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XHDATA cleverly combine a compact portable with a Bluetooth music player

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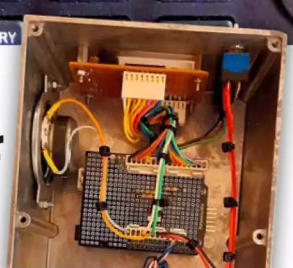
Examining recent advances in ATC communications.

Radio Nostalgia

A look back at some of the BBC's wireless equipment.



PRACTICAL Designing an HF Audio VSWR Meter

We describe how to build this handy Amicus-based SWR meter with audio.

CONTEST This Year's 144MHz QRP Event

Everything you need to know about this ever-popular *PW* contest.

RALLIES & EVENTS

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PA144-432-19-3-2CBP	7 el / 12 el	£226.95
PA144-432-21-3BP	7 el / 14 el	£219.95
PA144-432-13-1.5A	5 el/9 el 1.5m boom	£139.95
PA144-432-34-6-2CBGP	11 /23 el 2 conn	£369.95
PA144-432-38-6BG	11 / 28 element	£299.95

2M Yagis

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PA144-6-2A	6 el 2m boom	£129.95
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Keylines

Not much operating for me this past month, but I did get in some socialising by way of a trip to the Yeovil QRP Convention in Sherborne. I went specifically to see **Tim Walford G3PCJ** who has promised to write one or more constructional articles, based on some of the kits he sells. I'm very much looking forward to that. But I was pleased to see several other old friends, not least **Tex Swann G1TEX**, *PW*'s past Technical Editor, who still lurks in the background tidying up some of the drawings and circuit diagrams for us. Also **Colin Redwood G6MXL**, he of our *What Next* column and also our indefatigable contest organiser and adjudicator. And several other occasional contributors, too, as well as plenty of regular readers of *PW*. All in all, a very worthwhile trip out.

PW 144MHz Contest

And talking about the PW contests, this issue sees the publication of the rules for our 40th 144MHz (2m) QRP Contest. 40 years – wow! This one obviously has enduring popularity although Colin has reduced the duration this year by one hour but I do hope many readers will make a point of coming on to mark this very welcome anniversary.

This Month

Unfortunately (or perhaps fortunately as I have plenty of material!), a number of promised items have had to be held over to next month's issue. Please bear with us – all will appear in due course! But I hope you find this month's selection of articles to be of interest. There are a couple of constructional features, an antenna article, a review and our usual selection of regular columns. I know long-time readers probably still miss **Harry Leeming G3LLL's** features and, of course, we all lament the loss of **George Dobbs G3RJV** and his regular *Carrying on the Practical Way* articles. George was, of course, a stalwart of the G-QRP Club and I am delighted to see the club still carrying on with its excellent magazine *SPRAT* (now under the editorship of, yes, past *PW* Technical Editor Tex G1TEX) and offering supplies of the otherwise hard-to-get components. Some great constructional articles in the magazine too – it's nice to know that home construction remains popular among this particular group within the hobby.

A Correction

Phil Moss M3PBM writes, *"Dear Don, I must apologise to* PW *readers for a 'Senior Moment'. In my article on the Eddystone 730/4 (March 23* PW*), I managed to send the picture of the front of an Eddystone 680. It even says so in the top right-hand corner of the front panel. My thanks to* ***Alan Crookes G8UCN*** *who via the Editor let me know.*

Because my 730 had been so badly botched, I thought it more informative to send a picture of an unmodified one but then confused it with the 680, which I have also written about, though not published. Seems the original showing what people do to poor sets would have been better. Again, my apologies to readers and thanks to Alan."

(And my own apologies too – I should have spotted that one!)

Rallies and Conventions

With COVID behind us I had expected Rallies and Conventions to be very well attended, with everyone wanting to be out and about again and meeting old friends. Sadly, the opposite seems to be the case, with numbers still down on those experienced pre-COVID. This even seems to apply to many club meetings, with some clubs still offering Zoom attendance as an alternative to being at meetings in person.

As we move into summer, with more events scheduled, I do hope many of you will support them or the organisers may think twice about repeating them in the years to come. And the same applies to supporting your local club. Our hobby can all too easily encourage staying at home in the shack but face-to-face interactions are so much more rewarding in terms not only of socialising but also exchanging ideas, helping one another with technical problems and so on. I recently gave a presentation to the Bristol RSGB Group and it proved to be a great evening, with plenty of chatting and a few beers to help the process along.

Martin Lynch

Finally, I mentioned last month that **Martin Lynch** was in hospital (for a bypass operation) so I am delighted to report that it was successful and Martin is making a good recovery.

Don Field G3XTT
Editor, *Practical Wireless* Magazine

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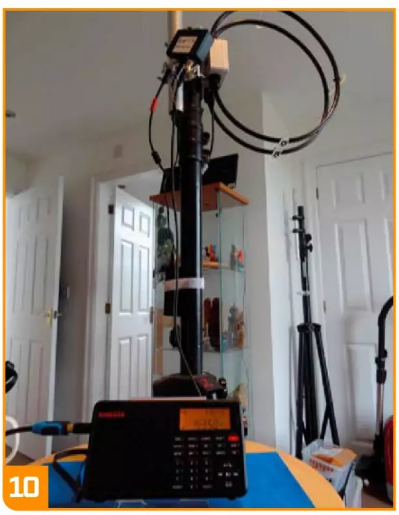

Newsdesk

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

Caister Marconi station contacts more than 150 radio amateurs

Radio amateurs at Caister Lifeboat in Norfolk managed to contact more than 150 other radio amateurs on Saturday 22 April when they took part in the annual International Marconi Day (IMD) event to mark the inventor's birthday.

Using the call GB0CMS and a mixture of Morse code, telephony and data (FT8), contacts were made across the UK and Europe.

Notable contacts were with other IMD stations at GB0IMD Brean Down in Somerset, where Marconi set a new distance record of 14km (8.7 mi) for wireless transmission over open sea in 1897; GB0MGY, which commemorated the ill-fated *RMS Titanic*; and GX0MXT in Chelmsford – the home of Marconi's original factory.

The Norfolk Amateur Radio Club (NARC) ran the all-day special event station at Caister Lifeboat to commemorate the village's original Marconi Wireless Station, which was established at Caister in 1900. The station was in a house in the High Street known as Pretoria Villa and its original purpose was to communicate with ships in the North Sea and the Cross Sands lightship.

NARC public relation officer **Steve Nichols G0KYA**, who organised the event, said: *"Everyone enjoyed themselves and we had some interested visitors as well.*

*"It was good to talk to **Ian VK3MO** in Australia, who was actually our first contact. He has a massive antenna so it was relatively easy.*

"We made contacts with other radio enthusiasts all over Europe using speech, Morse code and a the highly efficient FT8 digital mode that Marconi could have only dreamed of. We never used more than 180W of power, and often just 100W – about the same as an incandescent light bulb. Our thanks go to Caister Lifeboat again for letting us set up the station."

The photo shows **Mark Ribbands** (right) **M0UMG** and **Mui Tsun M0MUI** operating GB0CMS.

PERSONALISED HAM GIFTS: Our regular contributor, Daimon Tilley G4USI recently purchased a laser cutter/engraver and began to experiment with radio related signs and coasters. Feedback from friends and local clubs led him to set up a website (below) and to have a stand at the recent Yeovil ARC QRP Convention selling his wares. Daimon offers an individual service and a range of slate and wooden radio signs and coasters, the full range of which is on the website. He particularly welcomes contact from clubs who may wish to consider personalised coasters for members with the club logo and individual callsign – with no minimum order. An example of a club coaster on slate is pictured.
www.thehamlaserguy.uk

OFCOM PLAN OF WORK: Ofcom has published a statement on its proposed Plan of Work for the year 2023 to 2024. The statement describes plans for a review of amateur licensing arrangements. According to the document, consultation on the work is planned for the first quarter of the year. A subsequent statement is scheduled for the fourth quarter of the year. Once more details are available, the RSGB will review the consultation and provide guidance to UK amateurs on how to respond to Ofcom. You can read the statement in full on the Ofcom website:
https://tinyurl.com/ynesdj8x

RSGB APPOINTMENTS: Following the RSGB AGM on Saturday 15 April, a brief Board meeting was held to consider necessary appointments. The Board was aware that Stewart Bryant G3YSX, who had been in a dual role since the recent resignation of Richard Horton G4AOJ, had expressed a willingness to continue as Chair if required. It was agreed that Stewart should be co-opted to the Board under the terms of Article 37 and was asked to join the meeting. He was then elected unanimously to serve as Chair until the 2024 AGM. In the election for President there was only one nomination received so John McCullagh

Stewart Bryant G3YSX

John McCullagh GI4BWM

MBE GI4BWM was elected unopposed for a two-year term. John's term of office began at the AGM. The RSGB and we at *PW* would like to wish them well in their roles.

13 COLONIES SPECIAL EVENT 2023: G4EUZ, the Durham and District Amateur Radio Society (DADARS) is privileged to be participating again as one of the bonus stations in the hugely popular 13 Colonies Special Event. The special callsign GB13COL has been issued and will run from the club station 1 July 1300UTC to 8 July 0400UTC. The primary focus will be the HF bands, along with VHF, UHF & Satellite for QSOs using SSB, CW, FM, and various digital modes.
The 13 Colonies event began in 2009 as a way of celebrating American Independence with the original 13 colony States circa 1776. Since the UK was a major historical player in the Revolutionary War, GB13COL will present an added positive flair, historical significance and a challenge for radio amateurs to contact. This event has rapidly become the premier on-air activity in North America and beyond. During 2022, there were over 267,335 QSOs logged.
2023 QSL cards have been kindly sponsored by Canny Components. A warm thank you to Amanda & Davey for this.
Ken Villone KU2US (K2A operator) is the creator and manager of the event. Every year there is a different certificate theme for amateurs who make contact with either one or all participating stations, including the bonus stations. Ideally, amateurs taking part aim to get a 'clean sweep' of all 13 stations: K2A (NY), K2B (VA), K2C (RI), K2D (CT), K2E (DE), K2F (MD), K2G (GA), K2H (MA), K2I (NJ), K2J (NC), K2K (NH), K2L (SC), K2M (PA), plus WM3PEN, GB13COL & TM13COL operating as bonus stations. Contacts made will be endorsed on to the certificate along with your own personal callsign.
For UK QSL requests, please supply a Stamp Addresses Envelope to QTHR GB13COL.
www.13colonies.us

BERNIE GODFREY G4AOG. AMATEUR RADIO EXCHANGE 1927-2023 RIP: Martin Lynch G4HKS reports, *"My dear friend and Guvnor for almost 50 years has finally passed after reaching the age of 96. He is survived by his wife and business partner* ***Brenda Godfrey G4VXL*** *(ex G8SXY).*
"A sad time for Amateur Radio, but looking back, if you were into the hobby in the seventies and eighties, then chances are you'd bought something from Amateur Radio Exchange or A.R.E as they become.
"Bernie and Brenda were the mavericks and market disruptors in the retail section of the industry and that's where I learned a lot joining them full time in 1980. They helped to smash the price fixing cartels that were so prevalent at the time and became the leading amateur radio suppliers for licensed operators in the UK.
"I'll miss Bernie for all his advice and sense of humour. His body may have finally given up on him, but his brain was a shining laser guided light right up until the very end.
"RIP my friend and mentor."
Here is a link to the page dedicated to Bernie on the ML&S website:
www.hamradio.co.uk/bernie

GB0WYT: On 14 April 2023 a team from the Huntingdonshire Amateur Radio Society (HARS) assembled for the purpose of putting on Special Event Station GB0WYT for the RAFARS Airfields on the Air event at Royal Air Force Wyton, Cambridgeshire.
The team made 130 contacts across the HF, VHF and UHF Bands using SSB, FM, CW and Data modes, working into Scotland, Wales, Ireland, England, Belgium, France, Germany, Italy and The Netherlands. Conditions on the HF bands were very good during the day using the trusty full-sized G5RV antenna and Icom IC-7200.
HARS is a friendly radio Club with a wealth of radio and cyber knowledge among its membership. It has a face-to-face meeting once a month at Buckden Village Hall with a Zoom meeting also taking place once a month further information can be found at:
https://hunts-hams.weebly.com

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 25th April 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**

14 May
BRAEHEAD RALLY (RAYNET UK): This Rally is being run by Raynet-UK.
www.braeheadradiorally.com

21 May
DUNSTABLE DOWNS RADIO CLUB ANNUAL NATIONAL AMATEUR RADIO CAR BOOT SALE : Stockwood Park in Luton. This is the 38th year without a break (bar COVID) that this event has been run. All the usual facilities will be there. Further details on:
www.ddrcbootsale.org

21 May
RETROTECHUK (HOSTED BY THE BRITISH VINTAGE WIRELESS SOCIETY): Sports Connexion, Leamington Road, Ryton-on-Dunsmore, Coventry, CV8 3FL. Large annual vintage technology fair, with up to 200 indoor stalls. Private sellers, clubs and dealers offer vintage items, including radio, television, hi-fi and audio, vinyl & 78's, gramophones, telephones, communications equipment, spare parts, and much more. General admission is £10 for 10.30 am entry *(early entry [9 am] is £25)* (BB | FP).
jezzer3@hotmail.com
Tel: 07799 110 080
www.retrotechuk.com

28 May
DURHAM & DISTRICT ARS RADIO RALLY: Bowburn Community Centre, Bowburn, Co. Durham DH6 5AT. Doors open from 10.10 am to 2.30 pm with disabled visitors gaining access at 10 am. Admittance is £2. (BB | CR | SIG | RSGB | TS)
Tel: 07826 924 192
dadars@gmx.com

4 June
SPALDING RADIO RALLY: Holbeach Utd. Youth FC, Pennyhill Rd, Holbeach, Lincs, PE127PR. Doors open at 10 am. Disabled access from 9.30 am. Admittance £3. The organisers look forward to welcoming you all again this year for the usual excellent rally, lots of local attractions to make the journey worthwhile for all the family (CB | CR | FM | TS).
Tel: 07754 619 701
rally2023@sdars.org.uk
https://sdars.org.uk/spaldingrally

10 June
ROCHDALE & DISTRICT AMATEUR RADIO SOCIETY (RADARS) SUMMER RALLY: St. Vincent de Paul's Hall, Norden, Rochdale, OL12 7QR. Doors open at 10 am with the entry fee still only at £3 (CR | FP).
rozallin@gmail.com
dave@cardens.me.uk

11 June
JUNCTION 28 RALLY: Alfreton Leisure Centre Bowls Hall, Church St. Alfreton, DE55 7BD. Trader Bookings are now being taken. Opening at 10:15, traders will have access from 08:00. Everything is indoors. £12.00 per table (all provided) admission is £3.00 per person. As usual, we will offer 100 tables for traders, including dealers, manufacturers, and large and small suppliers providing new and used equipment, from vintage and military to the latest technology, including SDR; TV; DX; HF; VHF, and Microwave. Lots of components, tools and accessories, from tiny capacitors through chips, cables and connectors to large antenna masts, plus books and magazines.
Local and national or specialist clubs represented, RSGB, RAIBS, G-QRP, BR ARS, etc. so there is something intended for everyone. There were more than 400 visitors last year. For a booking form, location map, and so on, see the URL below:
www.snadarc.com
secretary@snadarc.com

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

18 June
EAST SUFFOLK WIRELESS REVIVAL (IPSWICH RADIO RALLY): Kirton Recreation Ground, Back Road, Kirton IP10 0PW (just off the A14). Doors open at 9.30 am, and the entry fee for visitors is £3. Trade tables are from £10. B4SWR HF station. Contact Kevin G8MXV: (BB | CBS | CR | FP | RSGB | SIG | TS)
Tel: 07710 046 846
www.eswr.org.uk

23-25 June
HAMRADIO FRIEDRICHSHAFEN
https://tinyurl.com/nf8cwuep

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

2 July
BARFORD NORFOLK RADIO RALLY: Barford Norfolk Radio Rally Barford Village Hall & Green, Barford, Norwich, NR9 4AB. Opens 0900 (traders from 0800) featuring trade stands, car boot sales, bring and buy, raffle, repeater groups, catering and free car parking. Entry £2.50 per person / under-16s free. Outdoor large pitches £8 (no need to book), indoor tables £10 each (booking essential). (BB | CBS | CR | RF | TS)
radio@dcpmicro.com
www.norfolkamateurradio.org

16 July
MCMICHAEL RADIO RALLY (RADARC/ BBRC/ BARC): Co-organised and hosted by the Reading and District Amateur Radio Club (RADARC), Burnham Beeches Radio Club (BBRC), and Bracknell Amateur Radio Club (BARC). Entry from 9 am (traders set up 8 am). Entrance fees have been kept to last year's rates of £3 per person and £10 per table for traders. No Dogs other than assistance dogs are allowed on the events field.
rally@radarc.org
traders@radarc.org
https://mcmichaelrally.org.uk
Facebook: McMichaelRadioRally
Instagram: @mcmichael_radio_rally
Twitter: @McMichaelRally

23 July
FINNINGLEY ARS RALLY 2023: Belton Rd, Sandtoft, Doncaster, DN8 5SX. Near J2, M180. From 10 am. (CB | CR)
http://www.g0ghk.com

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

6 August
BATC CONVENTION FOR AMATEUR TV 2023 (CAT 23) PART 1: CAT 23 will take place on Sunday 6 August, as a meet-up, show and tell, test and fix it, and bring and buy event, from 10.30 am to 4 pm. There will be full ATV and Microwave test facilities available for QO-100, 5.6GHz FM, Portsdown, Mini-Tiouner, Ryde, and power amplifiers and preamps.

