, and these are shown with the Super Sudden in un-boxed and boxed form in **Photos 8** and **9**.

Performance

So, how did it perform? Well, I was pretty pleased with daytime reception. It was sensitive and provided clear audio into both headphones and loudspeakers. I was able to clearly resolve CW, SSB and AM broadcast stations, and of course, using an external remote VFO with digital display, I could accurately tune to any frequency. The adjustable band pass filter appeared to work well (see later) and there was no daytime BC breakthrough. Unfortunately, the same could not be said of night-time performance. At night BC breakthrough was severe, making very hard work of being able to receive amateur signals on 40m and absolutely impossible on 30m. I was disappointed – but what was to blame – the BPF or the RX?



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Direct Conversion receivers are known to be susceptible to this breakthrough, but I decided to persist. It turned out that actually the BPF did work and could eliminate the BC noise, but you just needed to be much tighter on tuning it and find the 'notch' where there was no BC, but you could hear amateur signals. I found the easiest way to do this was to tune the notch over the top of the ever-present noise of FT8, as a solid and reliably strong signal source.

QRP Labs receiver

My final receiver build in this section is the **QRP Labs Receiver Module** kit. This kit is an SDR receiver module and costs $25 plus postage from Turkey. It too requires an external VFO (at four times the frequency you desire to listen to) and includes a single QRP Labs BPF kit for a band of your choice. I ordered the 40m one. That said, QRP Labs offer a total of ten different BPF kits for each amateur band from 160-10m, priced at $4.90 each, or you can buy all ten in one go at the same price per unit, so $49 in total. These filters are designed to be plug-in so that you can manually change them for your band of choice, or for $16 you can buy a relay-switched five-band board.

The receiver module is designed to directly drive a PC stereo sound card, where SDR software can be used to decode the signals, isolate the sideband you require and provide a waterfall/audio amplification. My own use-case, however, was as a stand-alone receiver not requiring a PC. In order to avoid the DC receiver problem of hearing both sidebands, I also purchased the QRP Labs Polyphase Network Module for $11. This module, which plugs into the receiver PCB, cancels out the unwanted sideband, and using a simple switch or relay it is possible to change between USB and LSB at will.

Photo 1: Aeritalia AMX at Fairford Royal International Air Tattoo July 2023.
Photo 2: Sukhoi Su-22 Polish Air Force Fairford Royal International Air Tattoo July 2023.

Training and testing flights have 'Zulu' as a suffix.

The radiotelephony callsign 'Helimed' is used for all UK HEMS flights, followed by a two-digit individual aircraft callsign The ICAO three-letter operator designator is HLE. The two-digit identifier may be suffixed with a letter indicating flight priority. 'Alpha' and 'Zulu' as above.

A new heliport

Portland Heliport, located on Osprey Quay in the Dorset town, is a new facility primarily used by company HeliOperations for search and rescue training. It is also available for military flying training. Frequencies allocated are Portland Radio on 122.130MHz and Portland Fire 121.600MHz available when a fire vehicle is attending an aircraft on the ground in an emergency. HeliOps' operations frequency is 131.685MHz, callsign HelioOps Zero. The landing area is aligned 02/20, length 201m.

Flightradar24.com improvements

Responding to feedback from users, Flightradar24.com has improved existing filters and added new ways to filter flights on this popular website. Flight categories can be filtered by airline ICAO code or by starting to type the name and selecting it from a dropdown list.

Changes to the Aircraft filter have also been heavily influenced by user feedback. The biggest change to aircraft filtering is the ability to filter for aircraft based on exact matches for the ICAO code. Previously, if you wanted to filter for C-17 cargo aircraft, for example, using aircraft filter 'C17' you would see C-17s and Cessna C-172s.

With Airport filters, the ability to select entire countries has been added. If you want to see flights, say, to Australia or from New Zealand, search for the country names and choose which direction of travel you'd like to view. Taking this a step further, you can filter by route and see flights between, for example, two airports or two countries.

Advanced filters include specific callsigns instead of whole airlines or by aircraft registration. Newly added is filter by transponder code ('squawk'), common codes including 1200 and 2000, or you can enable filtering for codes such as 7600 (radio failure) and 7700 (general emergency). The final new filter is aircraft age. If you want to see the oldest aircraft being tracked by FR 24, just use the sliders to select the years you are interested in and click 'add'.

Developments in space-based VHF communications

The Australian company Skycraft has successfully accomplished the world's first trial of space-based VHF voice communications for Air Traffic Management (ATM). It is part of their development of satellites to provide space-based aviation communications and surveillance services. Currently, VHF communications are only available when the aircraft is within range of a ground-based radio. This means that large areas of the Earth's surface, including much of the world's oceans, are not covered.

2

The trial in the VHF airband demonstrates the feasibility of satellite communication directly with aircraft using existing equipment. The use of satellites in place of ground-based radio systems will enable global real-time communications between pilots and controllers for the first time.

The testing took place in the southern area of Australia's Flight Information Region. Skykraft worked in collaboration with Airservices Australia to implement appropriate test protocols that ensured that there was no interference to the operational ATM system.

Five satellites were used for this trial of VHF voice services and Skykraft's initial constellation continues to be under rapid development, with two launches already in 2023, and more planned for 2024. The aim is a constellation of more than 200 satellites in low-earth orbit to provide global ATM services from space.

Tracking drones in lower airspace

Altitude Angel is an aviation technology company delivering solutions that unlock the potential of unmanned aircraft to routinely fly in airspace all over the world. It has announced that it has begun deployment of what is planned to be the largest commercial, aviation-grade sensor network specifically developed for wide-area low-altitude drone and aircraft detection in the UK.

Incorporating purpose-built ADS-B and Mode S receivers, as well as comprehensive SDR (Software Defined Radio) capabilities, the network is also capable of detecting existing and future 'Remote ID' broadcasts from transmitters on drones, as well as collecting transmission information from the common control systems used to pilot them. This means the sensor network will detect drones which are intentionally broadcasting their location electronically, as well as many which are not. In addition, due to the detection technologies used by Altitude Angel, low-flying crewed aviation can be detected and located using other passive sensors even when they are not broadcasting any signal.

This additional data received by the sensor network is 'fused' with Altitude Angel's already extensive air-surveillance picture (taken from primary sources, such as the sensor arrays deployed on the company's 'Arrow towers' and trusted secondary providers), to create a high-resolution, near real-time digital map of the low-altitude airspace.

The new network has been extensively tested across four sites, but is being rolled out to a further 30 sites across the Midlands and south-east of England. Altitude Angel is also announcing a programme to enable authorities to soon extend coverage where required, in turn, giving them access to the overall surveillance picture. In the words of a company spokesman, *"In building this network we're creating the most comprehensive, real-time picture of whatever is moving through the country's low-altitude airspace"*.

The capability to detect aircraft and drones at lower altitudes is becoming increasingly important and yet, it is exceptionally difficult to do well. Most people are familiar with aircraft tracking software, such as Flightradar24 or FlightAware, which are great for tracking large aircraft or aircraft at higher altitudes. However, the Altitude Angel network has been designed from the outset to facilitate new and future airspace users, such as drones and Urban Air Mobility operators, whose activities will largely take place in lower airspace. **PW**

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

6

east where *The White Heather Club* was made, **Fig. 4**.

In the early 1960s, the BBC acquired land adjacent to its Queen Margaret Drive base and eventually three colour studios were built together with significant radio facilities and a Film Unit with its own film processing facilities. The *BBC Scottish Symphony Orchestra* and the *BBC Scottish Radio Orchestra* had access to a large sound studio - *Studio 1*.

BBC Scotland started using their own television continuity announcers voicing over specific BBC Scotland station idents for all evening and weekend afternoon junctions from around 1977. Previously, announcers only introduced occasional opt-outs, which resulted in the London announcer being heard most of the time. The announcers were 'self-op', meaning that they had to speak and press the controls to change the sound and picture and cue in teleciné films, video tape recordings (VTR) and 'live' programmes. From 1979, their duties were expanded to cover reading the lunchtime news bulletins in-vision, just before the start of the main network *Midday News* programme.

Although most appeared 'in-vision', there was one announcer who was never seen. **Robert Logan** was also a Conservative local councillor. Consequently, he never read the news summaries, or indeed gave his name at closedown. From 1985, the announcing team began producing a news summary just before children's programmes at around 3.53pm. Within a few weeks, additional news summaries were introduced at 9.25pm. From 31 October 1988, newsroom staff started to read the news summaries instead of the continuity announcers.

Following the creation of several new BBC radio stations (*Radio Highland*, *Radio Aberdeen*, *Radio Orkney*, *Radio Shetland* and *Radio nan Eilean*), the first national station, *Radio Scotland*, was launched. Radio Scotland opened with a televised ceremony at Glasgow's *Kelvin Hall* in November 1978.

In 1980, to celebrate 50 years of broadcasting from Edinburgh's Queen Street studios, Radio Scotland's *Good Morning Scotland* programme was televised, pioneering breakfast television.

Service information: Switzerland, Part VIII

In November 1932, radio programmes for schools (known in German as *Schulfunk*) were introduced, **Fig. 5**. SRG has been working with schools to produce programmes ever since. In the UK, the BBC introduced schools broadcasts on 4 April 1924.

One year later, in May, a new studio at Brunnenhof, Zürich, was officially opened by SRG and immediately pressed into service. Also in 1933, SRG acquired steel-band sound recording equipment, probably based on the *Blattnerphone* system. The equipment was made available to all the studios and allowed for the first time, recordings to be made of entire programmes for broadcasting at a later date.

In 1935, some individual SRG studios acquired their first outside broadcast vans, complete with state-of-the-art equipment.

The Swiss parliament approved a series of loans in 1938 to finance the growth of the Schwarzenburg-based national short-wave service (then known as *Swiss Radio International*, later renamed *swissinfo.ch*). In the same year, music lovers were not too impressed to learn that the much-loved separate orchestras of the Lausanne and Geneva studios had been merged to form the *Orchestre de la Suisse Romande* (*OSR*) under the Swiss-born conductor from Vevey, **Ernest Ansermet**. This was his own orchestra, which he formed in 1918.

On 2 September 1939, with the declaration of war with Germany, Switzerland retained their neutrality status, but SRG's broadcasting licence was suspended for an indefinite period. The renamed *Schweizerische Rundspruchdienst* (*Swiss Broadcasting Service*) was attached to the *Directorate General of the Swiss Post Office* and placed under the control of the Army, **Fig. 6**. The military's *Sektion Ohr* (*Ear Section*) was charged with eavesdropping on programmes from foreign radio stations. Their intercept reports were carefully preserved in the General Management's Central Archive.

In 1944, the Federal Council ordered that all radio programmes must be approved by the *Federal Department of Home Affairs* before being broadcast.

During the war, the Swiss news organisation, *Schweizerische Depeschenagentur* (*SDA*), was allowed to increase its daily news output from two programmes to four. The SDA was the official press agency, which began in 1894.

Each national station was allocated a single studio for producing programmes. Beromünster broadcasts were produced in Bern, with Sottens operating from Lausanne. Programmes for the Italian-speaking Ticino were transmitted from the top of Monte Ceneri with the studio based in Lugano.

On 20 July 1945, following the end of the war in Europe, SRG's broadcasting licence was reinstated, along with all the rights previously granted to the organisation and their various ancillary services.

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 by searching for the *Latest Articles* section.
www.radioenthusiast.co.uk

Stay tuned!

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

★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

Old vs. New

Dear Don,
I was reading that the BBC Monitoring service had moved its base and reading all about the history of this, and it took me back to my youth.....

With reference to the BBC article:
https://tinyurl.com/4v2vj5ks

In 1969 following a high speed Morse test at broadcasting house London, for a new job as a civilian intercept operator for the BBC World Monitoring service, I was invited for interview at Caversham Park monitoring station near Reading.

On a tour of the foreign monitoring rooms in action, two technical systems piqued my interest: 1. The ancient looking floppy sleeve magnetic loop dictation recorders used for sound broadcast monitoring (Dictaphone Dictabelt or similar). One step up from the wax cylinder recorders used there during WW2.

and...2. The Long, Medium and Shortwave receiver recording technique, using a timer-controlled audio tape recorder set for high speed recording 15in/sec (Long before video recorders were around).

Often the foreign transmissions were a little off frequency or would drift about. Night transmissions would require a monitoring operator to search around and accurately tune them in at the scheduled time. The innovation here was to record a much wider bandwidth than that of the actual 9kHz AM voice transmissions. Less bandwidth for Morse and teleprinter.

A wider band (20kHz or more) of signals around the receiver intermediate frequency were extracted prior to the AM demodulator circuit. This larger band of the modulated IF could be recorded. The higher band of frequencies (wider than the audio AF), was captured using the tape recorder (Ferrograph) set to a faster tape speed (15 in/sec).

These taped signals, if played back as normal, would just sound like white noise audio mush. But the recorded signals were re-inserted into the receiver at a point prior to the AM demodulator (probably via mixer). This allowed an operator to manually tune across the recorded IF band to select the off-tune transmission and demodulate it into audio, teleprinter or Morse after the event, and without the need for a night shift operator.

Night shifts were the low point in my Y service Spec Op career, and this idea was too late for me as I was about to be demobbed following ten years in the Royal Signals.

In the 21st century this is major feature of Software Defined Radios and RF Analyser/Recorders.

A computer sound card Analogue-to-Digital Converter with a fast sampling rate is able to store a large .wav file recording of a very wide bandwidth of IF or baseband signals (some MHz wide).

Using a software panadaptor these signals are recorded prior to a demodulation. On playback this allows for the selective tuning (mouse control) across the whole recorded spectrum interactively, using the graphic spectrum and waterfall time displays, and on into the LF and digital audio playback to select individual sections, for demodulation of the particular type needed, AM, FM, SSB, FSK or Data, for analysis of each group transmission within the whole band. And all after the event!

Besides RF scanning activities I use SDR to Tune and Analyse reactions from our multi-channel Super-Paramagnetic Particle Bio- Sensors at:
https://biosensingtech.co.uk
Patrick Wraith G0JRP I.Eng FIET

*(**Editor's comment**: Thanks Patrick and I hadn't picked up on the fact that Caversham Park was due for closure as the BBC Monitoring Service. I knew it well having lived just outside Reading for over 34 years and visited the site with the Reading Radio Club some years ago. And our HF columnist **Steve Telenius-Lowe** (**G4JVG** at the time) used to work there as did his wife **Eva**. Definitely the end of an era but, as you say, some aspects of the technology have come full circle!)*

MurphyRadio

Dear Don,
I have been reading with interest the *Vintage Television & Radio* column and in particular the reference to Murphy Radio.

I left school in 1955 and went to work for a local radio & TV dealer. In Norfolk we didn't get TV until 1954 so there was no training in the colleges for that subject. All our training was done by the manufacturers and I was sent down to Murphy Radio in Welwyn Garden City for a two-week live-in course staying with staff members in their own homes. At the weekend a bunch of teenagers went down London and found our way to the red-light area of Soho. We found a club with lower charges paid our entrance money and walked in. We were then asked if we were members so we had to pay again.

The course took us from basic electronics to the complete superhet radio and on our last afternoon we were taken around the factory where they were using soldering irons heated in a gas flame! The following year a further two week training on television but by then they had electric soldering irons.

The City and Guilds intermediate three year course I completed at evening college but the Norwich City College were then to offer the final two year City and Guilds course.
Paul Burgess G3VPT
Norwich

C4FM Digital Mode

Dear Don,
I am 85 years of age and have been licensed since the early 80s. Having fallen in love with amateur radio, when listening to short wave radio broadcasting when I was working as a Flight Attendant for 37 years around the world and staying in 5 Star hotels, sometimes very bored in some of locations we stayed at.

I have tried most modes of communication and I have made very many friends and contacts around the world during this time, including OZ on 6 metres from my home QTH, a lovely 600ft ASL, on all sorts of antennas, even though I cannot put a nail in a bit wood....but with the help of the many amateurs I have met during this time I managed to progress to the Senior Licence called an 'A' Licence.

The one mode that interests me now, being unable to scale ladders and put up big antennas, is C4FM or Fusion as is also called. It is the best of the all digital modes and so clear for someone who now has some great hearing loss. This mode is incredible, as it does not need big antennas, etc, just repeaters and personal gateways. You can use it when just sitting in your Garden and the world is your oyster. Fantastic. I love it so much but I still operate FM and SSB, and I am so am very lucky and have made many friends over the years. However, a repeater is the ultimate if you are unfortunate to live in areas that are not good for this side of the hobby.

The reason I am writing to you is there are not enough repeaters in my area of Oxfordshire and Berkshire and it can be a great help for those who are not so lucky, but before the cynics cry *"It is not real Radio"*, remember you can lead a horse to the water trough, but you cannot make him drink from it can you? So please? May I make a request for a local radio club to take note, as I understand you can install a repeater for as little as £400, so I am reliably informed.

Your Letters

Send your letters to: Practical Wireless Letters, Warners Group Publications plc West Street, Bourne, Lincs PE10 9PH
E-mail: practicalwireless@warnersgroup.co.uk

Software for Radio

Dear Don,

As an amateur shortwave radio listener I have always been fascinated by the sounds that suggest a data mode has been found. Back in 2017 I purchased a DVD through *RadioUser* magazine of software programs compiled by QSP73 Services, which I hoped I would be able to utilise with a PC upgrade when my old Windows XP finally died.

However, with Windows10 now my only PC system I am reluctant to try and run any of the software (being also a Windows duffer) due to incompatibility issues. What I am really looking for is a program similar in performance to RadioRaft321 with automatic detection of modes and a spectrum view to complement the excellent JVComm32, which I run regularly for RTTY, FAX and SSTV signals.