6 August
KING'S LYNN AMATEUR RADIO CLUB 33ND GREAT EASTERN RADIO RALLY: Gaywood Community Centre, Gayton Road, King's Lynn, Norfolk. PE30 4EL. NGR TF638203. Doors open at 9 am. Admission is £2.50. Traders from 7 am, outdoor pitch £8; indoor £10 per table. (BB | CR | FP | TS)
rally.klarc@gmail.com
www.klarc.org.uk

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

Georg Wiessala
wiessala@hotmail.com

1

The XHDATA D-109 Multiband Radio and Bluetooth Music Player

Georg Wiessala takes a closer look at a new world band radio from Chinese manufacturer XHDATA. This small receiver combines the advantages of a small travel portable with those of a Bluetooth speaker.

Many Short Wave listeners, DXers and professional travellers have invested in the XHDATA D-808 world band radio, which has attracted several positive reviews over the last two years or so. The D-808 – also marketed in some countries under the RADIOWOW brand – has become a popular shack companion, not least, perhaps, on account of its provision of Single Side Band (SSB; USB and LSB) reception.

I too had used the D-808 model before, and we covered the radio, and the use of some potential homemade accessories with it, in previous issues of *RadioUser* and on the Radio Enthusiast homepage.

https://tinyurl.com/3uux7uub

The brand-new D-109, **Fig. 1**, under review here, does not, alas, include SSB reception, focusing instead on HF broadcast coverage. However, it doubles up as a wireless Bluetooth player and speaker. This is a very nice touch for a radio of this size. Having said that, this facility appears to be becoming more standard now, with some other models, e.g. by Tecsun (PL990X, 501X), also offering this functionality. And so they jolly well should.

Scope of Delivery and Technical Details

Out of the box, the small portable (ca. 150 x 80 x 30mm) radio weighs in at a mere 288g. It comes with a short, leaflet-style, manual of 14 pages, a rechargeable battery (18650; 2000mAh, 3.7V 7.4Wh), a pre-attached carry strap, and a short USB charging cable. Some of the key technical details are summarised in **Fig. 2**. The manual is here:

https://tinyurl.com/ycxw6kjj

The D-109 covers FM (in Stereo over Headphones, from 64MHz, if adjusted accordingly).

MW is up to 1710kHz. Tuning steps on LW are 9kHz, while on MW either 9 or 10kHz can be selected depending on where you are. Choose 9kHz for Europe. Selectivity for all frequency bands is indicated as 60dB, and there are 100 memory channels, for FM, LW and MW, as well as 300 for SW (Manual, pp. 13/4). This is more than enough I should think.

SW ranges from 1711 to 29999kHz and reception modes are FM and AM.

The simple telescopic antenna is ca. 530mm long. There is a small fold-out stand at the back.

Tuning and Other Functions

The radio can be tuned by direct-frequency entry, without a 'confirmation-key-press'. To get to Classic FM on FM, for example, press '1-0-1-1'; the final '1' tunes directly to the station.

On SW, for instance, and after band selection, '1-5-5-9-0" brings in China Radio International (CRI) straight away. You can, of course, use the tuning wheel (5kHz for SW), the SCAN key (scan-hold is 5 seconds) or the 'SW–' and 'SW+' buttons to move about. It is all very intuitive and ergonomic. The ribbed, plastic, tuning wheel does not accelerate the tuning rate as you move it faster; nor did I expect that it would. The D-109 has a range of alarm, timer and sleep functions, as well as appropriate features for the populating and retrieval of memories. Still, it does not offer a recording function, despite the presence of an SD card slot. So, you cannot directly programme the device to record your favourite regular broadcast for later evaluation. For that, you would have to use your ingenuity and some external equipment.

I think it is a great shame that this functionality, which many DXers would use even as far back as the 1980s, with the most basic of radios/cassette recorders (I used a Grundig Satellit 500/700 for example) has not survived into the modern age, at least not in stand-alone, traditional radios. Why not add a 'Record-to-SD-Now' key? SDRs are a different matter altogether, of course.

The D-109 in Use

I used the XHDATA D-109 largely in the shack at home. It is easy to set up and enjoy in no time at all, and navigating the radio is intuitive. In terms of sound, the thumbwheel volume control produces more than enough volume to fill your room, and for outdoor listening too, if you are camping, touring, and so on.

FM stereo, with head/earphones (not included) at the external speaker output, is fine and full. I connected my favourite bhi passive external speaker and the little radio coped well, producing a nice sound.

I have said this before, but I'll say it again in

Specification

Radio frequency range

- FM: 64-108 MHz / 76-108 MHz 87-108 MHz / 87.5-108 MHz
- LW: 153-513 KHz(9K)
- MW: 522-1620 KHz(9K) / 520-1710 KHz(10K)
- SW: 1711-29999 KHz(5K)

Radio noise limiting sensitivity

- FM: (S/N=30dB): ≥ 2 μ V
- LW: (S/N=26dB): ≥ 10mV/m
- MW: (S/N=26dB): ≥ 1mV/m
- SW: (S/N=26dB): ≥ 18μV

Radio Selectivity

- FM: 60dB
- LW: 60dB
- MW: 60dB
- SW: 60dB

Memory radio frequency

- FM: 100 pcs
- LW: 100 pcs
- MW: 100 pcs
- SW: 300 pcs

- Maximum output power: 2.0W
- Headphone impedance: 16-32 Q
- Speaker specification: 40mm (dual NdFeB 16 core) 4 Ω/5W
- TF card: support : 32 G(Not included)
- Audio playback format: Mp3/ WMA/ WAV/ FLAC
- Bluetooth transmission distance: 10M
- DC: 3.7V (18650) 2000mAh
- DC5V IN:DC5V /1000mA

Skype:radiwow
E-mail:xhdatacn@gmail.com
Facebook:XHDATA
https://www.xhdata.com.cn
Whatsapp:+86 18025193267

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Fig.1: The XHDATA D-109 Multiband Radio and Bluetooth Music Player. Fig. 2: Some of the radio's technical specifications. Fig. 3: CRI on 15590kHz with just the built-in telescopic antenna. Fig. 4: Adventist World Radio (AWR) Africa on 15145kHz, using a long wire and the R.E.C. Electronics balun, built by Keith Rawlings. Fig. 5: The XHDATA D-109 with the Cross Country Wireless (CCW) Double-Loop Active Antenna, which we tested here last month. Fig. 6: Using the XHDATA D-109 with vintage antennas, with mixed results: the Grahn Spezialantennen Magnetic Ferrite Bar Antenna. Fig. 7: The XHDATA D-109 as Bluetooth speaker.

case you missed it – any such small portable radio, if operated at home, will have its sound augmented if you use an active, noise-cancelling or even a suitable passive, external speaker, and the D-109 is no exception.

The same goes for antennas too. The built-in (small-ish) telescopic is OK, but the antenna cannot be brought into a fully vertical position when the radio is on its stand. With just the telescopic, the sensitivity of the radio ranges from acceptable to good. For instance, on the telescopic antenna, the D-109 brought in some of the stronger daytime Short-Wave stations (e.g. CRI, 15590kHz; **Fig. 3**); there were many more after dark and out-of-doors, of course.

When you connect an external antenna to this radio, the internal one is automatically switched down.

I also connected a random length of long wire, terminating in one of the brilliant R.E.C. Electronics baluns made by **Keith Rawlings** (**keith.g4miu@gmail.com**, see elsewhere in this issue, and **Fig. 4**):
https://tinyurl.com/2p97mcub

Doing this, I enjoyed a remarkably clear reception of Adventist World Radio (AWR) Africa on 15145 in French, a station I do not often get during the day here, Fig. 4 again.

I will now take the wire and balun with me on any travels since the improvement over the telescopic is significant.

Fun with External Antennas

I also still have the Cross Country Wireless (CCW) Double-Loop Active Antenna here, which I reviewed in the April 2023 issue of *PW*. The XHDATA D-109 had no problems with that, **Fig. 5**.

Using some older, and more specialised gear, such as my Grahn Spezialantennen Magnetic Ferrite Bar Antennas, Medium Wave reception was acceptable but not outstanding (The antenna in **Fig. 6** is the MW-3, 850-4000kHz model). Here, the XHDATA D-109's inbuilt ferrite won the day; this radio could well make a good

little MW DXers companion.

Overall, if you can hitch up some kind of external antenna, you will be rewarded with enhanced performance.

In other areas, it is the small things that matter. For instance, I did like the fact that you keep the display light on permanently. The bandwidth switch gives you reasonable control over selectivity, appropriate to the purpose of the radio (1, 2, 3, 4, and 6kHz). There is no AFC or SYNC.

The case is made of hard plastic. No environmental credentials here, but a solid enough shell to protect the radio; this inspires confidence that it may well withstand the occasional 'impact-assessment test' (i.e. fall from a great height).

What is nice about this radio is that you can insert a mini-SD card ('TF Card') to play your files. Moreover, with the Bluetooth feature, you transform this radio into a small Bluetooth speaker, which can be controlled from your phone, **Fig. 7**. You cannot, however, stream from the radio back to your external Bluetooth device.

Notwithstanding this, the D-109 makes for a nifty little mini-HiFi setup on your travels – a thoughtful touch from the engineers at XHDATA (see also below, in italics).

In Conclusion

The XHDATA D-109 is a solid little radio of an overall good build. It feels more robust than some of its competitors of the same size. The pocket receiver will appeal to many mobile users and travellers, and those looking, perhaps, for a secondary portable shack radio for HF.

I found that it worked very well and had a good, strong sound, on its own or with external speakers. The bandwidth selection on offer works well on AM, and I liked the MP3 Player and Bluetooth Speaker abilities a lot, they render the radio much more versatile.

The telescopic antenna cannot be brought into a vertical position, but this is a small niggle, there are very few radios in this class which allow you to do this.

The lack of a record-to-SD card facility, in my opinion, weighs more heavily, why have a micro-SD card slot when you can only make use of it for playback?

There is no SSB, AFC or SYNC, and radio mutes when (fast) tuning.

I raised some of the issues above with XHDATA in China and received – within less than 24 hours – the following additional comments (edited excerpts):

"(1) The D-109 is equipped with a Bluetooth transmitter, which can be used as a Bluetooth speaker, but it cannot be used as a device to connect to a Bluetooth headset, only wired headsets can be used.

(2) At present, [the] D-109 does not have a recording function, so the operation you mentioned cannot be achieved, but the suggestion you mentioned is a very good idea, and we have already fed back to our engineers. If possible, this function will be added to future models.

(3) The D-109 does not have SSB, but both D-808 and D-109 have an AFC function because we use a DSP chip, which can complete this function inside the chip, unlike the analogue machines a few years ago that need external processing.

[…] It will automatically mute when the SW is performing quick tuning to avoid annoying noises for users."

Altogether, the XHDATA D-109 represents good value for money. Like all such radios, the astute use of accessories, such as external speakers and antennas, improves matters noticeably, but on its own, much fun can be had with this little receiver. Sensitivity and selectivity on SW range from adequate to good.

My warm thanks to XHDATA, and in particular **Evie** in XHDATA Customer Services, for the kind loan of the review model and for answering my additional questions in lightning-fast time. All photos are by the author. More information from: **www.xhdata.com.cn**

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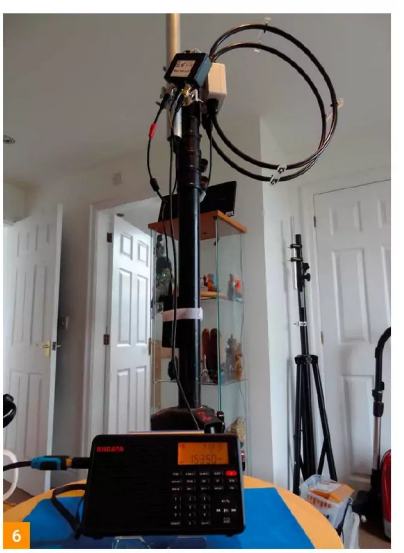
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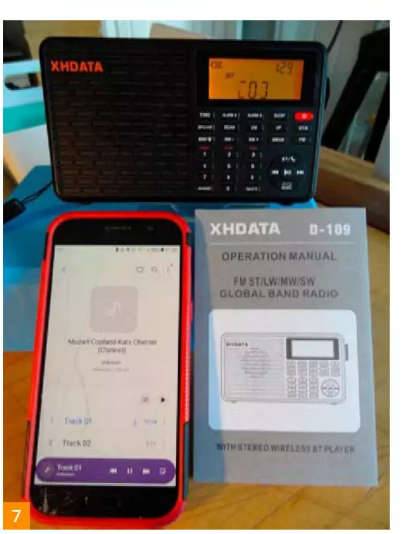

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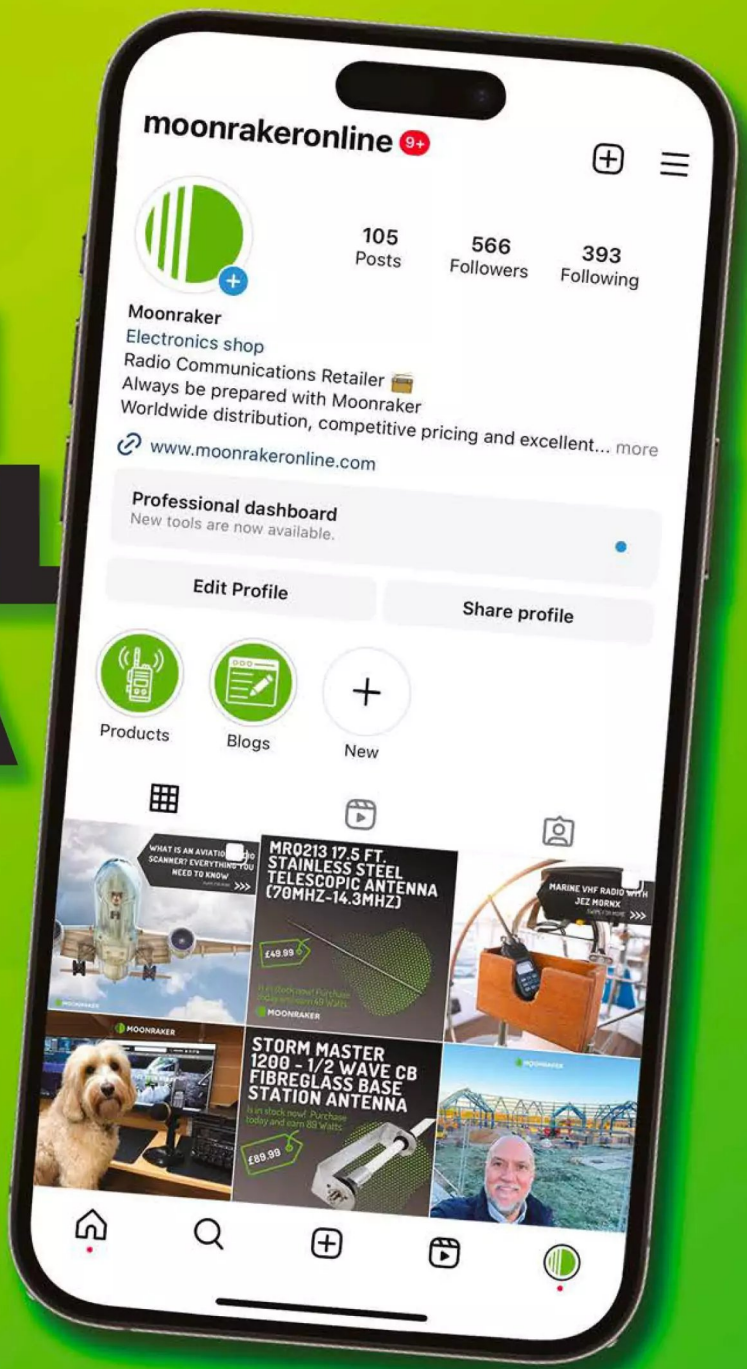