It occurred to me that a list of tried and tested software programs for the different modes featured in **Mike Richard's** *Data Modes* column of the magazine could be a useful addition to his excellent series and help the reader, like myself, extend their listening experience when these sounds are discovered.

I should also like to extend my thanks to *Practical Wireless* for awarding me Star Letter in the August edition for which I was able to make full use of the £20 voucher on Mike Richard's 'Data Modes' DVD from your bookstore.

Simon Bagg
Ashford, Kent

*(**Editor's comment**: Thanks for this Simon. Yes, the QSP73 service was an excellent one, run by **Chris Lorek G4HCL**, who sadly became a Silent Key a few years ago. But I'm pleased to say that Mike Richards has taken up your suggestion and hopefully this will result in some useful advice on suitable software in the months to come.)*

BVA Valves

Dear Don,

In the June 2023 *PW* **Andrew Redding** asks about BVA valves.

Although this is not about BVA I can say that valves are to be manufactured once again using the Brimar name under the Great British Valve Project. Machinery is being bought to make audio valves using original Mullard and Brimar machinery bought from European locations. ECC range, rectifiers and power valves advertised.

What a pity Mullard stopped making the KT66/88 range of valves as now there is a Chinese 300B in place of them. They thought there was a market for them.

The G.B.V.P. sell KT66 and KT88 and also sell a replacement PX4 sold as closely matched pairs. Looking at the prices I'm glad I have some, probably used, but serviceable audio and rectifier valves.

But times have moved on and prices have increased.

Bill Kitchen G4GHB.
Ashton-under-Lyne

AC/DC Sets

Dear Don,

Mains-powered AC, DC and Universal sets, as well as similar elderly equipment, really ought to be supplied through an isolating transformer (see *PW* September p.14). A residual current (earth leakage) device is fine as the last resort when all else fails, but isolation prevents that systemic failure in the first place. If you want to frighten yourself, try a high-voltage insulation test (500-1000VDC, eg from a Megger), even on a set that has an inbuilt mains transformer.

Also, don't just plug an historic set directly into the power supply. Place a 60W incandescent lamp in series and, when its glow diminishes, short it to go to full power. This reduces inrush current stress, especially on valve heaters and smoothing capacitors. If said capacitors are faulty, eg bulging, replace before the bang!

On another topic, CW isn't Morse (you might want to read that again), no wonder **Rob Dancy G3JRD** is *"...utterly confused..."* on page 66 of the September *PW*. Early transmissions were generated by sparks across a gap, giving a rapid train of individual impulses that resonated and decayed. Modern sets (valves, semiconductors) have oscillators that just run and run, producing a constant sine wave as a result.

Compare the rapidly-repeated striking of an electric bell with the steady note produced by holding down a key on an organ. Only the latter, or the output of a modern oscillator, is continuous (CW) rather than a train of distinct impulses.

Nowadays, Continuous Wave (CW) is what we modulate to send information. It can have audio mixed in to affect its amplitude or frequency for full AM, SSB AM (yes, that's what it really is!) or FM. That's strictly speaking modulated CW (MCW). However, these days, we specifically apply this term to a steady modulating tone being started/stopped to generate Morse while the carrier remains on (as in aero/marine Non Directional Beacons).

No matter how it's generated, the plain carrier can be Intermittent/Interrupted, started and stopped to form Morse symbols. Because we've forgotten what spark was, also because the nomenclature is easier, we now refer to CW when we really mean (intermittent) ICW.

Godfrey Manning G4GLM
Edgware

*(**Editor's comment**: Thanks Godfrey, always good to hear from you. Yes, in reading the biography of **Marconi** – see my* Keylines *– I have been reminded that 'wireless' relied on spark transmission for many years. It was, as you say, only the introduction of valves (or initially, the Alexanderson alternator) that allowed a true continuous wave, paving the way to voice transmission.)*

Dear Don,

I enjoyed **Michael Jones**' excellent article this month on the Eddystone 840A.

In addition to his coverage of safety aspects involved in restoring and operating these sets, I would add a couple of points.

Firstly, dropper resistors very often involved asbestos insulation washers and/or asbestos shrouds to reduce heat damage to the cabinet and other components. This old material can often be crumbly and great care should be taken not to disturb it. I like to use a solution of PVA glue painted gently over the asbestos and allowed to dry to consolidate it. Wear a suitable mask and gloves when doing this!

Secondly, should not the capacitor C3 on the chassis side of the aerial socket be Y rated in case of failure? Some of these old radios also included a capacitor across the mains at input to reduce hum. These should always be removed and if necessary, replaced with an X rated equivalent.

David Kerr 2E0FXO
Sutton Bonington

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Bargain Basement

For Sale

RADIO TODAY GUIDES FT DX10 and IC7300, unused. £7.50 each.
Call Paul on 07748 948685
FOREST OF DEAN

Wanted

OLD HALF INCH FERRITE RODS. Must be half inch 12.7mm in diameter and be six inches long or more will pay good money for the old rods. **Call Peter Tankard on 0114 2316321 SHEFFIELD or Email peter.tankard@gmail.com**

the *Wireless Set No. 38*. This was a 5-valve High-Frequency portable man-pack radio transceiver used by the British Army. The equipment, powered by a large dry-cell battery, covered 7.4 to 9.2MHz and was designed to be carried in a separate haversack.

The company also manufactured equipment for use in war-time armoured vehicles. The *Wireless Set No. 19* was designed to allow direct communication between tank commanders and infantry. In 1945, a Mk. III version was produced, housed in a sealed diecast enclosure.

After the war, Murphy Radio used its military experience to design and build sets for Naval use, principally the B40 series for the *British Commonwealth Navies*. This communications receiver covered the HF bands. The frequency range was continuous from 600kc/s to 30Mc/s. The IF was at 500kc/s and had a crystal filter. The B40 was a single-conversion superheterodyne receiver with two RF stages and three IF stages. It was powered using either 115V or 240V. For use on battleships, the equipment had to be strong and reliable, but also sensitive and easy to use. It also had to stay on frequency, particularly when the ships fired their guns!

During the late Forties, Murphy Radio developed their *Larkspur* transceiver system. It was adopted by the Armed Forces from the mid-Fifties. The project was an attempt to move tactical short-range radio communications in the forward battle area from HF, using amplitude modulation, to low-band VHF, employing frequency modulation. This followed a similar move by the US Army in the latter part of WWII, which had demonstrated significant advantages. Where the use of VHF was not practical, HF sets using narrow-band phase modulation (NBPhM) were developed as the only practical method at the time of obtaining some performance improvement over the use of AM, especially at night.

BBC Cymru-Wales centenary, Part VI

The *BBC 5WA Station* opened on 13 February 1923, with a performance of *Dafydd y Garreg Wen* (*David of the White Rock*) by the singer **Mostyn Thomas** in a tiny studio above a music shop at 19 Castle Street, Cardiff. The BBC expanded rapidly into larger premises at Park Place and various other studios dotted across the city.

The arrival of television after World War II prompted the BBC to purchase a ten-acre site in the grounds of the Victorian villa, *Baynton House*, in 1952 to house all its operations in the city. However, construction at the Llandaff site was delayed owing to the projected cost, and the fledgling television service in Wales was broadcast instead from the former *Broadway Methodist Chapel* in Roath from 1959 and was later joined by premises in nearby Stacey Road.

The design for the new *Broadcasting House* was drawn up by the Welsh architect **Ivan Dale Owen** in the 'Modern' style in 1960, and the first phase was constructed between 1963 and 1966.

3


5


4

Broadcasting House in Llandaff, Cardiff, was the first BBC Wales building to bring together the organisation's radio, television, news and other functions into one purpose-built centre. Radio studios were in use by late 1966 and the building was officially opened by **HRH Princess Margaret** on 1 March 1967, which just happened to be St. David's Day.

The construction of television studios at Broadcasting House took place in the 1970s, requiring the demolition of Baynton House in 1975. The grounds also included the original outdoor set for the drama programme *Pobol y Cwm*. In 1986, the BBC bought University College Cardiff's School of Home Economics located on Llantrisant Road and created a new administration, finance and archive block, renaming it *Tŷ Oldfield* as a tribute to former controller, **Alun Oldfield-Davies**.

BBC Cymru Wales moved out of the Llantrisant Road site in 2019 to their new headquarters at Central Square, next to Cardiff Central station. The Llandaff site was demolished and the site was used for housing.

Over 1,000 production staff transferred from the Llandaff site to the new broadcasting centre in October 2019. The new, extremely lavish, complex at Central Square cost £120 million.

The first 'live' transmission was broadcast by **Tim Cooper** on 14 July 2020. The BBC-1 news programme, *Wales Today*, transferred from Llandaff to Central Square in September 2020. The centre is the first BBC building to use 'live' IP (Internet Protocol) technology whereby video data is sent across the net in packets of data. The new centre also has *augmented reality* and *virtual reality* facilities and *robotic cameras*. State-of-the-art graphic design facilities are also available. This is in stark contrast to the 1980s when the revolving *BBC-1 Cymru* Globe Symbol consisted of a very detailed model of the Earth (even including most of the minute islands dotted around the World), a motor, one lamp, a curved mirror and a monochrome television camera, the colour being added later, **Fig. 3.**

Construction of the Central Square building started in December 2015 on the site of the former Cardiff Central bus station. The building is half the size of the former Broadcasting House in Llandaff. There are four floors providing office, studio and production space. The internal size of Central Square, over several floors, is 155,582 square feet (14,454m^2). The BBC agreed a 20-year lease on the building, at an annual rent of around £25 per square foot per annum, with the developer of Central Square.

BBC Scotland-Alba centenary, Part VI

When BBC Television first came to Scotland, there were no dedicated studios and Scotland shared an Outside Broadcast unit with BBC North, based in Manchester. Apart from a limited news service, all programmes about Scotland had to be transmitted from London and have a general appeal to a UK audience.

When a new rival commercial television broadcaster was about to arrive in 1957, BBC Scotland, based in Glasgow, managed to produce slightly improved news coverage by a complicated arrangement involving the newsroom in Queen Margaret Drive in the west of the city and the former *Black Cat Cinema* in Springfield Road in the

Here is hoping, as our existing local repeaters are hardly used now and it would greatly enhance our hobby to all those in this area.

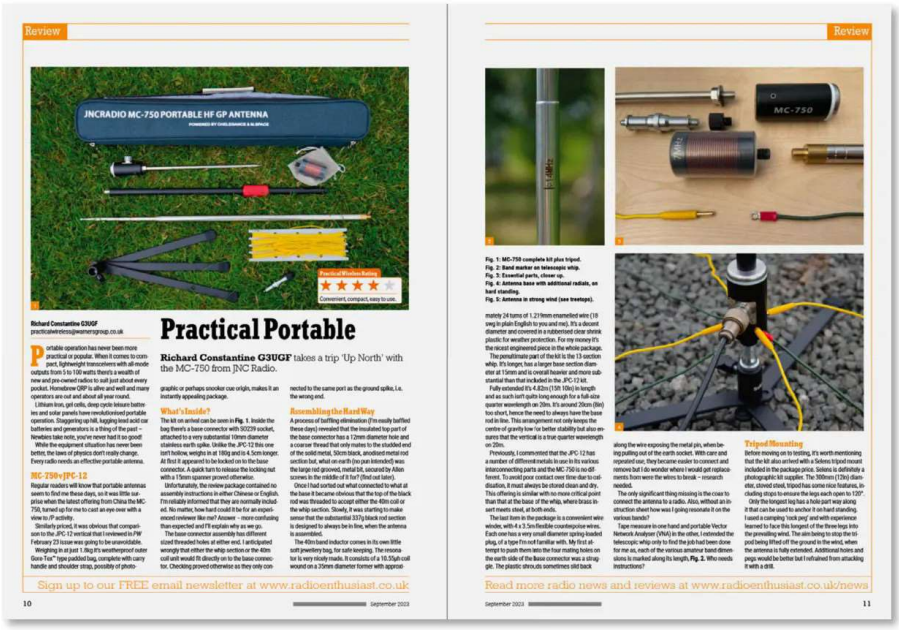
David Self G0TKV
Reading
(My Gateway is MB6IOX on 434.5125MHz)

JNC MC-750 Antenna

Dear Don,

Is it my imagination, or is it the case that in China a few enlightened manufacturers of radio related products have discovered a large gap in the ham radio marketplace? The current clamour for portable antennas in a bag. But of course, on a similar theme, I do understand why many people have chosen to enthusiastically embrace the avalanche of cheap and cheerful Chinese manufactured HF transceivers, which continue to tumble upon our shores, a scenario that has probably given the 'big three' manufacturers pause for thought. However, given what the hobby of amateur radio is partly about, making something for almost nothing (putting aside the fact that not many of us could put together a multi-mode 100 watt HF transceiver in a week or two, and it's now the 2020s not the 1950s), it's a little puzzling why a lot of people would rather buy a simple antenna than make one themselves?

Okay, these commercial antenna products are tempting (And yes, I'm tempted too, sometimes). As G3UGF's review of the JNC MC-750 (September 2023) points out, they are quick to put together and convenient. The downside is that this particular antenna costs £229.99, including the obligatory bag.


Review

JNCRADIO MC-750 PORTABLE HF GP ANTENNA

Practical Portable

Richard Constantine G3UGF takes a trip 'Up North' with the MC-750 from JNC Radio.

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10 September 2023

Review

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September 2023 11

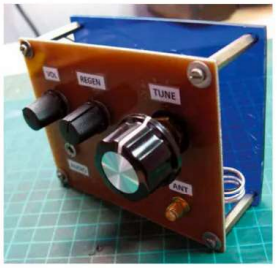
But why do that? Make one instead and save about £200. It makes some sort of sense to me. For example, when I'm out and about on hilltops away from the madding crowds doing what comes naturally, you know, hopefully QSOing, all the antennas will be home-brewed. Basically, various lengths of wire in various shapes and sizes. Or a vertical of some description. Usually, a length of wire helically wound on a plastic pole and more wire for a few radials.

Obviously, I can't get a 16 foot pole (for 40m) in my car as it's 13 feet long. So, it consists of three pieces. The approximate cost of the aforementioned vertical antenna was £20. The most expensive part was the 9:1 balun. I bought that at a Longleat Rally yonks ago for a tenner. But I might have to purchase a replacement. Or make one. The last time I looked, they were priced at £49. There again, I might throw caution to the winds and splash out some cash. Well, you can't take it with you to the afterlife.

Ray Howes G4OWY
Weymouth

Next Month

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



THE FACE BEHIND THE CALL: Roger Dowling G3NKH profiles TV weatherman Jim Bacon G3YLA.
REMOTE STATION: John Warburton G4IRN shares some ideas about how to set up and operate a remote station.
A SIMPLE VHF RECEIVER: Steve Macdonald G4AQB revisits an old favourite, but with modern-day components.
TWO FOR THE ROAD: Dr Bruce Taylor HB9ANY describes a versatile pair of 144/432MHz mobile transceivers.
CW BANDPASS FILTER DESIGN: The second and final part of this feature by Alpar Cseley HA8KT.
PREPPERS: Joe Chester M1MWD continues his preparations for the end of the world as we know it!

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

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4.9

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Like our service? Why not leave a review?
https://uk.trustpilot.com/review/www.hamradio.co.uk

Can we really get any better?

Magnificent again today
Magnificent again today (Saturday staff) with Tony and the staff coping with everything thrown at them with great humour and kindness. Customer service remains KING. Many thanks.
73 Mark
Date of experience: *15 July 2023*

Great service and very fast delivery of Equipment
Great service and very fast delivery of the equipment I ordered. Will be using the company again.
Date of experience: *12 July 2023*

Amazing company and proud to have partnered with them
I have just returned safely from the Expedition to Rockall. My team put out a request for a SW radio to ensure I had essential comms for the mission and Marin Lynch and sons immediately responded to the call with the offer of a radio for the mission. Myself and my team are forever in their debt, in the knowledge that their utmost concern was for our welfare and safety. Thanks team. Cam Cameron VR FRGS Rockallexped.com
Date of experience: *20 June 2023*

Super-fast delivery
This company has seriously fast delivery!!!!! Great products at great prices. Always use them because of this. I don't understand why other companies take so long to deliver.
Date of experience: *18 June 2023*

Nice people to deal with
Nice people to deal with. Richard was really helpful on the phone, and my new radio turned up next day, very well packaged.
Date of experience: *06 July 2023*

The crew always seem to deliver what you want
The crew always seem to deliver what you want, when you want it. I needed some Messi and Palloni Coax - my local emporium does not stock it .
Date of experience: *18 June 2023*

Wide range of stock, good website easy...
Wide range of stock. Good website. Easy to order, prompt acknowledgement and speedy delivery. Thankyou
Date of experience: *18 June 2023*

Excellent service yet again
Made another purchase from Martin and his amazing staff. Nothing was too much trouble and from ordering to the goods arriving at my house - 24hrs - now that's service and quality...well done guys.
73s G7WBB
Date of experience: *12 June 2023*

Good welcome, John on counter very good
Very good stock of items allways good quality. My favourite Ham Store. Hard working team and very helpful.
Date of experience: *16 June 2023*

Hello, I went into Martin Lynch today...
Hello, I went into Martin Lynch today with all my second hand gear. I was welcomed by John Jenkins, who was so nice, kind and professional - we had a lovely chat. Went through the whole process regarding my radio gear and printed out separate invoices for me and will keep me informed on progress all this was done with a smile. The shop was fantastic I had seen it on YouTube but when you go inside and see the shop it's highly impressive and the staff are so nice. Martin Lynch the owner, you should be very proud of your team.
Kindest regards
Paul in Orpington
Date of experience: *26 May 2023*

Good Ham Radio Retailer
New to the hobby, get good advice and good quality, delivery always straight forward and swift, and only one issue resolved without problem. And I really like the weekly video clips and past videos.
Date of experience: *04 June 2023*