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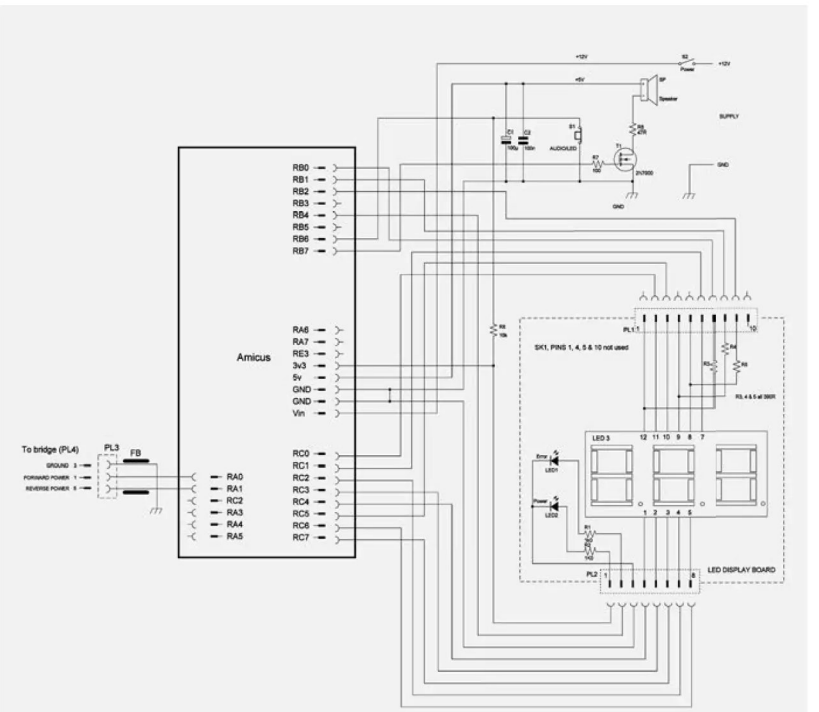

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A Simple Audio VSWR Meter

Ken Ginn G8NDL describes an Amicus-based SWR meter with audio indication.

Ten years ago I decided to design two HF VSWR meters, one with an LCD and the second with an LED bargraph display. With those projects printed circuit boards were manufactured for the sense head and the microcontroller board, which drove the displays. They were successfully built and one meter I have always run with my HF rigs from the shack.

I was asked to consider designing a simple HF audio VSWR meter, and it took me a year or two to actually get around to this project. This design is built around an Amicus development board, which is the PIC version of the Arduino. Programmed in BASIC rather than the Arduino, which is generally programmed in C.

Of the original boards I had one pair of PCBs left and they were begging to be used. However only the remaining sense head PCB was used in this particular project. The rest of the design was salvaged from the junk box with the exception of the three digit seven segment LED display and a can of spray paint.

This project is very simple and apart from the sense head only uses a handful of components. The sense head design shown here need not be followed. An alternative design (a tandem coupler) or a stripline for VHF/UHF, or even built into an existing VSWR meter or integrated into a rig could be used, although I would personally prefer not to do the latter.

This meter is connected in line with the transmitter and antenna and forms part of any normal shack installation. Power to operate the VSWR meter is derived from the shack's 12V DC supply and draws minimal current (less than 80mA). The voltage regulators on the Amicus are both used, the 3.3V regulator supplies current to the microcontroller, whereas the 5V supply supplies current only to the speaker circuit.

Circuit Description

Power is supplied to the Amicus, which uses the Arizona Microchip PIC18F25K20. The board has 3.3 and 5.0V regulators incorporated; both regulators are used as described above. This particular microcontroller works from 3.3V and not 5V, although a different specification PIC can be used in place running at 5V. The Amicus board will accomodate a different PIC utilising a 5V supply.

Two ADCs (analogue to digital converters) are enabled in the PIC and these are used to measure the forward and reverse voltages from the sense head. Within the PIC's firmware the necessary calculations are made to drive the error LED and the seven segment LED display. The latter displays a VSWR reading at and below 9.99:1; this is the default function. Depressing the push button switch S1 redirects the function of the code in the PIC and this runs through a routine that initiates the audio tone generation. The frequency of the tone heard is dependant upon the VSWR measured. A tone frequency of about 50Hz will be heard through the speaker with a VSWR of 1.00:1, and at 9.99:1 the frequency will rise to 750Hz. Above 9.99:1 the tone stops and the alarm LED will flash. The LED display will switch off during the period when S1 is depressed. The tone generated from the speaker is in the form of a square wave. Releasing S1 will enable the seven segment LED display and indicate the VSWR (below 10:1). The audio output is provided by a small 8Ω speaker driven by T1 and with the 47Ω series resistor (R8) in the drain circuit, this gives adiquate tone volume. LED1 indicates a high VSWR, higher than 2.00:1 this LED will remain lit, and above 9.99:1 will flash to indicate a value measured that is out of range.

The seven segment LED display indicating VSWR will not illuminate in receive, since there is no forward and reverse power to measure. Once the transmitter is keyed with a low power set up for tuning purposes (e.g. 5W) the LED display will operate and indicate the measured VSWR. Adjusting the ATU should reduce the VSWR down to an acceptable value. Only the amber coloured LED (LED2) will remain illuminated when the meter is switched on.

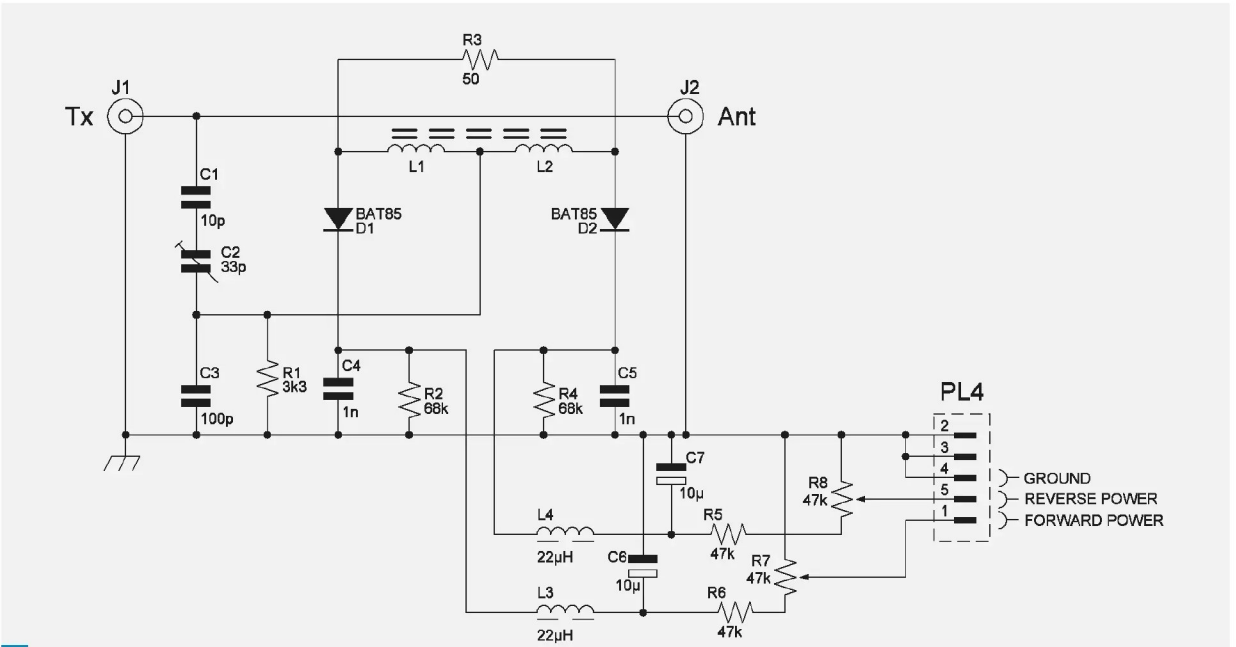
A Word of Warning (Health and Safety)

In this and other projects that I have built, I have always been cautious and generally encase the live parts with some form of screening. In this case the tub part of a diecast box encloses the sense head. Not only does this limit the radiation from the sense head to other parts of the circuit, but also helps to prevent the touching of any live parts.

Construction

The prototype meter is housed in an aluminium diecast box measuring 185 x 120 x 80mm. The principal component schematic is shown in **Figs 1** and **2**. Apertures are cut into the enclosure for the seven segment LED display (LED3), LEDs, switches, connectors, mounting screws and the speaker.

The LED colours were chosen to assist a visually impaired user. A green seven segment display was used to identify the numerical VSWR while the amber LED is there to identify when the meter is powered. The red LED was used to indicate an alarm state; flashing or steady on. All the LEDs were soldered to a piece of stripboard with the tracks running vertically, as shown in **Fig. 13**. S1



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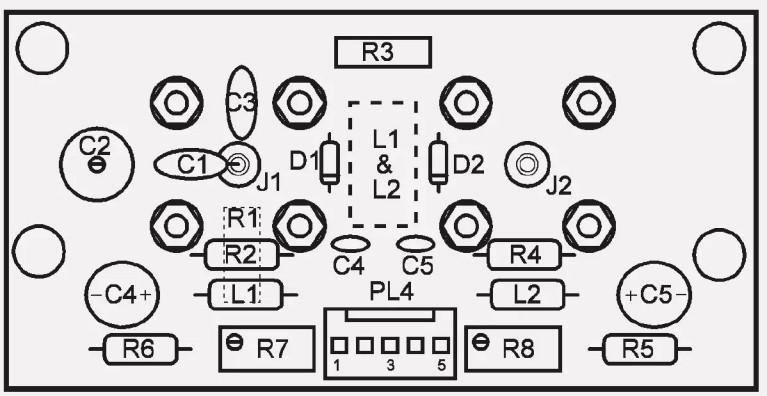

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R1 is a SMD resistor soldered on bottom side of board

Fig. 1: Cicruit diagram of the Amicus board, display and peripheral components.
Fig. 2: sense head circuit diagram.
Fig. 3: Sense head component layout.
Fig. 4. Top side of sense head.
Fig. 5. Track side of sense head.
Fig. 6: PCB tracks shown through from top side of board. Fig. 7: Retaining ring for speaker made from aluminium sheet. Fig. 8: Daughter board component layout. Fig. 9. Daughter board underside view. Fig. 10: Internal view of the completed meter. Fig. 11: Dimensions of the sense head sense line. Fig. 12: Display board circuit diagram. Fig. 13: Display board component placements. Fig. 14: Bottom case view showing principal component placements. Fig. 15: Front of the VSWR meter. Fig. 16: Rear of the meter showing RF and power connection.

has a white button to contrast with the colour of the case. S2, the power switch, is a common small toggle switch.

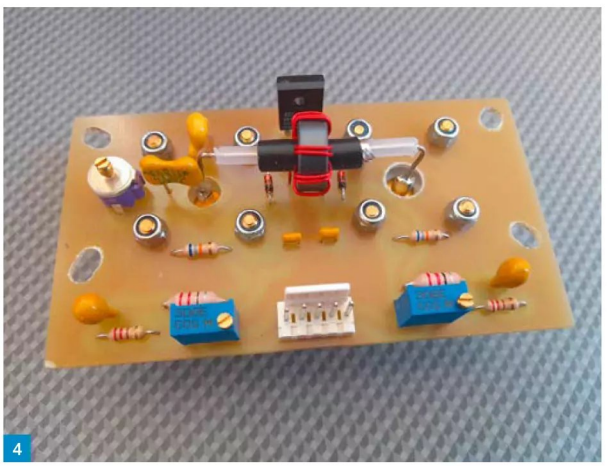
Details of the original sense head assembly are given here for completeness. In this example it was built into a small diecast box, which was mounted on to the PCB. The completed sense head was held in place with an arrangement of M4 screws and nuts. The original tapped holes in the tub portion were tapped out to M4 to allow for longer mounting screws to be used. These fasteners hold the sense head clear of the rear of the case, and secure the tub of the diecast box close to the PCB. The two SO239 sockets were mounted on the track side of the PCB with short 6mm long M3 threaded spacers. The sense head circuit is shown in **Fig. 2**, the PCB component layout and tracks are shown in **Figs 3** and **4**. The specific sense head design shown here need not be used. As mentioned, the PCB shown was a leftover from an old project.

L1 and L2 are constructed with six and a half turns of 0.6mm diameter copper wire bifilar wound on an FT50-43 toroid. The construction of the sense head is shown in **Figs 3**, **4**, **5**, **6** and **11**. A short length of 50Ω coax cable was also used in the construction, the dimensions of this sense line are shown in Fig. 5. R3 is a low inductance type, it does not dissipate high power.

I have adopted a technique of hiding the heads of countersunk screws in some metal enclosures such as diecast boxes. The countersunk hole is drilled deeper than would usually be needed; in such a way that the head is a fraction of a millimetre below the surface of the box. The screw head is also ground down and sits about 0.8mm below the surface. The head of the screw is covered with a small dab of car body filler and sanded smooth. This technique can only be adopted if the screw is initially firmly secured on the inside of the case with a nut or a threaded spacer. The same technique is used to mount the Amicus PCB, speaker and the stripboard LED display. Evidence is covered with a coat of primer and a top coat of paint. Two part epoxy cement can also be used as a filler.

A suitably shaped piece of aluminium is cut and shaped to hold the speaker in place on the side wall of the box, see **Fig. 7**.