Great customer service at ML&S
Great shopping experience with the guys at ML&S, who know their Trade. Fast speedy next day delivery and my new Radio was well packed. Indeed, special thanks to John Power who helped me with all my sales and going the extra mile by setting aside my two items for my new radio, Thanks John!
All in all, a very pleasant shopping experience with Martin Lynch & Sons. So much so I will be back! Recommended Radio online shop.
Date of experience: *05 May 2023*

Speedy service and item very well packed
I've used Martin Lynch and Sons a few times, they have always been extremely helpful in answering questions and giving advice. My most recent order was for a very delicate bit of kit and I don't think I've ever received a parcel better packed.
Date of experience: *10 August 2023*

One more very happy customer
The team at Hamradio looked after my best interests throughout, I had a problem with my computer that left me ending up with two order's running, only one paid for, the team pick this up and contacted me to confirm my wishes were met. The dispatch and delivery times were second to none as was the information that kept me up to date with the progress of my order. Combine all that with a very competitive price and what was not to like. Well done team, you have one more very happy customer that doesn't mind spreading the word.
Date of experience: *19 July 2023*

Fantastic service
Sent my radio to ML and sons for repair. Communication with store was excellent both in main store and workshop. The problem with my radio was diagnosed & sorted by Matt who also called me to explain the actual problem. The price for their technical expertise was very fair. Radio was delivered back next day working absolutely perfect just like a new radio. Thank you ML&S for fantastic service.
Date of experience: *04 August 2023*

Thank you!

A big thank you to all our many thousands of customers worldwide. Without you, we wouldn't be where we are today.

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Point your camera to this, the only QR Code for Ham Radio you'll ever need, it takes you directly to our web site!

Of course. There's always room for improvement.

73 from our team: Martin, Dan, Henry, Tony, Gary, Steve, Tia, John, Denise, John P, Kim, Richard, Matt, Chris, Karamjit, Mark, Jan, Paul, Manu & Kelvin.

Fig. 1: An *Emitron* television camera positioned at *Apsley Gate* for the 1937 Coronation. Fig. 2: An advertisement in April 1937 for the *Murphy All-Wave Set*, manufactured in time for the Coronation. Fig. 3: The revolving mechanical 'BBC-1 Cymru' Globe Symbol, radiated in Wales during the Eighties. Fig. 4: One of the most popular programmes on BBC Scotland between 1958 and 1967 was *The White Heather Club*, hosted by Andy Stewart. Fig. 5: Swiss radio programmes for schools were introduced in November 1932. Fig. 6: All Swiss broadcasting installations were guarded and under the control of the military during World War II.

to do justice to the occasion. If the cameras had been placed, for example, at the northern face of Wellington Arch, the sun would have been directly in their lens, which would have ruined everything.

Vintage coronation wireless equipment

This month's stray through vintage copies of dusty newspapers and magazines has yielded an advertisement by *Murphy Radio* for their latest 'All-Wave Set', which was produced in time for the 1937 Coronation, **Fig. 2**.

The text has been left in its original format to reflect the spelling, grammar and punctuation of the time. This is the full description of *"The new Murphy All-Wave Set"*, originally featured in an advertisement dated 16 April 1937:

"The new Murphy ALL-WAVE SET

We're late....but we've got a good excuse!

WE WON'T MAKE SETS WE WOULDN'T BUY OURSELVES

Here is the first Murphy All-Wave Set. A lot of people (particularly our dealers) will say "And about time too". But please don't suppose that we have been sitting around doing nothing, while everybody else has produced all-wave sets. We know that plenty of people like listening to stations on the other side of the globe, but unless they have a good set they are not likely to enjoy themselves very much once the novelty has worn off. Whatever people may say, reception on the short-wave part of a set is not as good as on the medium and long waves. There is much more background noise. (Some of the "hailstorm" effects are magnificent.) And to make matters a bit worse, tuning on the short-wave section - even for an expert - has been very tricky.

In the new Murphy we have done two things - greatly reduced the background noise - and by converting short-wave stations electrically into medium-wave stations, made tuning very much easier. This new set costs £15. 10. 0. I know that you can buy all-wave sets for a pound or two less, but if you do, you must not expect as good results. You might also pay a good many pounds more and fare a lot worse. It was a great temptation to rush into production when we saw other firms selling all-wave sets, but I am very glad now that we did not.

E.J. Power

THE NEW MURPHY ALL-WAVE SET

SHORT WAVES MEDIUM WAVES LONG WAVES

13.9 – 50 METRES 200 - 550 METRES 900 – 2,000 METRES

Reproduction better than previous table sets.

New easy tuning on Short Waves. Short-wave stations are converted electrically into medium-wave stations, and are tuned in the normal way – a great improvement on any mechanical "vernier" devices.

New Alphabetical Tuning Scale. Long and medium-wave stations in alphabetical order.

Cathode Ray Indicator, showing when you are exactly in tune.

Noise Suppression between Stations. Extremely high sensitivity, but less interference, particularly on Short Waves.

Cabinet in highly polished figured light and dark Walnut.

£15. 10. 0

A.C. OR D.C./A.C. MODEL

Other models include Mains Table Sets at £11. 10. and £8. 5.

Battery models at £10. 15 and £6. 10.

HIRE PURCHASE TERMS AVAILABLE ON ALL MODELS

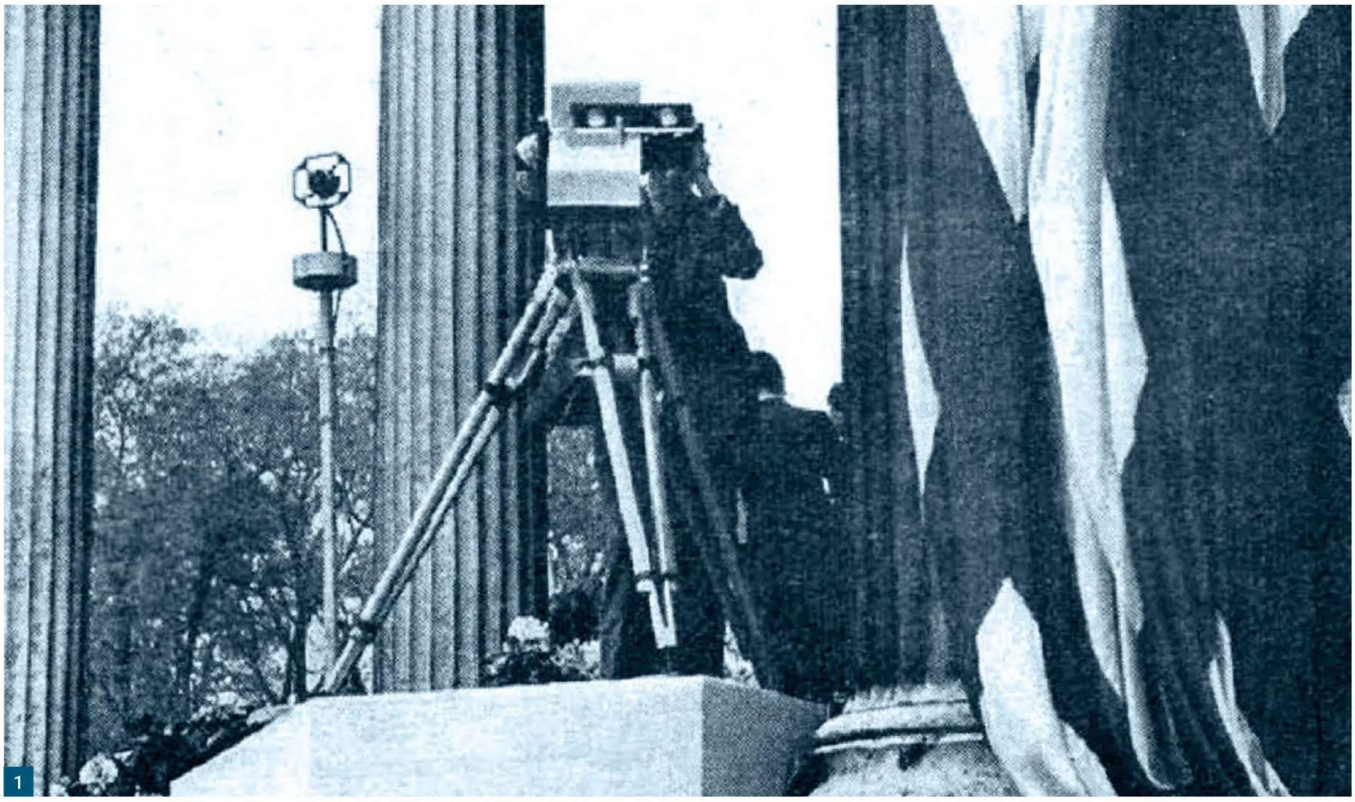
All Murphy sets, exclusive of valves and batteries, guaranteed for a year. Prices do not apply in I.F.S.

Murphy Radio Ltd., Welwyn Garden City, Herts. Telephone: Welwyn Garden 800."