A large ferrite bead of unknown origin was found in the junk box and this is used to help re-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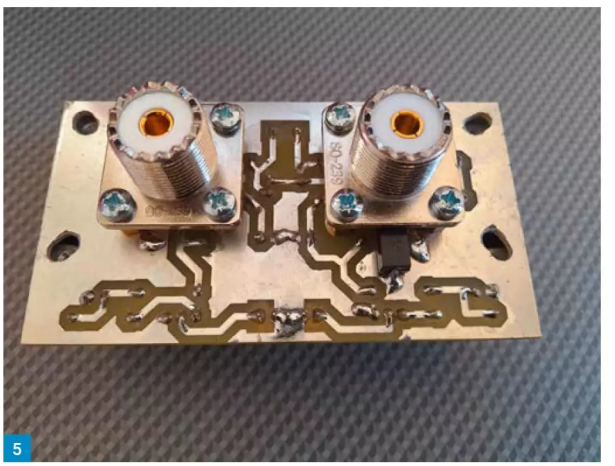
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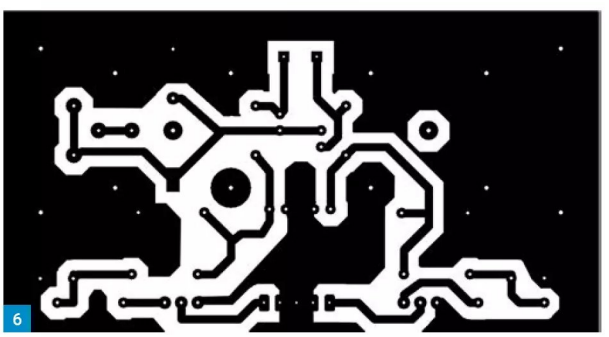
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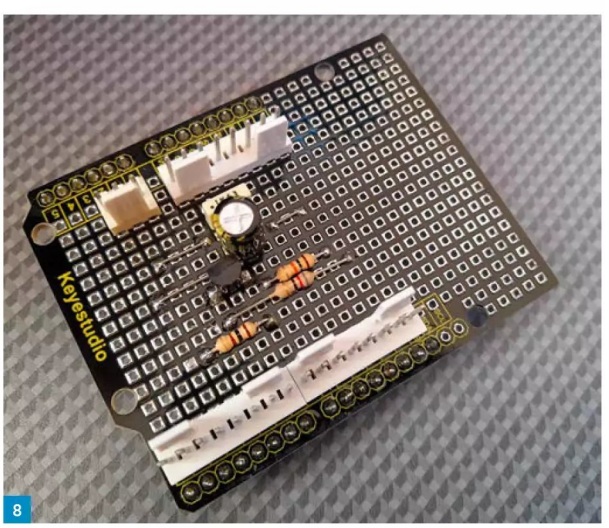

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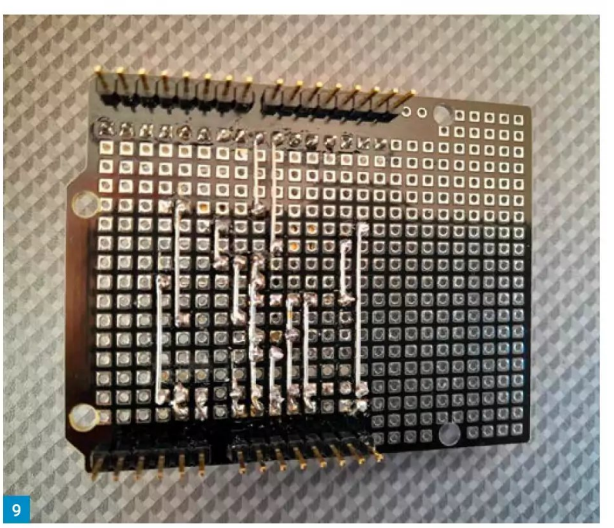
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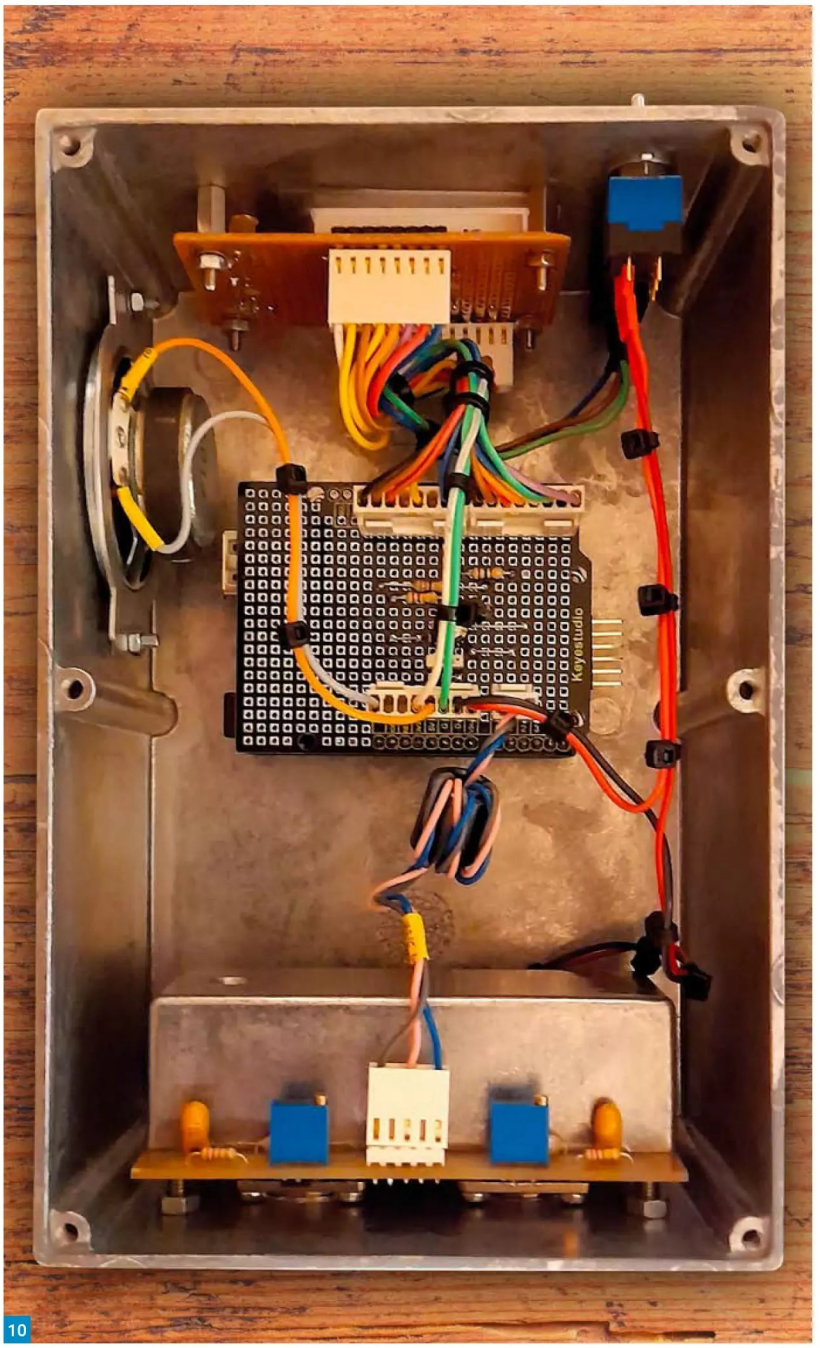
duce any RF being conducted from the sense head to the Amicus board. This ferrite significantly reduced any residual RF being received at the ADC inputs of the Amicus. This lead consists of three turns wrapped around the ferrite bead between the sense head and the daughter board (**Figs 8** and **9**) atop the Amicus.

The Amicus board is mounted to the diecast box on threaded pillars. Above this is a small Arduino prototype board (shown in the photo, **Fig. 10**, with the circuit diagram and component placement shown in **Figs 12** and **13**), which accomodates eight connectors (four above and four below the board), R6, R7, R8, C1, C2 and T1 (2N7000). This board connects to the dislpay board, speaker, switches and the sense head. This prototype board plugs into the Amicus board and forms an intermediate connection and circuit between the microcontroller and its peripheral components. **Fig. 14** shows the placement of the various modules as seen from the bottom of the case.

Calibration

The initial steps here will ensure the operation of the meter is somewhat accurate. Ensure that the sliders of R7 and R8 are set to the hot end. If in doubt, this can be measured with a multimeter reading ohms between ground and the slider of each potentiometer. This is measured at pins 1, 5 and ground pin 3 of the sense head, and should read in the order of 28kΩ. This will ensure an accurate reading while setting up.

With the sense head isolated from the rest of



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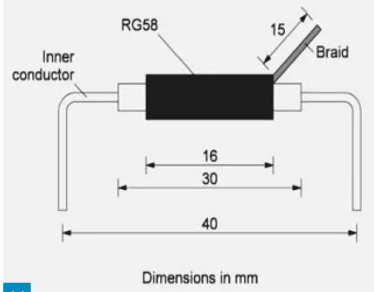

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Components (sense head)

- R1: 3.3kΩ, 3W surface mount resistor
- R2 and R4: 68kΩ, all resistors are 250mW carbon film unless other stated
- R3: 50Ω TO-220 high power resistor (20W)
- R5 and R6: 47kΩ
- R7 and R8: 47kΩ, preset trimmer
- C1: 10pF, 500V disc ceramic
- C2: 33pF, trimmer
- C3: 100pF, 500V disc ceramic
- C4 and C5: 1nF, 63V ceramic
- C6 and C7: 10µF, : 16V tantalum
- D1 and D2: BAT85 Schottky diode
- J1 and J2: SO239 socket
- L1 and L2: See text
- L3 and L4: 22µH: choke

Misc components

- Screws, nuts, spacers, PCB, diecast box, multiway connector (5-way), RG58 etc.

Components (main body)

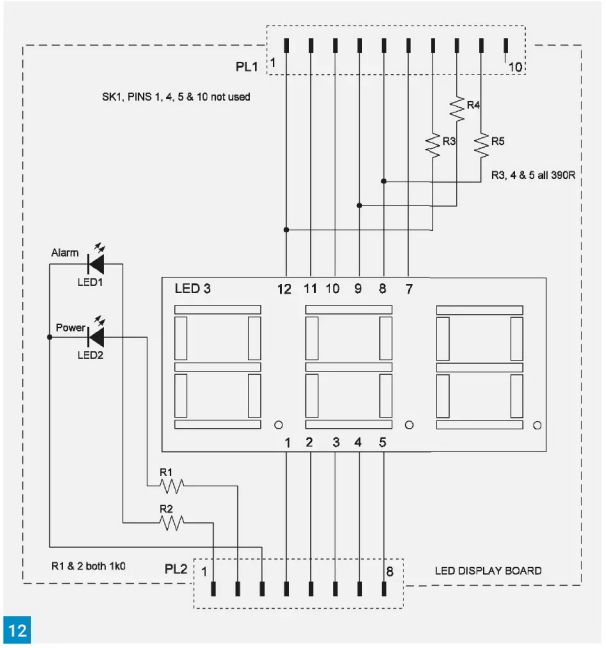
- C1: 100µF, 16V electrolytic
- C2: 100nF, 63V polyester
- LED1: LED red 5mm
- LED2: LED green 5mm
- LED3: TruOpto OSL30561-IG 14.2mm 3 digit green display common anode
- R1. R2: 1kΩ(All resistors are 250mW carbon film)
- R3, 4, 5: 390Ω
- R6: 10kΩ
- R7: 100Ω
- R8: 47Ω
- S1: Push button switch, push to break action
- S2: SPDT miniature toggle switch
- SP: 8Ω Speaker 40mm diameter
- T1: 2N7000

Misc components

- Diecast box, Amicus, screws, nuts, tapped spacers, stripboard, wire, Arduino prototype board, speaker bracket, board connectors, ferrite bead.etc.

the circuit connect a reliable dummy load to the antenna socket J2. Connect an HF transceiver to J1 and a multimeter reading DC volts to pin 5 of the sense head and ground – pin 3. Measure this voltage with the maximum power of the transmitter going through the sense head (100W), I used a signal on 20m. Adjust the trimmer capacitor C1 so that the voltage measured on the multimeter is as close to zero as possible (approximately 1mV measured). It is best to adjust this trimmer with a plastic tool and with the diecast box cover in place.

With the Amicus disconnected from the sense head set the maximum power that can be delivered from the transceiver to the dummy load (in my case 100W), measure the voltage on pin 1 and ground (pin 3) of the sense head. Adjust the trimmer R7 and the reading on the multimeter should be set to 3.0V and no higher with the PIC18F25K20. Take note of this voltage. The maximum voltage that can be tolerated by the ADC inputs to the Amicus board is limited



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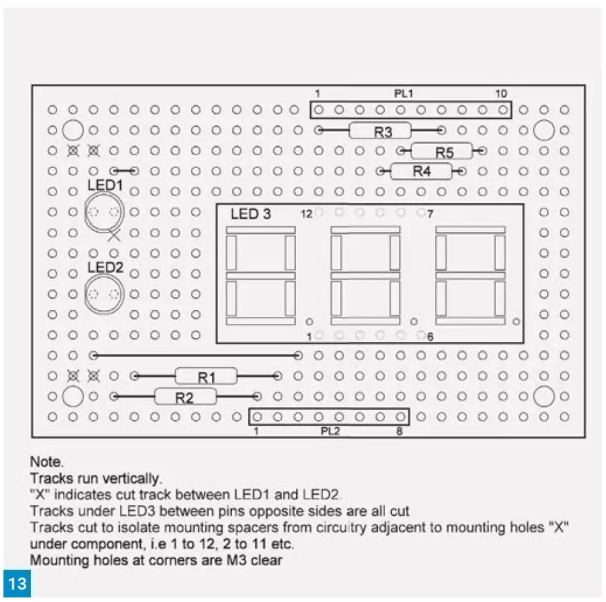

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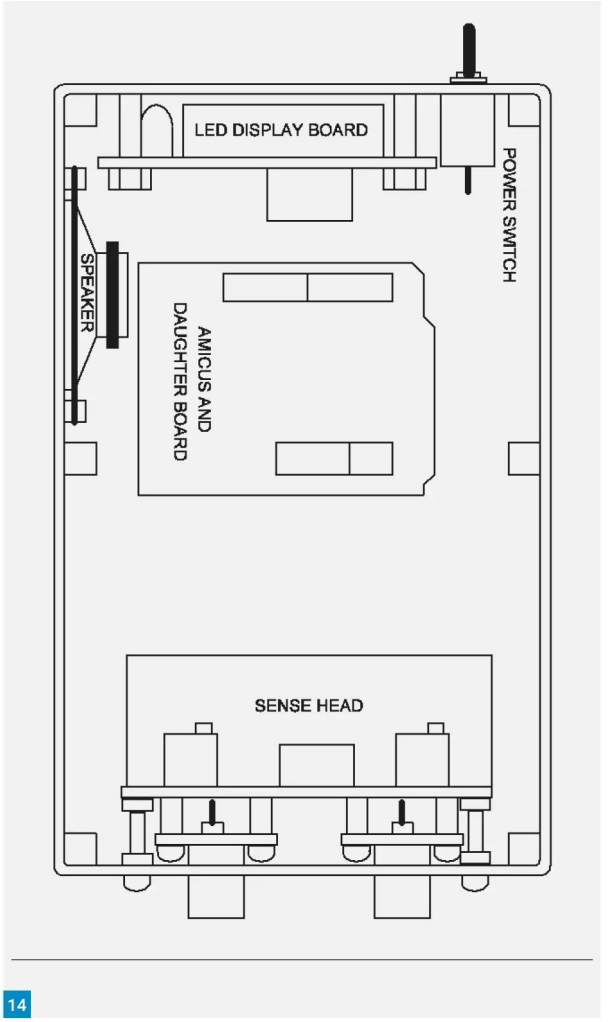

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to 3.3V, so a maximum of 3.0V offers a safety margin.

Connect the multimeter to pin 5 of the sense head and ground (pin 3), again reading DC voltage. Reverse the connection to the sense head of the transceiver and the dummy load. Transmit at the maximum power, 100W, and adjust the trimmer R8 so that the voltage measured is the same as measured in the first instance (within 50mV). Remember the voltage at both ADC analogue inputs should be no higher than 3.3V. Setting R7 and R8 is important because the ADC in the Amicus makes a calculation of the VSWR based on both arms of the sense head being identical. The meter readings will be incorrect if this not set correctly. This concludes the calibration.

In Use

In use I have noticed the LED display will occassionally flicker with the transceiver in receive and only when attached to an antenna. This I have surmised is due to signals being received on the antenna and reaching the ADCs in the Amicus. This seems normal.

When tuning, there are two options, either rely on the LED display or depress S1 and use the audio from the speaker. The higher the frequency of the tone, the higher the VSWR, 50Hz with a VSWR of 1.0:1 and 750Hz with a high VSWR greater than 9.99:1. The output is in the form of a square wave and sounds a little raw, but it gives a good indication of the measured VSWR.

Unfortunately, the paint on the prototype was several shades darker than the colour indicated on the spray can. This makes the viewing of the lettering a little difficult to see.

I have a number of Amicus boards that can be programmed with firmware for constructors to use. The photos, **Figs 15** and **16**, show the front and rear of the finished meter. **PW**

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1

Look For a New One on 4 Metres This Summer

PW's HF columnist **Steve Telenius-Lowe PJ4DX** recently paid a visit to Bonaire's premier VHF operator, Martin PJ4MM

Late last year **Martin Moens PJ4MM** received a special permit to allow him to operate in the 4m and 8m bands. This unique privilege means that, other than a few VP8 stations in the Falkland Islands, PJ4MM is the only station in the Western Hemisphere to be active on 70MHz. With the 2023 summer Sporadic E (Es) season rapidly approaching, Martin hopes to set a whole series of 'firsts' by working UK and other European stations in the 4m band.

On an unusually wet and cloudy day (for Bonaire!) in April, I paid a visit to his impressive hilltop house and station, **Fig. 1**, to find out more about Martin's hopes for this year's Es season, and to learn about his future plans for a 'mega' VHF/UHF/microwave station.