The initials 'I.F.S.' in the advertisement refer to the *Irish Free State*. This was established as a dominion of the British Empire in December 1922.

Murphy Radio Limited was established in Welwyn Garden City during 1929 by **Frank Murphy** and **Edward Power**. The former left the company during 1937 and went on to begin another company called *FM Radio*. He died in 1955, aged 65. A profile of Edward Power was featured in the September column.

Murphy Radio played an important role during World War II, designing and manufacturing radio sets for use by the British Armed Forces. One of their most notable productions was called



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BBC coronations, (Pt VI)

This month, **Keith Hamer** and **Garry Smith** continue the special series looking back at the BBC's coverage of Coronations since 1937. There is also a Coronation vintage wireless advertisement from the archives, including details of Murphy Radio's war-time productions. Also featured is the continuing saga detailing 100 years of BBC Scotland-Alba, plus the concluding instalment about the BBC Cymru-Wales Centenary. We also continue the series about the development of Swiss Radio and Television since 1922, turning our attention to the start of broadcasts to schools in 1932 and military intervention during the War.

Keith Hamer
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Garry405625.gs@gmail.com

For the Coronation of **King George VI** and **Queen Elizabeth** in 1937, the BBC deployed three 'optical-electrical' *Emitron* television cameras. This was half the total number that they actually owned. They were positioned each side of *Apsley Gate*, **Fig. 1**. The monument, featuring scroll-topped columns, was designed by **Decimus Burton** and built between 1826 and 1829, using Portland stone.

One camera was positioned approximately five feet above pavement level and captured the whole of the procession in close-up (about six feet away) as it approached. The second camera, about ten feet above ground level, was used for 'setting the scene' with mid-shots of the crowd and the procession until the latter approached up to about ten yards. The third camera was used to follow the procession as it disappeared into *Wellington Arch* on *Constitution Hill*. The cameramen could hear the main description on headphones. The speed and accuracy in synchronisation between sound and vision depended to a great degree on the initiative and technique of the men behind the three cameras.

Frederick Grisewood provided commentary as the Royal procession approached through *Hyde Park* and passed through the gate. Post Office engineers were responsible for connecting Hyde Park Corner, *Broadcasting House*, and *Alexandra Palace* by means of a special coaxial cable. A section from the control position in Hyde Park to *Stanhope Gate* was an offshoot from a pre-existing experimental underground circuit of cables, which were planned to link up the maximum number of likely sources of programme events within Central London. Great reliance was placed by the BBC on the direct coaxial cable connection with the Alexandra Palace transmitter. However, as a stand-by, there was also a van equipped with an ultra-shortwave transmitter for feeding the programme to Alexandra Palace. There was a certain amount of anxiety among engineers a few weeks before the Coronation because the control van and the transmitter were not completely ready for delivery! A certain amount of additional time was also necessary in order to complete experiments to fully test the system.

Apsley Gate was chosen as a prime camera location because it was one of the few places that combined a number of important technical characteristics. The afternoon sun had to be behind the cameras, and preferably on the subjects to be televised. The selected site had to allow close-ups because of the small receiver screen, so that at least one camera would be within six feet of the procession and, if possible, at the same level as the windows of the Royal coach. The cameras had to be close to the control van and stand-by transmitter, certainly no further than a hundred yards. The television engineers had to be remote and safe from a huge crowd so that the apparatus could not be inadvertently put out of action. The view of the procession had to be as extensive as possible

David Harris
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Gerald Marcuse G2NM

David Harris reviews a new book that covers the life of pioneer radio amateur Gerald Marcuse G2NM.

Gerald Marcuse (1886 -1961) was an early pioneer of amateur shortwave radio. He was the first person in the UK to make radio contact with South America, Australia and California. He was born in Surrey to a wealthy family of seed merchants who were of German origin. Gerald obtained the equivalent of a degree in engineering and became a sales engineer for Rushton & Proctor, a Lincoln based firm of steam engine manufacturers. His early working life was spent travelling the world installing steam engines in many countries, including Mexico, Russia and Turkey. While in Turkey he witnessed the massacre of Armenians, which he writes about in his journal which is reproduced in full as an appendix to this book.

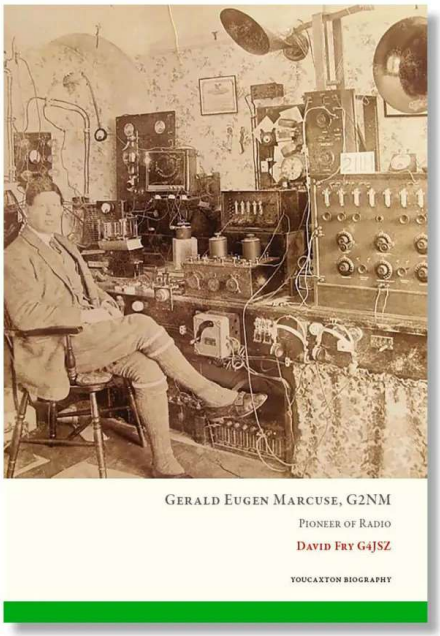
Although Marcuse was a mechanical engineer by profession he had also studied electrical engineering and became interested in the science of radio. He obtained his first experimental amateur radio licence in 1913. In 1920 he moves to Caterham, Surrey where he is licensed as 2NM. He spends a lot of money on radio equipment and aerials as he starts to explore the possibility of long-distance radio transmission using the shortwave bands. At that time the regulatory authority, the Post office, did not feel that these bands had any future for radio communication. In 1923 he left engineering to join his father's London based seed merchants. This may have given him more time at home to pursue his radio experiments, which in 1924 enabled him to make the first radio contact between the UK and California.

Gerald was active in promoting shortwave amateur radio to the global radio community and was made manager of the British Isles by the American Radio Relay League (ARRL). In 1925 he became vice-president of the newly formed International Amateur Radio Union, which is still going strong today with a membership of 172 national radio societies. In 1925 he pulls off an amazing piece of communication by making contact with a lost expedition of explorers who were 1000 miles up the Amazon in Brazil. The American Hamilton-Rice expedition had been presumed lost until Marcuse made contact with them early one January morning in 1925. This was also the first radio contact between the UK and South America.

As well as pioneering shortwave for amateurs Marcuse wanted to broadcast programmes of entertainment on short wave. In 1932 the BBC started the Empire Service, which broadcast programmes in English to the colonies but Marcuse began experimental broadcasts of music and speech in 1927. These broadcasts were picked up in Australia and generated some publicity. He continued them until 1928 despite opposition from the Post Office. In 1929 he becomes President of the Radio Society of Great Britain (RSGB), which was founded in 1913. He is also a founder member of the Reading and District Amateur Radio Club (RADARC). They published a pamphlet about the life of Marcuse in 2013, which can be read on their website:
https://tinyurl.com/syh8vbmf

During the Second World War, Marcuse, like many radio amateurs, becomes a Voluntary Interceptor who monitored German radio signals and transcribed them before sending them to Bletchley Park for assessment and decoding. He is also involved in monitoring German naval traffic from ships based on the south coast of England where he works as a member of the Royal Observer Corps. Marcuse was fluent in German so his radio and language skills must have been invaluable. He was also involved during WW2 in advising the police and ambulance service on radio communications.

He retired from the family seed merchants in 1942 and in 1944 moved to the West Sussex village of Bosham, which is on Chichester Harbour where he was to live until his death in 1961. He helped to set up a local fire brigade in the village and for many years was both a District and County Councillor for Chichester and West Sussex.



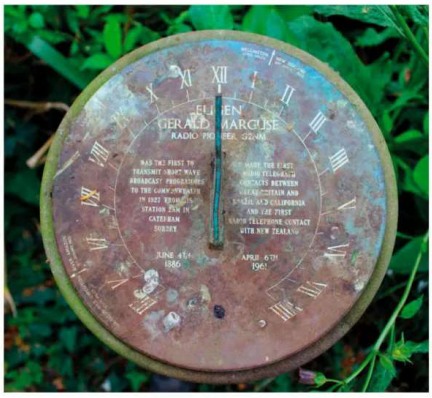
Gerald Eugen Marcuse G2NM, Pioneer of Radio
by David Fry G4JSZ.
Youcaxton. 2023. 298 pp. Pbk. £16.
ISBN 9781915972125
www.youcaxton.co.uk

This book is more than just a conventional biography as it includes a catalogue of resources relating to the life of Gerald Marcuse. The author has made extensive use of the Marcuse archive, which is held at Amberley Museum, West Sussex. This vast open-air museum has around 50 display areas, including a Radio and TV Exhibition, BT Connected Earth centre, an old telephone exchange plus many transport, engineering and craft areas:
www.amberleymuseum.co.uk

Among the many resources found in the book are transcripts of interviews Marcuse recorded in 1960 with a number of radio amateurs. These interviews take up 37 pages and give a fascinating insight into the early days of amateur radio when amateurs were true experimenters building their own equipment and pushing the boundaries of international communications. This is followed by over 90 pages of summaries of letters Marcuse received between 1923 and 1960, including many reception reports. There is also a 50-page summary of the contents of a scrapbook that Marcuse kept from 1920 onwards.

The book has a full index and contains many good quality photos and images of documents. Marcuse was active as G2NM up until his death in 1961. He is commemorated in the churchyard at Bosham, near Chichester, West Sussex, where one can find a memorial bench and sundial. The bench is just outside the churchyard at its southern end. The sundial can be found at the northern end of the churchyard.

This book would be of interest to anyone who would like to learn more about the early days of amateur radio and how pioneers like Marcuse enabled short wave broadcasting to become the preferred method for long distance radio communication. **PW**



Above The air war in France prompted huge public interest in the RAF's fighter pilots who were perceived as 'glamour boys' and already earning a kudos that only strengthened during the Battle of Britain. On the left is Flying Officer Newell 'Fanny' Orton, on the right, Flying Officer Edgar 'Cobber' Kain DFC, of New Zealand. Kain became the first Allied 'ace' of the war and was awarded the DFC in January 1940. He was killed in a flying accident on 6 June 1940. Orton was shot down on 15 May 1940 and baled out with burns. He was then shot at and wounded by French soldiers and took no part in the Battle of Britain but returned to operations in 1941, being killed in action on 17 September 1941.

Below This photograph of 'B' Flight, 56 Squadron, was taken on 3 September 1939 – the day war was declared. Within three days, two of these men had been shot down by friendly fighters. Seated at front left is Pilot Officer Hulton-Harrop, who was killed. Standing, back right, is Pilot Officer Rose who was unhurt. He was killed in action over France in May 1940.

BATTLE OF BARKING CREEK

On 6 September 1939, RAF Fighter Command suffered its first air battle fatality. However, the tragedy was that it was a 'friendly fire' incident, with Spitfires attacking the Hurricanes.

With Britain's defences at high readiness, and hordes of German bombers expected any time, the RAF's response to perceived threats was on a hair trigger.

With aircraft reported over Essex by anti-aircraft batteries at 06.15, RAF North Weald were notified and duly 'scrambled' eighteen Hurricanes of 56 and 151 Squadrons. Meanwhile, air raid sirens wailed across Essex and Kent and Spitfires of 54, 65 and 74 Squadron were 'scrambled' from Hornchurch.

Exactly what happened next is confused, but suffice to say that both groups of fighters were expecting to meet enemy aircraft. Ultimately, the Spitfires of 74 Squadron attacked the Hurricanes of 56 Squadron before the mistake was realised. Two of the Hurricanes were shot down.

Pilot Officer Montagu Hulton-Harrop was killed while Pilot officer Frank Rose made a safe force-landing in his damaged fighter. Meanwhile, anti-aircraft guns opened fire on the Spitfires of 65 and 74 Squadron damaging one of the 65 Squadron aircraft.

It was a debacle with tragic quences which became 'The Battle of Barking Although Pilot O the incident fighter ca shot d

The Battle of Britain

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- Display is not included. The image is shown with an optional third-party external display that may be connected using a DVI-D digital cable.

* Photo shows the FT-710 AESS

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Air Chief Marshal Hugh Caswall Tremenheere Dowding, C-in-C, RAF Fighter Command, 1940.

The Battle of Britain IN COLOUR

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Welcome

The Battle of Britain will forever hold a special place in the collective memory of the peoples of Great Britain and her Commonwealth and was also a battle which saw the participation of airmen from no less than 15 nations, including the occupied countries of Europe. It was also a battle on which national survival depended if Germany was to be held at bay and prevented from launching any invasion and occupation of the British Isles. Indeed, such was its significance that it is unique in being the only battle of either of the world wars which has its special commemorative date set in the British calendar: Battle of Britain Day, the event marked on the nearest Sunday to 15 September each year with commemorative events and church services.

As a battle, it was perhaps caught up in the national psyche more than any other because it was fought out in the skies above Britain – and principally over the south east and London – and in full view of the British public. Certainly, the population had been exposed to relatively limited attacks by Zeppelin airships and aircraft during the First World War, although this was the very first occasion on which the British public were so much on the front line, bystanders to the greatest aerial assault that the world had yet seen. From their grandstand view of the battles which unfolded above their heads, so the public's admiration of the RAF's fighter pilots grew and was nurtured. In fact, it would be true to say that this admiration grew to adulation and hero worship as the battle progressed. This was, perhaps, increasingly the case as a realisation dawned that these young fighter pilots were seemingly all that stood between potential defeat and the catastrophe of invasion. Not only that, but as bombs began to fall on Britain in an increasing tonnage, so the RAF's fighter pilots were pretty much the only effective defence to counter the assault by the Luftwaffe's bombers. Thus, they were rightly perceived as the saviours of the nation and defenders of the people.

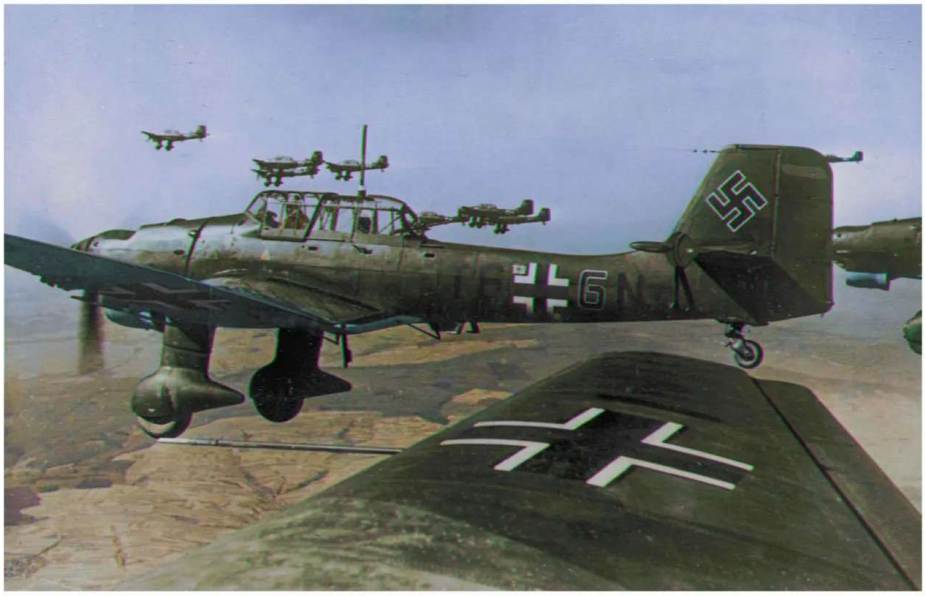
Eighty years on, and there is every reason to still remember with gratitude the sacrifices and the endeavours of the pilots of RAF Fighter Command during that momentous summer of 1940 and to honour their memory. Of course, the Battle of Britain has been remembered by a grateful nation across the decades and through all manner of commemorations, memorials, books, films and TV programmes. Frequently, photographs from the Battle of Britain will have been seen across many years and will be widely familiar. However, for the most part at least, these images will have been in black and white and it has often been said that our perception is almost that both world wars were fought in black and white. Now, in this unique publication, we bring you an entirely fresh view of that battle as its narrative is told through digitally colourised photographs from 1940. These colourisations have been professionally created by using references to known colours and markings of the period and by scientific evaluation of shades and tones on the original images.

I hope you enjoy this unique look at the Battle of Britain in its 80th anniversary year through a publication which is presented as a tribute to the young men of RAF Fighter Command, Churchill's revered 'Few'.

Andy Saunders
Editor, Battle of Britain in Colour

The Battle of Britain IN COLOUR

INSIDE THIS COMMEMORATIVE PUBLICATION



Left A Hurricane of 501 Squadron starts-up for an operational sortie at Betheniville, France, May 1940. Air Chief Marshal Hugh Dowding argued successfully against further wastage of the home-based RAF fighter force by sending yet more fighters to France to bolster a futile defence.

Right As the unstoppable juggernaut of German military might advanced across Europe, the deadly Junkers 87 Stuka dive-bomber came into its own. However, the RAF quickly learned how to deal with the aircraft, and this stood them in good stead when facing the Stuka during the Battle of Britain.

Below right Panzer IV tanks roll across France in May 1940. The German advance was rapid and overwhelming, and within six weeks France had collapsed and the BEF were evacuating from Dunkirk.

sand in an hour-glass' and he predicted catastrophe if Churchill continued to help the failing ally. Thus, he sent a letter to the Air Minister on 16 May 1940, which may well have saved Fighter Command, and ultimately Britain, in the nation's darkest hour. He wrote:

"I have the honour to refer to the very serious calls which have recently been made upon the Home Defence Fighter Units in an attempt to stem the German invasion on the Continent ... I would remind the Air Council that ... my strength has now been reduced to the equivalent of 36 Squadrons ... I must therefore request that as a matter of paramount urgency the Air Ministry will consider and decide what level of strength is to be left to the Fighter Command for the defence of this country, and will assure me that when this level has been reached, not one fighter will be sent across the Channel however insistent the appeals for help may be.