The house is a couple of kilometres off a paved road along a bumpy dirt track, well away from any neighbours and is entirely off-grid. Fresh water is delivered by bowser and all electricity, stored in 56kWh batteries, **Fig. 2**, is generated by 50 x 400W solar panels.

Background

Martin was first licensed as PE1DCY in the Netherlands in 1978 but changed his Dutch callsign to PA4MM shortly before he moved permanently to Bonaire in 2021. His interest has always been with VHF/UHF DX working: he may occasionally venture as low as 28MHz but most of his time is spent on VHF/UHF.

Martin works from home as a datacomms engineer for a Dutch company, with his customers mainly in the USA. His office doubles as his shack, **Fig. 3**, which means he does not get to miss many openings on the VHF bands. He became active as PJ4MM in late 2021 and in his first 18 months of activity has worked 137 DXCC entities on 6m (plus 22 on 2m – no mean feat from here: only eight of those were by 'tropo' – tropospheric propagation – two or three by TEP, trans-equatorial propagation, and the remainder by EME moonbounce).

Special Permit

Once settled in and active on 6m, 2m and 70cm, Martin approached *Agentschap Telecom*, at that time the island's licensing administration (now *Rijksinspectie Digitale Infrastructuur*), to apply for permission to operate in the 8m and 4m bands. As neither band is recognised in ITU Region 2 as an amateur allocation this was by no means a mere formality, but Martin received an early Christmas present on 23 December 2022 when he was granted permission to transmit with up to 50 watts (all modes) between 40.660 and 40.700MHz (8 metres) and up to 100 watts, again on all modes, between 70.000 and 70.500MHz (4 metres). It is a licensing condition that the 4m antenna is fixed on Europe, so as to avoid causing any interference to TV services in Venezuela, only 80km to the south of Bonaire.

4m Possibilities

At the time of writing Martin has not made a single QSO on 4m. This is not really surprising because the nearest stations licensed for the band are well over 5000km distant (and the UK and Ireland are around 7000km away). F2 propagation is unlikely to reach as high as 70MHz, even at the peak of the solar cycle, but Martin is hoping that the 2023 Es season will provide him with contacts all over Europe.

Martin has several rigs he can use on 4m, including a Yaesu FTdx5000 with an HA1YA ME4T transverter, as well as an Icom IC-7300 and an IC-7100. The 4m antenna, mounted on a mast on the side of the house, **Fig. 4**, is an InnovAntennas 8-element LFA Yagi by **Justin Johnson G0KSC**.

Take a look on 70.154MHz using FT8 this summer and you may be the first to contact PJ4 on 4m, or perhaps set a new distance record for the band!

8m Activity

As VHF operators will be aware, there have been frequent openings between the Caribbean and Europe on 50MHz, so it will come as no surprise that Martin has already worked a number of stations down on 40MHz. He uses up to 50W from an Icom IC-7300 to a YU1CF 6-element Yagi on 40.680MHz FT8 (*avoiding* 1400 – 1600Hz), on WSPR (using 1400 – 1600Hz) and on SSB.

In the Republic of Ireland 8m has been allocated as an amateur band although in both the UK and USA operators must hold a special permit to transmit on these frequencies: in the UK this is known as an 'Innovation and Trial' licence. Martin has contacted G9PUV (the callsign of G7PUV's Innovation and Trial licence), GR9B (G0JHC), EI2IP, EI7HBB, EI4GNB, EI23M plus a number of stations in the USA and the few other countries that also have access to the band.

Future Plans

On the higher-frequency bands Martin uses an Icom IC-9700 transceiver. At present the 2m antenna is a 9-element F9FT Yagi while on 70cm he has a single 38-element M² Yagi. On 23cm there is a 23-element F9FT Yagi. All these antennas, as well as Martin's 7-element LFA Yagi for Six, are mounted on a small tower adjacent to the house, **Fig. 5**.

However, Martin has some big plans for the future. He already has a very heavy duty 24m tilt-over telescopic tower concreted into the ground and is currently building H-frames for 6m, 2m and 70cm arrays, **Fig. 6**. The big tower will house four 7-element InnovAntennas LFA Yagis on 50MHz plus four 38-element horizontal and four 13-element vertical M² Yagis on 432MHz.

A third tower, an 18m Versatower, will eventually support an array of four 13-element cross Yagis on 144MHz plus 67-element Yagis for 23cm and 13cm, after which the current tower will be

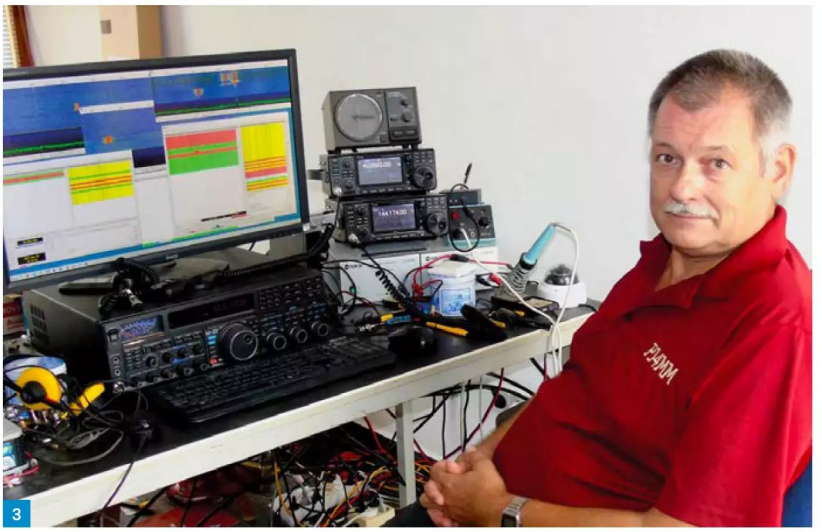

Fig. 1: The PJ4MM station is located well away from neighbours on a hilltop in the centre of Bonaire. Fig. 2: The battery room at the PJ4MM station. Fig. 3: Martin Moens PJ4MM in his VHF/UHF shack. Fig. 4: The InnovAntennas 8-element 70MHz LFA Yagi, beaming at Europe. Fig. 5: Top to bottom: 23cm 23-ele, 70cm 38-ele, 2m 9-ele and 6m 7-ele Yagis. Fig. 6: Martin building the 6m H-frame. In the background the 24m heavy-duty tower.

used for the 8m and 4m antennas, plus a pair of InnovAntennas 17-element Yagis for the ITU Region 2 1.25m (222MHz) band. Looking further ahead there is also talk of a couple of large dishes for the microwave bands.

Summing Up

The Sporadic E season generally starts in May, peaks in June and July, and extends into August (or possibly early September). 4-metre operators in the UK, Ireland and elsewhere in Europe stand a good chance to work Bonaire this summer by keeping an eye on the 70.154MHz FT8 frequency.

I'm sure my colleague **Tim Kirby GW4VXE** would be interested to receive reports of 70MHz contacts with Bonaire for his *World of VHF* column.

My thanks to Martin PJ4MM for his hospitality and for showing me around his impressive station. **PW**

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1

Evaluating Cheap Antennas from eBay (Pt 2)

Keith Rawlings G4MIU continues with his evaluation of the selection of cheap antennas he bought from Chinese eBay suppliers.

Measurements were made using the Chelegance JNCRadio VNA-3G and screenshots of the resulting plots were produced by NanoSaver. Measurements were saved to the VNA-3G itself first and then loaded into the software to produce the images seen here. Specifications given are taken from the sellers listing. For more details see last month's *PW*.

Diamond SuperGainer Mini NR-770-S

This is a dual-band 2m/70cm antenna with 100W power capacity and a PL259 mounting, **Fig. 1**. It measures some 460mm long approximately. The bottom section of the stainless-steel whip has a diameter of 4mm and the top section 3mm.

The base appears to be made from steel and has a label stating that it is a Diamond product that was made in Japan. It has a quoted gain of 2.15dBi

This antenna was sourced directly from China off eBay although it seems the world is swamped with vendors offering this particular design. When it arrived I was very impressed with its construction quality. It felt very sturdy, was well finished and the antenna screwed smoothly onto the magmount demonstrating that the threaded portion was good. It also looked as though it could stand up to the rigours of mobile use.

Overall, it is very solidly built. However, this impression was spoilt somewhat after I touched the loading section in the middle where it promptly fell out of the two mounting holes and onto the floor! This drew my attention to the centre section itself where I noted that the upper and lower parts were not isolated from each other as I would have expected. That is, the element is formed into one solid section and a continuity check with a multimeter confirmed this. This begs the question as to what this circular piece of metal was actually achieving!

I reinserted coil and tightened up the grub screws. I then went over the remaining screws and each needed about a quarter of a turn to secure them.

My next step was to place the magmount with the antenna on the roof of my car and use the excellent VNA-3G to sweep over the range 100-500MHz to get an idea of how well it matched.

The first sweep demonstrated that as supplied the antenna was resonating low in frequency. On VHF minimum SWR was found to be 140.400MHz and on 70cm it was around 420.000MHz.

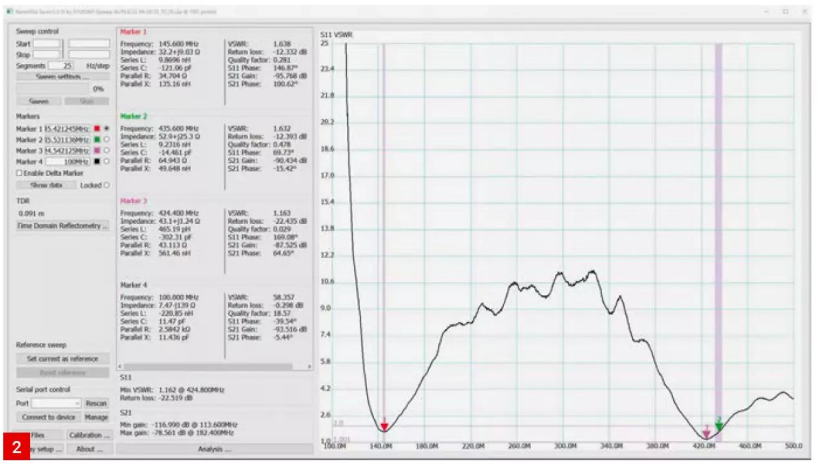
By loosening the two grub screws at the base of the whip I pulled the vertical section out by about 6mm. However, I could now only re-tighten one screw as the element was above the lower screw. I ran another sweep, which can be seen in **Fig. 2**.

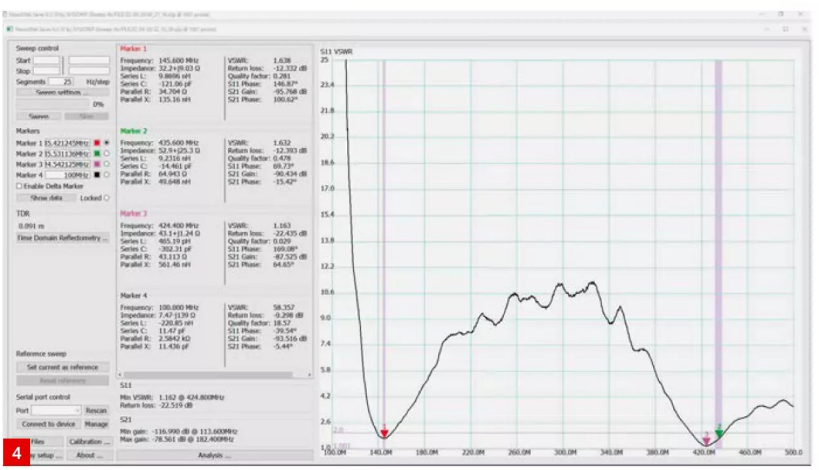
Now the minimum VSWR was 1.6:1 at 145.600MHz and at 433.600MHz the VSWR was 1.5:1 with minimum on the UHF band being 1.16:1 at 424.4MHz.

I then tried a sweep with the coil removed and this presented me with a shift in frequency on VHF of 4MHz high with a slightly less shift on UHF.

I am not sure what, if anything, is in the base of the antenna. There is no DC path between the element and the metal outer of the base.

This I am sure is not a genuine Diamond product. Looking at website pictures from those supplied by reputable UK dealers the insulated section on the base is more squared off compared to the one I have. Nevertheless, I found





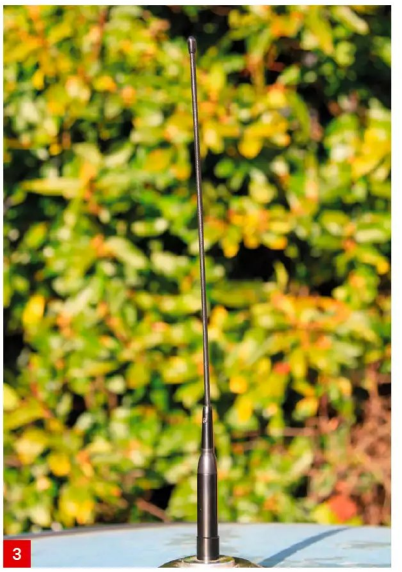


Fig. 1: Diamond Super Gainer Mini NR-770-S.
Fig. 2: NanoSaver VSWR Plot of NR770-S.
Fig. 3: Nagoya NL-R2 Dual-Band 'Flexi' Antenna.
Fig. 4: NanoSaver VSWR Plot of NL-R2.
Fig. 5: Diamond SRH805S 100-500MHz Sweep.
Fig. 6: NanoSaver VSWR Plot of Diamond SRH805S 100-1300MHz.
Fig. 7: 'Stubby Whip Antenna' on car roof.

that in use this antenna worked well enough. It is short and unobtrusive and cheap enough to replace if lost or damaged.

A genuine NR-770S will set you back £30+ in the UK whereas on eBay the model I have can be bought from China for £6.95, including postage but, not having a Diamond item to compare it with, I can't vouch for how it compares with a genuine product.

Nagoya NL-R2 Dual Band 'Flexi' Antenna

This antenna, **Fig. 3**, is almost the opposite of the NR770s in that it is extremely flexible. It has a PL259 mount with an overall length, including the base, of approximately 395mm. The 3.5mm diameter flexi-whip section looks as though it is made from plastic-coated steel and the base may be made from brass, judging by the appearance of the thread.

This model too seems well made with a decent thread on the base but I'm not sure if it is up to prolonged exposure to the 'elements'! It has a quoted gain of 2.15/3.0dB with a power handling of 100W although I don't think I would try it with anything like that power.

Interestingly, when the antenna arrived it had no manufacturer's marking and indeed the plastic case was also unmarked so it was most unlikely to be a genuine Nagoya.

I used the VNA-3G to perform the same measurements using the magmount and the results can be seen in **Fig. 4**. The VSWR on 2m was quite high being 2.76:1 at 145.600MHz with the lowest reading still a rather high 2.6:1 at 149.600MHz. The matching on 70cm was better being 1.55:1 at 434 .800MHz.

This antenna too worked well enough for local contacts using 10W but while mobile I had reports of considerable flutter on 70cm and also when stationary at traffic lights there could be flutter on receive until the antenna stabilised itself. I imagine this may also be the case when used static on a windy day!

A look on eBay reveals that this antenna may be bought from China for £6.50 inc. p&p. However, I could not find a price from a mainstream UK stockist. This antenna would be good for mobile use where there are a lot of low branches! Also, I think that it would be fine when used with a hand portable although an SO239/BNC/SMA adaptor would make it cumbersome.

Diamond SRH805S

This is a short stubby antenna, **Fig. 5**, with a claimed coverage, written on the antenna itself, of 144/430/1200MHz plus wideband receive. Wording on the yellow plastic envelope the antenna was shipped in however claims 120/150/300/450/800/900MHz.

Being only 45mm long and 13.5mm diameter I didn't expect too much from this little antenna. Clearly intended to be used on a handheld transceiver or scanner, it is meant to be small and unobtrusive, which it is.

For this test the VNA-3G was calibrated on its S11 port and the SRH805S fitted directly to the VNA, which was used as if it was a handheld.

The resulting plot may be seen in **Fig. 6**. It seems that this version at least is not suitable for use on 2m as the VSWR is off the scale. 70cm is better at 1.7:1 but at 23cm again the VSWR is 46.4:1.

I tried the antenna out on 70cm and while indoors I was able to open a local repeater, which is about four miles away, using 0.5W although I did not manage to make any contacts.