"I believe that, if an adequate fighter force is kept in this country, if the fleet remains in being, and if the Home Forces are suitably organised to resist invasion, we should be able to carry on the war single handed for some time, if not indefinitely. But, if the Home Defence Force is drained away in desperate attempts to remedy the situation in France, defeat in France will involve the complete and irremediable defeat of this country."

It was a hard-hitting letter, but Dowding's words had their effect and while the French still asked for more fighter squadrons to be sent to France, such appeals were rejected. However, further squadrons of Hurricanes were deployed over France, but they remained based in the UK.

Losses Mounted

At around the same time, another momentous decision was undertaken by making Lord Beaverbrook Minister of Aircraft Production. Aircraft production had in fact kept pace with fighter losses incurred during the Battle of France. Soon, production would outstrip losses. Thus, the availability of fighters would not become a limiting factor in the air defence of Britain.

However, by 1 June 1940, the RAF had lost 436 fighter aircraft and almost all its light bomber force of Fairey Battles, along with a considerable number of its Bristol Blenheims. However, RAF Fighter Command at home continued to operate over France as the situation worsened.

In a matter of six weeks, France collapsed entirely. Now, it only remained for British forces, and some units of the French army, to evacuate via Dunkirk in what was Operation 'Dynamo'. RAF Fighter Command at home continued to be called into action, covering the evacuation from Dunkirk and other French ports. Inevitably, their losses mounted. Meanwhile, the battered and depleted RAF units that had been based in France were withdrawn to Britain. Here, they were re-equipped where necessary, and manpower shortages made good so far as possible. Meanwhile, RAF Fighter Command readied for what was to come. Certainly, the Battle of France was over. The Battle of Britain was about to begin.

Immensely Powerful

Dowding had mentioned the possibility of invasion as early as the middle of May 1940, but by the end of that month the possibility had been turned into what appeared to be probability. If Hitler was to impose his will on the British people, then he could apparently only do so by crossing the English Channel and dictating his terms from Westminster. To

CONTRIBUTORS

Richard J Molloy

The colourisation artist for this project was Richard J Molloy who specialises in the digital colourisation of historic images. His particular interest is with military subjects and he is a regular art contributor to Iron Cross magazine, also published by Warners Group Publications Plc.

Using research based on known colours, and sometimes using period colour charts, Richard constructs accurate representations of period images. His evaluation of those images is often carried out through forensic research, requiring background investigation to properly represent the image being coloured.

This piece of work on the Battle of Britain is Richard's largest single project to date, and is work of which he is justifiably proud.

Samples of Richard J Molloy's work may be viewed by searching:- @colourbyRJM

Andy Godfrey

The aircraft colour profile artwork for this publication was by Andy Godfrey of the Teasel Studio.

Andy specialises in bespoke profile artworks for publication and commission.

Working from his studio near Hastings, East Sussex, his work draws on an extensive reference collection, gathered over five decades, a deep fascination with aircraft and specialist knowledge of colours and markings.

For enquiries:- teaselstudio@yahoo.co.uk

Acknowledgements

A number of individuals have helped in the production of this commemorative publication. In no particular order of merit, they are: Chris Goss, Rob Pritchard, Col Pope, Simon Parry, Winston Ramsey, Sarah Warren, Kate Pierce, Nicholas Pierce, Mark Fisher, Mike Fisher and Richard Paver.

The Battle Looms

The Battle of Britain was one of the most iconic battles of the Second World War, embedding itself indelibly into the nation's consciousness. Earlier, the Battle of France could easily have spelled defeat before the air battles got underway in July 1940.

After the outbreak of war in September 1939, there followed eight months of what became known as the 'Phoney War'. However, it was clear that large-scale fighting would ultimately follow, and a British Expeditionary Force was sent to France before the end of that year. As part of that BEF, a large Air Component was supplemented by an Advanced Air Striking Force. In total, these air forces amounted to 25 squadrons, six of which were Hawker Hurricane-equipped fighter squadrons. The remainder of the RAF force in France comprised largely light bombers and Army Co-Operation squadrons. Eventually, however, the 'Sitzkrieg' became the 'Blitzkrieg'.

On 10 May 1940, German forces launched their all-out assault on France and the Low Countries and what followed in Belgium, the Netherlands etc. was the complete collapse of those countries under the overwhelming might of German military power. Across France, German forces rolled inexorably onwards towards the English Channel and while the French and British tried desperately to stem the advance, so the situation became ever more hopeless.

Predicted Catastrophe

When the fighting had broken out in earnest on 10 May 1940, aircraft of the Air Component were in almost constant combat, and losses had to continually be made good from squadrons based in Britain. The Commander-in-Chief of RAF Fighter Command, Air Chief Marshal Hugh Dowding, had already stated as early as September 1939, that if he was expected to defend Britain's skies, then he would need 52 fighter squadrons. At that time, he had only 32 under his command and was told it would be impossible to produce the number he required. However, efforts would be made to provide him with a further eight.

During the fighting in France, increasing numbers of fighter squadrons were sent across the Channel, urged on by desperate appeals from the French Prime Minister, Paul Reynaud. Dowding saw his resources 'slipping away like

Leader of the 'Few'

Air Chief Marshal Hugh Dowding is rightly given credit for not only preparing Britain's air defence system which ultimately brought success in the Battle of Britain, but also in his brilliant leadership of RAF Fighter Command during that battle.

Air Chief Marshal Hugh Caswall Tremenheere Dowding was born in Moffat on 24 April 1882, and educated at St Ninian's School and Winchester College. He trained at the Royal Military Academy before being commissioned in the Royal Garrison Artillery in 1900.

Promoted to lieutenant on 8 May 1902, he served with the RGA before becoming interested in aviation. Gaining his Aviator's Certificate in 1913, he attended the Central Flying School,where he was awarded his wings. Although added to the Reserve List of the Royal Flying Corps, Dowding resumed his RGA duties.

In August 1914, he joined the RFC as a pilot on 7 Squadron and was promoted to Major in 1915. In 1916, having been promoted to temporary lieutenant colonel in 1916, he was given command of 7 Wing at Farnborough, transferring to command 9 Wing in France in June. Returning to England, he was promoted to temporary colonel on 1 January 1917, as commander of Southern Group Command, and became temporary brigadier-general in June 1917, before commanding Southern Training Brigade in August. Sent to York as chief staff officer in April 1918, he was made Companion of the Order of St Michael and St George in January 1919.

Dowding was given a permanent commission in the RAF in August 1919, with the rank of group captain, commanding 16 Group from October 1919 and 1 Group from February 1920. Promoted to air commodore on 1 January 1922, he was appointed Chief Staff Officer for RAF Iraq Command in August 1924.

In May 1926, Dowding was director of training at the Air Ministry and made a Companion of the Order of the Bath on 2 January 1928, being promoted to air vice marshal on 1 January 1929.

He became Air Officer Commanding Fighting Area, Air Defence of Great Britain, in December 1929, joining the Air Council as Air Member for Supply and Research in September 1930. He was promoted to air marshal on 1 January 1933, and advanced to Knight Commander of the Order of the Bath on 3 June 1933.

Above Removed from command in November 1940, Dowding maintained an interest in his 'dear fighter boys'. Here, in bowler hat, he is flanked by participants in the Battle of Britain outside the Air Ministry on the 1942 anniversary of the battle.

The 'Dowding System'

In July 1936, Dowding was the first commander of the new RAF Fighter Command, conceiving the 'Dowding System' of integrated air defence. He also introduced modern aircraft into service during the pre-war period, including the Spitfire and Hurricane. He was promoted to air chief marshal on 1 January 1937, and became Knight Grand Cross of the Royal Victorian Order in January 1937. Due to retire in June 1939, Dowding was asked to stay on until March 1940 because of the international situation, and was again permitted to continue through the Battle of Britain until November 1940.

In 1940, Dowding, nicknamed "Stuffy", was unwilling to sacrifice aircraft and pilots in the Battle of France, resisting requests to weaken home defence by sending precious squadrons to France.

Beyond the system of integrated air defence, his major contribution was to marshal resources (including replacement aircraft and aircrew) and maintain significant reserves while leaving subordinate commanders' hands free to run the battle in detail.

Dowding was known for humility and great sincerity, and was characterised as caring for his men, with their best interests at heart. He referred to his fighter pilots as his "chicks": indeed, his son Derek was one of the 'Few', a Spitfire pilot with 74 Squadron.

Because of his brilliant preparation of air defences, and prudent management of resources, Dowding is given large credit for victory in the Battle of Britain.

Dowding was made Knight Grand Cross of the Order of the Bath in October 1940. He unwillingly relinquished command on 24 November 1940, but was elevated to the peerage in June 1943.

Post war, he developed interests in spiritualism and was a leading anti-vivisectionist. In 1969, in the film *Battle of Britain*, he was played by Laurence Olivier.

He died in Tunbridge Wells on 15 February 1970. His cremated remains were buried beneath the Battle of Britain window in Westminster Abbey, recognising the unique place he held in ensuring Britain's survival during the Second World War. ■

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