I found the genuine Diamond version is available in the UK from around £22-23 and from £2.99 including p&p shipped from China on eBay.

A Little Stubby Whip!

I could not resist getting this tiny little antenna, **Fig. 7**. It is a mere 142mm long, including the incorporated magnetic base, and has 3m of what

looks like RG174 cable attached, which is terminated into a female SMA socket.

The eBay listing was advertised as being for use with the Baofeng 888s UV-5R. It has a quoted frequency coverage of 136-174 and 400-520MHz, a gain of 3.0dB and a power capacity of 10W. I wondered if this was a bit optimistic.

I put the antenna onto the roof of a car where the magnetic base gripped it fairly securely, not exactly glue-like but good enough considering its small size.

The VNA-3G was calibrated at its TX port as it was not practicable to gain access to the base of the whip to calibrate from there. The resultant sweep, **Fig. 8**, will show the effects of the cable. Matching on 2m was not as bad as I expected but still very poor returning 4.8:1 at 145.200MHz. 70cm was better returning a VSWR of 2.1:1 at 433.600MHz but still rather high considering most radios require a match of 2:1 of less.

I have not attempted to make any contacts using this antenna but looking at the frequency range of 230-390MHz on NanoSaver the maximum VSWR within this frequency range is 4.4:1 at 230MHz so it may be of use for those interested in Military Airband?

The cheapest price I could currently find for this model on eBay was £4.31. Again, this was from China but it is available from sellers that claim to be in the UK for just a couple of pounds more.

Conclusions

There is a multitude of cheap antennas available from many online sources, not just eBay, but you do get a certain amount of buyer protection on this platform.

I had purchased another longer version of the 'Little Stubby Whip' and when it arrived I found it had been bent double to fit into a little grey plastic bag that was much too small for it and it had broken off at the base. A photo was sent to the vendor and I immediately had my money refunded.

As stated, I do not have any genuine antennas for direct comparison so cannot say how well these cheaper versions stack up. If you are after the genuine article, then certainly buy from an authorised dealer. If, however, you can accept that there may be some degradation in performance, or you may wish to experiment, then these 'knock offs' might offer good value.

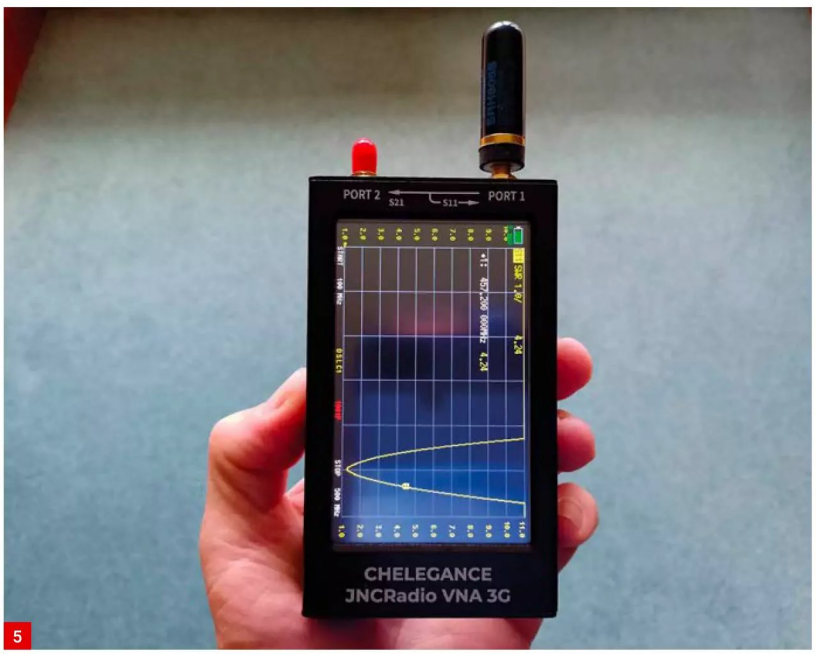
I hope this brief 'insight' into a selection of cheap antennas sourced from China has been of interest to you.

VNA-3G Link

https://tinyurl.com/3j86fjxp

EZNEC Bug Fix

Although **Roy Lewallen W7EL** has retired from EZNEC he appears to still be offering bug fixes. Roy has corrected two V.7.0.1 bugs in what is now V.7.0.2



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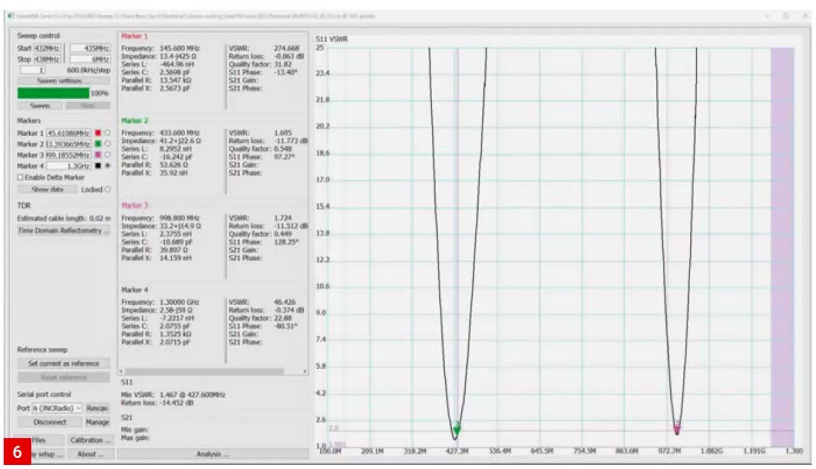
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Firstly, it was noted that in the Far Field table (via the 'FF Tab' button) there was no column included for relative phase, this has been fixed.

If you explicitly do **not** want to include phase in the table, use Special Options **FFPhase = Off** in the .INI file.

Secondly, when using **either** the built-in NEC-4.2 engine (NEC-4D, available only with Pro/4+) **or** an external NEC-4.2 engine (Pro/2+ or Pro/4+), switching between Real/High Accuracy and Real/Extended Accuracy ground would not automatically signal that the engine must be run again to update various calculated data items. This was only a problem when toggling between those two ground choices. Switching to any other type of ground (Free Space, Perfect, or Real/MININEC) *would* signal that an engine rerun is required. This is now fixed.

Pro/2+ users can download EZNEC_Pro2+_702_setup.exe from here:

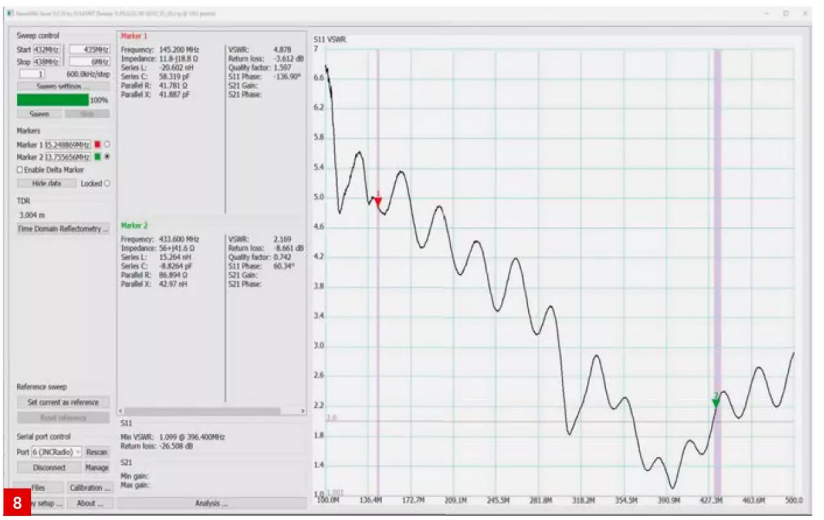
https://tinyurl.com/3kvr8ps8

Pro/4+ users can download EZNEC_Pro4+_702_setup.exe here:

https://eznec.com/pro4+_upgrade.htm

Your EZNEC Customer ID will be needed.

It is not necessary to uninstall v.7.0.1 beforehand; v.7.0.2 will overwrite it. My sincere thanks to **Dan AC6LA** for this information



April Spoof!

In the April issue I mischievously featured a 'Conformal Monopole', which was actually a roof tile! I asked for comments and a few of you got back to me. I don't have room to repeat all of the replies but I will pass on what I thought was the best (or worst depending on your point of view!), which came from **Godfrey G4GLM**.

"Dear Keith, I recognise that object, it's a roofing filter. Being of only one pole, it's restricted to 6dB/octave roll-off. Don't roll off the roof when fitting it."

Thank you, Godfrey! With that I wish you all 73 and will see you next month. **PW**

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

David Smith
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LDACS: The Future of ATC Communications

In a new occasional column, **David Smith** reports on recent advances in airband communications.

The international electronics group Rohde & Schwarz has been working with research partners to develop the L-Band Digital Aeronautical Communications System (LDACS), a new air traffic control (ATC) communications system that significantly increases bandwidth and allows modern IP-based communications. It is poised to replace the current VHF digital link (VDL) mode 2 in civil aviation to become the future worldwide standard. The frequencies allocated are in the 1452-1492MHz range within the L-Band.

LDACS offers data throughput that is up to about 200 times faster than VDL mode 2. LDACS specifically uses portions of the L-Band frequency reserved for flight communications. Modern aviation demands the secure exchange of data and LDACS reliably enables high data throughput that is secured with encryption. With ever-increasing flights, air traffic controllers need to be able to distribute new navigation data faster, so that they can adjust flight paths in time when the situation changes in their airspace.

Reliable and secure data transmission from LDACS will also help with new environmentally friendly navigation methods. The plan is to select aircraft routes with precise coordinates in three-dimensional space and with rigidly defined time limits. The 4D trajectory concept can be used to dynamically route aircraft near airports to avoid noise-sensitive areas. The long-term goal is complete flight path management from departure to destination exclusively with 4D trajectories for much more efficient and environmentally friendly airspace usage, resulting in lower carbon emissions. It should be emphasised that LDACS will not replace direct speech communications, but supplements it for route clearances, position reports and weather information, to name but three examples.

The aircraft L-Band ranges from 960–1215MHz. Aircraft can use Automatic Dependent Surveillance-Broadcast (ADS-B) equipment at 1090MHz to communicate position information to the ground as well as between them for traffic information and avoidance. The 1090MHz frequency (paired with 1030MHz) is also used by Mode S transponders, which ADS-B augments when operated at this frequency. The TCAS (Traffic Collision and Avoidance) system also utilises the 1030/1090MHz paired frequencies. ADS-B information can also be broadcast on the L-Band frequency of 978MHz. DME (Distance Measuring Equipment) and TACAN beacons are also in this frequency band.

Airspace Re-design Over Wales and the South-West

Operational from 23 March, West Airspace Deployment (West) is the culmination of over three years of planning. The project has transformed the way UK airspace is structured above 7,000ft over south-west England and most of Wales, modernising the route network and providing a simpler and safer future for air travel. NATS (the national air traffic control provider) says that the airspace changes represent one of the most technically complex challenges it has ever faced. The core of the current airspace route system in the area was designed many years ago and, despite upgrades, the airspace has not kept up with the navigational capabilities of modern aircraft and this can create delays.

Also, this is the first time systemised airspace on this scale has been deployed in support of the UK's Airspace Modernisation Strategy. By using the latest airspace technology and approach to airspace design thinking, it introduces highly-defined flight paths, which use available airspace as efficiently as possible through the lower-level network from 7,000ft up to 24,500ft. Routes are based on aircraft departure points and/or destinations. This is particularly effective in airspace with climbing and descending aircraft, as it will reduce complexity, therefore improving safety, increasing capacity and reducing delays.

Designing routes in systemised airspace relies on Performance Based Navigation (PBN), which uses satellite technology fitted to modern aircraft allowing them to fly more precise and consistent routes. This level of accuracy was not possible in previous generation aircraft. It now allows the distance between routes to be minimised, in some cases parallel routes separated by seven nautical miles where aircraft follow a structured route system,

Free Route Airspace (FRA) covers the airspace structure above 24,500ft and allows aircraft to fly their preferred route between a defined entry and exit point, subject to any airspace constraints at the time. FRA gives airlines the autonomy to plan their optimal route and significantly helps to reduce flight time, fuel burn and CO_2 emissions. FRA was introduced for the first time in the UK over Scotland in December 2021 and West will be the second implementation.

Landing Error Prevention

ASDE-X Taxiway Arrival Prediction (ATAP) is a safety tool that enables air traffic controllers to detect potential runway conflicts and mistaken approaches to land on taxiways by providing detailed coverage of movement on runways and taxiways. It is based on Airport Surface Detection Equipment, Model X. The ASDE-X data comes from surface movement radar located on the con-

Photo 1: A departure queue at London Heathrow (photo courtesy NATS). Photo 2: Boeing 727 with two Extra EA-300s at Fairford 2022.

trol tower, multilateration sensors, ADS-B sensors and aircraft transponders. By fusing the data from these sources, ASDE-X is able to determine the position and identification of aircraft and transponder-equipped vehicles on the airport movement area, as well as aircraft flying within five miles of the airport.

Controllers in the tower see this information presented as a colour display of aircraft and vehicle positions overlaid on a map of the airport's runways, taxiways and final approaches. The system creates a continuously updated map of the airport movement area that controllers can use to spot potential collisions, supported by visual and audible alerts This technology is especially helpful to controllers at night or in poor visibility.

It is now operational at 43 major US airports and has prevented more than 50 potential taxiway landings since 2018 when first introduced. There have been eight alerts already in 2023. The technology is likely to be adopted at some European airports, particularly Amsterdam where a Boeing 737 attempted to take off from a taxiway in 2019.

Electronic Countermeasures in Dense Signal Environments

The so-called 'threat environment' in air warfare is rapidly evolving and electronic countermeasures (ECM) are under constant development to respond proactively to any new attacks. The goal of an ECM device is to deceive detection systems such as radar, sonar or infrared. Aircraft, ships, and even advanced tanks rely on ECM to protect them from attack. The ECM device may perform offensive or defensive actions.

As radars advanced to evade countermeasures, ECM systems responded with new capabilities. Radars, for example, become increasingly sophisticated by continuously evolving. Once those technology capabilities are known, countermeasures undergo performance advancements to supersede them. Each time the threat or countermeasure progresses in capabilities, the other will develop past it. As the two sides compete against each other, every step in development grows increasingly complicated.

Jamming techniques are improving in intelligence and speed because of machine learning and digital signal processing techniques. Examples are:

Broadband noise: When a radar signal sends out a pulse, that pulse reflects off objects in the environment and bounces back. That is known as echo return or a skin return. If a pulse is sent out where an F-35 multi-role combat aircraft is flying, RF energy bounces off that F-35, returns to the radar receiver, and the return is displayed. The simplest way to impact a radar signal is by jamming it with broadband noise. As that skin or echo return hits the receiver, it brings with it a lot of RF energy. This process overwhelms the reflection of the original radar signal off the targets (skin return), making it impossible to recognise the target on the radar display.

2

Range and velocity gate pull-offs: This technique sends a pulse back that looks similar to what the target radar would produce, but slightly altered. Because this process has a fast turnaround, this technology is used to create multiple false targets by replaying those acquired radar pulses. It appears that the reflected object is moving away instead of toward you, for example. As a result, you lose track of it. For instance, you could make it look as though an aircraft is flying east when in actuality it is moving north. You start tracking to the east and then realise you have lost it.

Digital Radio Frequency Memory (DFRM): This process is an electronic method to digitally capture, digitise, and re-transmit RF signals to create new RF energy based on the received pulse. This can create multiple false targets by quickly replaying those acquired radar pulses. Many DRFM systems can perform sophisticated tasks by digitising the pulse. DRFM systems adjust acquired pulse data using aspects such as amplitude, phase and frequency to make the radar think that there are many more aircraft than just one.

Electronic Countermeasure Techniques

In aircraft, for example, ECM emits radiation, making it easier to detect. Typically, aircraft systems comprise the following approaches:

Stand-off jamming: The aircraft's design specifically performs jamming and electronic countermeasures. It flies a farther distance from the radar, usually outside the lethal range, and performs jamming functions to protect fighters and bombers attacking a target.

Stand-in jamming: This aircraft is equipped with electronic countermeasures, which perform jamming and ECMs on their own instead of another platform doing it for them.

Stealth aircraft use materials and design geometry to reduce the reflection and emission of radar or radio frequency. Stealth technology is a substantial step beyond jamming and the usual countermeasures. These stealth principles apply to military platforms such as aircraft, submarines, satellites and ships. Ideally, they make them invisible to detection techniques such as sonar, radar and infrared, camouflaging their presence within the EM spectrum.

For example, when a radar sends out a pulse in the direction of a stealth fighter, it should not get a good skin return. Very little energy should reflect from the object. Stealth vehicles come coated with materials that absorb rather than reflect energy. The energy reflected from the object disperses, which is why it seems hidden to radar.

Some radar systems will detect stealth aircraft. For example, using a passive sensor-based approach, infrared search and track (IRST) systems track a stealth vehicle's heat signature. These passive systems emit no radiation, effectively cloaking their presence to make them impervious to radar jamming. Such approaches invite a new challenge – how do you jam and counter radar systems designed to detect and undermine stealth systems?

News in Brief

Formerly known as City Airport or City Airport Manchester, this general aviation aerodrome five miles west of the city centre has been re-branded as Manchester Barton. Its frequency remains 120.255MHz, callsign Barton Information. As part of an ongoing plan to reduce the number of UK VOR beacons, the Machrihanish VOR in south-west Scotland has been decommissioned. Its associated DME (Distance Measuring Equipment) remains in service. **PW**

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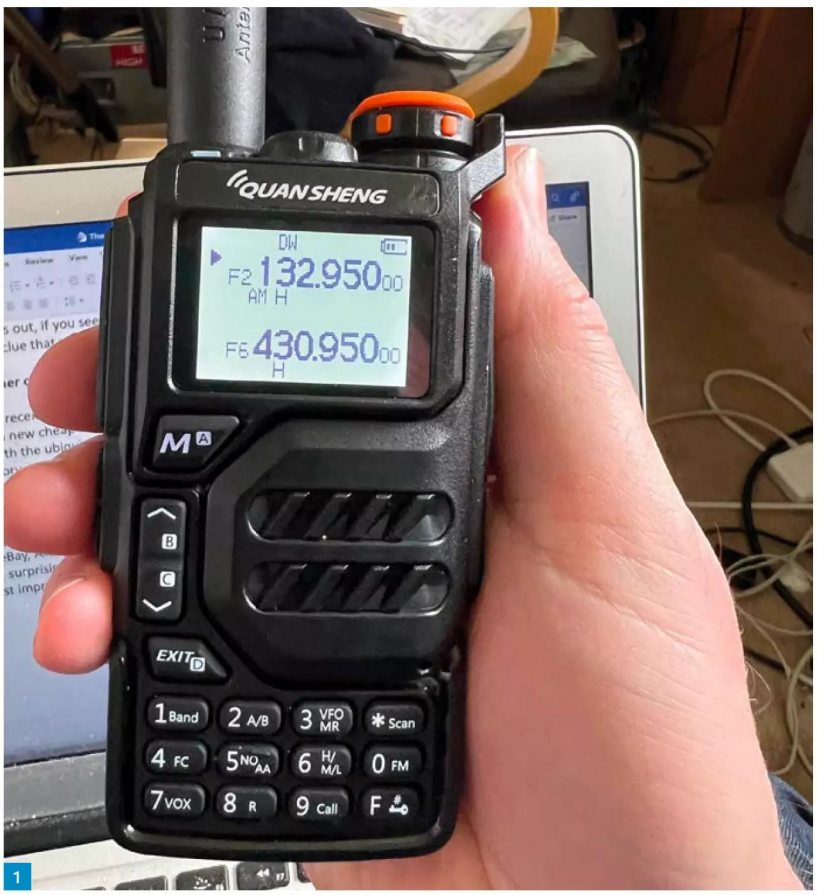

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More on FT Modes Etiquette

Tim Kirby GW4VXE has another full column, with a discussion about FT mode QSOs, a new handheld, FM/DAB DX and lots happening on the bands.

Tony Collett G4NBS wrote in regard to my comments about when FT8 operators could consider a contact complete. Tony wrote, *"A problem arises when a station sends RR73 which is not decoded by the other operator. Too many log the QSO at that point without waiting for a 73 in return. That leaves him sending his R-16 or whatever ad infinitum. That problem is exacerbated by 'robots' and stations using software that actively filters out stations that have been worked before (why?) so you don't get a second chance if that elusive RR73 isn't decoded for whatever reason. I used to not log those QSOs as there is no way of knowing if my R-16 was received or not but like you the all.txt file and eQSL have too often provided confirmation at a later date so now I tend to log 'in case'..... provided I see the other station is calling CQ or working something else immediately after. If just lost to QSB and never seen again, I would be more likely not to log it"*.

Indeed, the 'no dupes' filter in JTDX and perhaps other software is not helpful in this regard. There was one occasion when I worked a DX station – sent an R report and didn't get a 73 in return. I hoped it was completed but wasn't sure. It wasn't until that same station wouldn't respond to my signal in the next opening, despite a big signal, that I realised that the previous contact was complete! Not ideal. Happily, an LoTW match turned up for the QSO, so it was just as well that I had logged it.

If you're someone who has a 'no dupes' policy on FT8, think about why? Does it really slow you down so much or stop you working some elusive DX?

As Tony also points out, if you see someone call CQ directly after the 'lost message', then that's probably a clue that your contact was completed. Again, not ideal.

Oh no, not another Cheap Handheld? The Quansheng UV-K5

I was interested recently, to see a video from **Lewis M3HHY**, on the Ringway Manchester YouTube channel, about a new cheap handheld from the Far East, the Quansheng UV-K5, **Fig. 1**. Lewis contrasted it with the ubiquitous Baofeng UV-5 and similar radios. The Quansheng model is capable, in theory, at least, of receiving on 50 and 70MHz, as well as transmitting and receiving on the 2m and 70cm bands. In addition, the Quansheng boasts aircraft band receive capability.

Suitably intrigued, and, on the basis that the Quansheng UV-5K can be bought for between £20 – 30 on eBay, AliExpress and the like. I thought I would place an order and give one a try. It arrived surprisingly quickly. Although this isn't the place for a lengthy review, I can tell you a few first impressions.

The radio's design is quite pleasing and feels fairly solid. It's relatively intuitive to operate and with only a small amount of reference to the instruction manual (not bad!), I was able to program up a couple of memory channels and have it scan. It has a dual-watch feature, so I was able to have it scan a few marine channels while leaving the other 'VFO' on the EI7MLR repeater, 85 miles away across the water. Even with the rig inside, I was able to receive EI7MLR quite comfortably, although I felt the squelch was quite 'tight' even on the lower settings, meaning that it would be possible to miss weaker signals. Reception on the aircraft band was disappointing. Although signals are received, it's pretty hard to understand the audio! Initially, I thought it was perhaps just weak signals and poor audio from a particular aircraft, but a quick comparison with the audio from a Yaesu FT-2D showed that it was markedly poorer on the Quansheng. So, don't buy one based on the advertised capability for aircraft band reception – although it does receive signals there and you can sometimes make out the audio. It's just not great!

Transmit audio seemed fine. I programmed the UV-5K up to access my Allstar hotspot, used the Hubnet 'parrot' to listen to my own audio and it sounded perfectly acceptable. The rig has three power levels; High, Medium and Low, with high power being quoted as 5W. I haven't yet put the rig on the test meter, to see what the power levels are in practice.

Also, I've not had an opportunity to test 4m and 6m FM receive so far, but in his video, Lewis showed reception on 4m FM over a few miles.

Receive audio is a little tinny – perhaps just the speaker – but quite acceptable. There's probably not enough audio to use in a car as a receiver. The battery is 1600mAh and first impressions are that battery life is good. A drop-in charger is supplied.

All in all, a tidy little rig – plenty of fun for the

Fig. 1: The Quansheng UV-5K – a cheap addition to the shack at between £20 and £30.
Fig. 2: It's unusual to see an aurora in Pembrokeshire, but GW4VXE managed to capture some colours during the event on 23 March.
Fig. 3: Allan GM4ZUK's new 23cm amplifier.

money. Does it compare with an expensive HT? No! If you want a cheap handheld with some interesting features to play with, you might well enjoy it.

(Apparently Mirfield Electronics are now stocking this one, at £39.95. Look out for a review in a future PW *– **Ed**.)*

The 8m Band

Paul Farley G7PUV operating as G9PUV on the 8m (40MHz) band, just missed last month's deadline, but there was lots of interest, so I wanted to include it in this month's column. At the end of January, Paul was heard by VK4TVL (QH30) and UN7MBV (LO51). On 15 February, Paul had his first contact with 4X1BG and a report from ZS4TX saying that Paul was +14dB. Later in the day, Paul was heard by 4Z5ML while Paul was beaming to North America – probably backscatter despite 4X being some 3000km away. On 16 February, Paul was heard by VK4TVL and worked OD5KU who was S9+20db on the meter. Just after that, a very strong carrier appeared on 40.680 that everyone monitoring the frequency at the time could hear – but the source of the signal could not be established. On 18 February, Paul was heard by no fewer than five stations across Russia, with the furthest being in NO14. Paul says that this was unusual because up until that point, he had only had one report from Russia in the whole time that he had been active on 8m. On 5 March, Paul had contacts with two new stations, SP9NOF (KO02) and 4X1TI (KM71). Two days later, on the 7th, Paul made another new contact and added a new country to his list with a contact with A71XX (LL55) made in the late morning and he was heard by 9K2GS (LL39) at the same time. On 10 March Paul finally got a signal to the west coast of the USA with a late afternoon opening, being received by K6EU (CM97), and WM2XCC (DM13). WM2XCC is one of the US experimental licence holders so hopefully it will be possible to turn that into a two-way contact at some point. On 13 March, Paul was heard by ZL1RS (RF64) over the long path, between 1854 and 1900UTC and was copied by K6EU (CM97) at around 1900UTC. On 28 March, Paul had a nice, lengthy SSB QSO with ZR1DI with signals peaking up to S9.

Kevin Hewitt ZB2GI has been monitoring the band using his IC-7300 with a 5m wire connected via a 9:1 balun. Stations heard over the month include PJ4MM (FK52), VA2CY (FN46), ZS6OB (KG44) and ZS6WAB (KG66).

Roger Lapthorn G3XBM (Cambridge) has had his Innovation and Trials licence renewed, allowing his experiments on the band to continue. He says he has not been too active of late, but is looking forward to the Es season and hopes that there will be more FT8 or WSPR activity – even if it is just 10mW ERP in the ISM band without a licence.


2

The 6m Band

Roger Greengrass EI8KN (Co Waterford) worked V51JH (JG77) on 6m (50MHz) for a new country on 12 March. Here at **GW4VXE** (Goodwick) I received a couple of periods from V51JH on the same day, but sadly, signals were not strong enough to make a QSO – I was using the vertical antenna at the time. Deciding that the gale season had probably ended, I re-erected the 4-element Powabeam for the band in early April. Naturally, a day later, we had one of the strongest storms of the 'winter' season! Fortunately, everything stayed where it was supposed to be. Since putting the beam back up, I haven't worked any DX to speak of, but was pleased to complete a meteor scatter QSO (on FT8), with GM3POI (IO88) as well as working GW0WZL (IO73), GW0GEI (IO72) and G4CLA (IO92). There have been a good number of meteor bursts most days and actually, while I've been writing this on 16 April, I noticed some weak Es into Germany. Incidentally, I also managed to capture a nice aurora visible from here, **Fig. 2**.

It was great to hear from **Ron Adam GM4ILS** (Elgin) for the first time in a long while. Ron had a lot of fun in the 27 February aurora. He was hearing the OY6BEC beacon with an auroral tone and worked OH0Z (JO90) with a beam heading of around 60° at around 1810UTC.

Kev ZB2GI has been active on the band from both the GARS club station using his FT-450 and the club's Hexbeam as well as from home, using the whip and counterpoise wire poked out of his apartment window using a broomstick. From the club, Kev worked CE2SQE (FG40), CE2SV (FF47), CE3VRT (FF46), CE4MBH (FF44), CE4WJK (FF45), CT1FFU (IM59), CT1JOP (IN50), CX6VM (GF27), D2UY (JH87), EA5AJX (IM98), LU2GPB (GG03), LU2HGB (FF87), LU5FCI (FF98), LU7HN (FF88), LW2DAF (GF05), PP2CS (GH53), PT2ZXR (GH54), PT9IR (GG29), PU2KNM (GG55), PU2MLO (GG66), PU2NBI (GG66), PU4JLV (GH51), PV8ABC (FJ92), PY1WS (GG87), PY2ACP (GG66), PY2BT (GG66), PY2DV (GG57), PY2GG (GG66), PY2GR (GG57), PY2IQ (GG66), PY2KP (GG66), PY2RJ (GG66), PY2RSA (GG77), PY2VH (GG67), PY2WC (GG66), PY2XU (GG66), PY3DCC (GF49), PY4OY (GG78), PY6BK (HH07), PY7ZZ (HI21), V51JH (JG77), V51WW (JH81) and ZP9CTS (GG22). From home, with the rather simpler system, Kev worked EA8CHC (IM67), PV8DX (FJ92), EA7YV (IM76), EA8CHC (IM67), LU7FIN (FF97), PY1EME (GG76), PY2BW (GG65), ZS6NK (KG46) and ZS6OB (KG44).

Steve Telenius-Lowe PJ4DX reports that the March-April period was another excellent month for 6m DX. *"I made an attempt to summarise the openings day-by-day, but it proved to be too complicated and far too long; there was just so much DX about. Suffice to say that every day there have been openings to Indonesia, the South Pacific, Africa, the Middle East or southern Europe, and often two or three of those places in one day. For example, on 14 to 15 March **Antoine 3D2AG** was coming in for over five hours from 2100UTC onwards, while later on the 15th there was a nice opening to Asia with HZ1SK and VU3WEW coming in. There was a great opening to Australia on 24 March when I worked 14 VK4s (Queensland) plus two VK8s (Northern Territory). How quickly one becomes blasé, though: if there are only Indonesians coming through, I don 't even bother to transmit any more!*

"The best DX stations worked on 6m FT8 between 9 March and 9 April were: 3C3CA, 7Q7CT*, 9X5RU*, A62A*, CN8LI, CN8YZ, D2UY, D4K, E51WL* (North Cooks), FK8CP*, FK8HA, FY5HB, HR1JBR*, HZ1DG, HZ1SK, KH6HI*, S01WS, TG9AJR*, TR8CA, TT8SN, TZ1CE*, VK4BLK,*

VK4CZ, VK4DCM, VK4EM, VK4HJ, VK4KSY, VK4KX, VK4MA, VK4PN, VK4QG, VK4SC, VK4UV, VK4ZB, VK4ZPU, VK8AW, VK8MS, VU3WEW, YB1AR, YB1MIG, YB1TJ, YB2DX, YB2MDU, YB5QZ, YB0COU, YB0SAS, YC1PZ, YC0BJJ, YE1DO, YF1ACL, YF3BVD, ZD7CTO, ZD7MY, ZL1AKW, ZL1RS and ZL2MF: those marked with asterisks were 6m All-Time New Ones ('ATNOs') worked during the month. There were five 'gotaways', though, potential ATNOs decoded but not worked: 9G5AR, 9K2OD and 9K2GR, A71VV, C5C (Gambia) and VP8LP."*

The 4m Band

Ron GM4ILS made several 4m (70MHz) contacts during the aurora on 27 February: SM4GRP (JO69), G4MKF (IO91), G3WZT (IO90), DK3BU (JO33) and G0LBK (JO03).

The 2m Band

Ron GM4ILS worked the following on 2m (144MHz) during the aurora on 27 February, showing that good contacts are possible: DL6BF (JO32), DF9CY (JO54), GM4JXP (IO87), G0LTG (IO81), GM4PPI (IO75), G4RRA (IO80), PA2RU (JO32), G4NBS (JO02), G3LTF (IO91), G4FVP (IO94) and G4KUX (IO94).

Jef VanRaepenbusch ON8NT (Aalter) was active during the FT8 Activity session on 1 March, with the highlights being OV3T (JO46), G4CBW (IO83) and G8EEM (IO93). On 5 March, Jef worked G4ASR (IO81) on CW.

During the April UK Activity Contest, **Simon Evans G6AHX** (Twyning) made 23 contacts over 11 different squares, with the best DX being F4HRD (JO00) at a distance of 306km.

Roger G3XBM was active during the UK Activity Contest using 2.5W and the big wheel omni-directional antenna. Roger is also active on his local FM net.

The 70cm Band

Although Ron GM4ILS didn't make any 70cm (432MHz) QSOs during the opening on 27 February, he did hear auroral whispers from the OY6BEC beacon at around 53A. Ron could also hear the beacon at 579 by tropo at the same time.

During the FT8 Activity session on 8 March, Jef ON8NT worked GW4HDF (IO81).

Roger G3XBM was on for the SSB UK Activity Contest but didn't manage to make any QSOs running 2.5W. However, he was more successful during the FT8 Activity period when he made one contact, but heard much more. Roger feels that more people are moving to FT8 and that there is less activity on SSB.

The 23cm Band

Roger G3XBM reports an SSB QSO on 23cm (1296MHz) with John G4BAO. Roger was using his SG-Labs transverter and a 2-element PCB Yagi indoors.

Allan Duncan GM4ZUK has just completed construction of a 150W amplifier for the band, **Fig. 3**, although he hopes that this will not tempt fate with the power limit being drastically reduced on the band as has happened in some other countries recently.

3

481THz

Possibly the highest band ever mentioned in *PW*? Roger G3XBM reports that he conducted his first optical tests locally in over 10 years and is hoping to try some cloudbounce with G4HUW at a distance of around 9km. This sounds fascinating! I hope Roger will keep us posted on his progress.

Satellites

Kev ZB2GI operated through QO-100 from the GARS club station and worked a huge number of stations. On transmit, Kev used an FT-817, DX Patrol up-converter with a power amplifier connected to a POTY feed mounted on a 60cm dish. On receive, Kev used an LNB with TXCO fed via a bias tee, connected to an RTL-SDR dongle running on SDR Console with the Beacon lock feature activated. Highlights of the log include 4Z1TL (KM72), A65TE (LL97), GB3RS (IO91), GI7ULG (IO64), GU6EFB (IN89), GW8TIX (IO81), R9LR (MO27), TA1D (KM56), TA2SUA (KM69), TK1CX (JN42), VU2NSL (MJ89), VU2PN (NK03), ZD7GWM (IM74) and ZS1LS (JF96).

Dave Ryan M0GIW has been putting together a portable system for QO-100 to allow him to activate rare squares. His first activity planned at the time of writing was from JO03 square.

Broadcast Band FM / DAB

This month, I'm very pleased to be able to include details of Broadcast Band and DAB DX for the first time. It fits nicely with the rest of the content of the column, and I hope readers will find it interesting. FM DX can often provide an interesting signpost to propagation openings on the 2m band. RDS data transmitted by most FM stations allows you to identify the source of the station. When this first happened, it seemed like magic and I remember having great fun monitoring the FM band in Jersey, while staying with Allan GM4ZUK (at the time GJ4ZUK) using his Grundig portable receiver, which had the 'new' RDS facility.

This year, I understand, is the 20th anniversary of the first recorded reception of FM signals from the USA in Europe. I am hoping to include more details about this in a future column, as I am sure much of it will be news to many people that this was even possible! This information could be of great interest to 70MHz enthusiasts, looking for 4m paths across the Atlantic.

Simon G6AHX writes, "*I have had my interest in FM DX rekindled after meeting a friend from Cheltenham who is part of a group who report their findings to FM LIST, which gets displayed on DXMAPS. Initially, I fed my Band 2 aerial into an RTL-SDR and used SDR sharp in WFM mode to tune in and, importantly, reduce the bandwidth to reduce interference from adjacent strong stations. Then I was made aware of a small specialist radio from China called a TEF6686. It has a very sensitive tuner and is able to alter the FM bandwidth dependant on signal strength. The chips inside come from the car radio world. In flat conditions, with the radio connected to a horizontal dipole in the loft facing E/W, I can hear bursts of France Musique from Rouen on 92.0MHz and Lille 88.7MHz. When you want to find out what transmitters are using a particular frequency, there's a fantastic site called _. Firstly, you tell it your location. Then for any particular frequency, FM, DAB, AM or TV it will give a list of transmitters nearest to you.*

"My friend in Cheltenham has made a video of the TEF6686 as he tunes across the band at his house:

https://tinyurl.com/3bpzjx9z

"For DAB+ I have recently bought an Ocean Digital WR10 radio, which has a reasonably sensitive tuner in it. Under flat conditions, with a small beam in the loft facing East, it finds 104 channels, including East Wales and Oxford MUXes. Earlier this year during lift conditions it managed to recognise a WDR MUX for Cologne and several in Belgium and North France.

"From 2 May the Isle of Man is hoping to start a three-year DAB trial:

https://tinyurl.com/nhec88br

"The aim is to eventually switch off their AM transmitter on 1368kHz".

Playing around here, I tried using my SDR Play RSP2Pro receiver, connected to an indoor loop with a G8CQX loop amplifier on the FM band. I used the SDRuno software and was pleased to discover that SDRuno features an RDS decoder so that you can quickly see where the signal is coming from. Despite a relatively simple antenna system, I was surprised that I could pick up many stations from over the water in Ireland with good signals. It will be interesting to see if I can hear anything on the sea paths when tropo opens up. I also found I could decode a couple of DAB MUXes, although for some reason, despite installing the appropriate DLL, I struggled to get any audio from a couple of DAB+ stations.

That's it for this month! Thanks to everyone who has been in touch with their news. Please keep it coming. See you next time. **PW**

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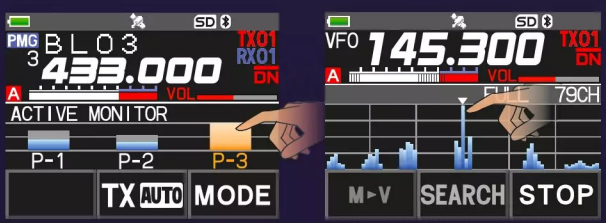

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1

Colin Redwood G6MXL
practicalwireless@warnersgroup.co.uk

Working DXpeditions

Colin Redwood G6MXL looks at some techniques to help readers make contacts with DXpeditions in remote locations.

I'd be the first to acknowledge that chasing DX is not every radio amateur's cup of tea. However, for those who do like to chase DX or would like to try, it is useful to have information about DXpeditions to remote parts of the world. The number of DXpeditions is certainly picking up as international travel returns to normal after the Covid pandemic, together with improvements in propagation on the higher HF bands resulting from increased sunspots (the 11-year sunspot cycle).

Even if you're not into HF DXing, it is worth noting that some DXpeditions operate from comparatively rare locator squares on the VHF/UHF bands – particularly operating on 6m and using EME on other bands. An increasing number of DXpeditions are also taking equipment to operate through satellites, including the QO-100 geostationary satellite.

What is a DXpedition?

DXpedition is a term used to describe a visiting amateur radio operation from a relatively rare location. Typically, the location for an HF-oriented DXpedition will be a DXCC entity which has few, if any, local amateurs. In some cases, the location may be remote such as an unpopulated island, **Fig. 1**. At its simplest, a DXpedition can comprise just a single amateur operating part-time somewhere a bit rare during a family holiday – often termed a 'holiday-style' DXpedition. At the other extreme, a DXpedition can comprise a team of 20 or more people with total costs running to over £750,000!

Contests

Some DXpeditions are planned to operate before and/or after a major international contest. These activities enable contacts to be made with the DXpedition on different modes or bands than the DXpedition group use during the contest.

Advance Information

There are a number of sources of advance information about forthcoming DXpeditions.

DX 425 News

DX 425 News has been publishing a free weekly bulletin since 1991, which you can subscribe to. You can also download a monthly magazine:
www.425dxn.org

The Daily DX

The Daily DX (TDDX) sends daily emails of the latest DX news Monday to Friday. A weekly version is also available. You do, though, need to pay to become a subscriber:
www.dailydx.com

DX World

DX World, the excellent DX information website run by **Col MM0NDX**, produces a weekly bulletin on a Thursday.
www.dx-world.net

NG3K

As you might expect, there is a lot of duplication between the various sources of information I've listed above. I find the list of announced DXpeditions on NG3K's website, **Fig. 2**, is especially helpful as it brings together information from a number of sources into a common format, summarising the essentials and providing links to DXpeditions' own websites. I use this as my main source of information:
www.ng3k.com/Misc/adxo.html

DXpedition Logistics

It is worth bearing in mind that the remoteness of some DXpeditions means that often regular public transport cannot be used, and the DXpedition will need to charter their own transport. In some cases, landing by air or sea can only be accomplished during favourable weather conditions. Even if some of the team can get to land, they need basic survival equipment until more equipment can be off-loaded. Consideration also needs to be given to getting the equipment and team back from the remote island, etc. High and low temperatures and humidity can all present major challenges to even the fittest and hardiest DXpeditioner. The February 2023 Bouvet Island (the most remote island on earth) DXpedition had to drastically cut back on its plans when landing conditions prevented the safe transport of most of the equipment from the boat to land and up an ice and snow-covered hill to its operating position.

May						
2023 May02	2023 May20	San Andreas & Providencias	HK0	LoTW	TDDX 20230316	By PY8WW as HK0/PY8WW, PY7XC and PY7RP likewise; 80-6m; SSB CW FT8; QSL via Club Log OQRS or h/c direct
2023 May20	2023 May27	Market Reef	OJ0	EA5GL	DXW.Net 20230127	By LB5SH as OJ0/LB5SH fm JP90nh; 80-4m; SSB CW FT4 FT8
2023 May20	2023 Jun04	Maldives	8Q7VJ	LoTW	TDDX 20230317	By HB9VCJ fm Ookolhufinolhu, Lhaviyani Atoll; 40-6m; SSB + FM on 10m; 5 or 10w
2023 May23	2023 Jun14	Rwanda	9X2AW	M0OXO	DXW.Net 20230310	By DF2WO fm Kigali; 160-10m; CW SSB + digital
2023 May26	2023 May29	Iceland	TF	DL1MGB	DL1MGB 20230323	By DL1MGB as DL1MGB; 80-10m; for CQ WPX CW
2023 May28	2023 May31	Scotland	MM0UKI/p	M0OXO Direct	DXW.Net 20230105	By G0VJG DL8JJ fm rare IOTA EU-189 Isle of Rockall; HF; dates approximate

2

Band	CW	SSB	FT8	RTTY
160	1.820		1.836	
80	3.523	3.785	3.567	
60	5.352		5.357*	
40	7.023	7.170	7.056	7.045
30	10.108		10.131	10.142
20	14.023	14.210	14.094	14.085
17	18.079	18.130	18.095	18.105
15	21.023	21.285	21.091	21.080
12	24.894	24.955	24.911	24.925
10	28.023	28.485	28.095	28.080
6	50.105	50.130	50.313	

* Recommended 3khz bandwidth to comply with US allocation

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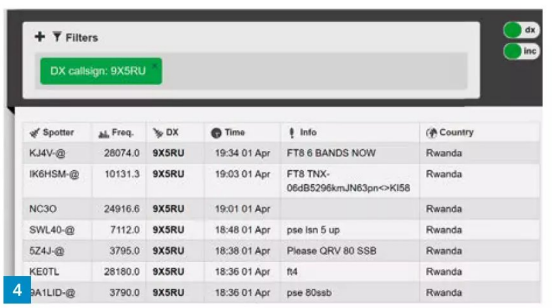

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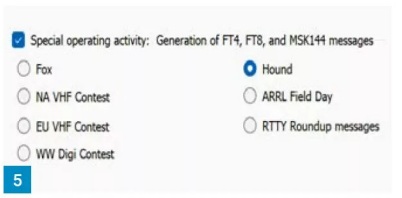

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Fig. 1: The antennas at the 3B7C DXpedition to St Brandon in the Indian Ocean (September 2007). Fig. 2: Announced DXpeditions for May 2023 listed on NG3K's website as seen in early April 2023. Fig. 3: The planned operating frequencies on the website of the Sable Island CY0S DXpedition in March 2023. Note the non-standard FT8 frequencies. Fig. 4: Using the filter feature on the DX Cluster to find bands and modes in use by the Rwanda 9X5RU DXpedition early April 2023. Fig. 5: Settings in the Advanced tab of WSJT-X to operate as a Hound. Fig. 6: An FT8 QSO with the CY0S DXpedition using the Fox and Hound facility in WSJT-X. Fig. 7: The DXpedition log search facility in Club Log.

Bands & Modes

Many of the bigger DXpeditions publish their planned operating frequencies for each band and mode, **Fig. 3**. In the case of FT8 and FT4, the frequencies used by DXpeditions are often not the ones usually used for these modes. No matter what frequencies are published in advance, they may change if the DXpedition encounters QRM on a particular frequency that they weren't anticipating (perhaps clashing with another DXpedition).

Keeping Up-to-Date

It is important to keep up-to-date with a DXpedition's plans and activation as these often change at the last minute, not least due to weather. Often larger DXpeditions will have a dedicated website, showing dates, planned bands and modes, team members, equipment and equipment sponsors etc. Social media, such as the DXpedition's Facebook group, will often feature pictures of the operation.

DX Cluster

I'd certainly recommend keeping an eye open on the DX Cluster, **Fig. 4**. Searching by the DXpedition's callsign will quickly show which bands, frequencies and modes are currently being used by the DXpedition, often with an indication of the frequency split being used (see 'Split' below). It will often show if Fox and Hounds is being used with FT8.

Pile-Ups

DXpeditions generally have to handle a huge number (pile-up) of stations wanting to work them for days on end. They certainly don't have time to exchange pleasantries such as your name, QTH, weather, or equipment. The exchange will be short, sharp and to the point. In fact, apart from the lack of serial numbers, the exchange is usually just as succinct as a contest exchange, with just callsigns and reports being exchanged. It's a good idea to listen to the DXpedition station for a while, to get a feel for their particular operating style. In most cases the operators are very proficient at handling a pile-up and making contacts as rapidly as conditions permit.

Split

One technique used by DXpeditions to handle pile-ups is to operate split frequency on the HF bands when using CW, SSB and RTTY.

This means that while the DXpedition station will transmit on a particular frequency, they will listen on a slightly different frequency – often 5 to 20kHz higher (HF) of the frequency that they are transmitting on when operating SSB, perhaps 1 to 5kHz higher on CW. This helps everyone hear the DX station better so they can time their calls, follow instructions, and not create unnecessary interference.

You'll need to set your transceiver to receive on the DXpedition's transmit frequency but you'll need to transmit on a frequency where they have announced they will be listening. A DXpedition station may announce that they are listening *"5 up"* or *"5 to 10 up"* for example. You'll need to use twin VFOs (usually labelled A and B) and the split button. If you're not familiar with this, then I'd suggest referring to your transceiver's operating instructions and practising a few times before you need to use split frequency operation in earnest. When operating split, you'll notice that the frequency displayed on your transceiver changes as you start to transmit and automatically changes back to the receive frequency when you end your transmission. Make sure that you don't transmit outside the band-edge!

If you are lucky enough to have a transceiver with a spectrum scope, it can help you see the frequency where successful stations are working the DX station. Once you've made your contact with the DXpedition, don't forget to revert back to normal (non-split) operation.

FT8

Nearly all DXpeditions nowadays operate FT8 in addition to SSB and CW modes. In many cases the big DXpeditions will operate on different FT8 frequencies to the usual ones used for day-to-day contacts. Doing this helps keep the exceptional volumes of callers free of the standard FT8 frequencies and also enables the DXpedition station to take full advantage of some additional facilities such as DXpedition mode, most commonly termed Fox and Hound or F/H.

Fox and Hound

Fox and Hound (F/H) enables the DXpedition to increase its throughput of contacts. I won't cover the configuration that the DXpedition (the Fox) needs to make, but focus on the settings for the stations wishing to work the Fox (the Hounds). The description below applies to WSJT-X. Although there are a number of steps involved, it actually takes a lot of words to describe the quite simple process, so stick with it!

F/H Settings

If you are using CAT control between your computer and transceiver, then, in the settings, on the Radio Tab set the split operation to None. If you don't use CAT control, then you can ignore this step. Regardless of whether you use CAT or not, on the Advanced Tab, you'll need to click the box labelled Special Operating Activity, and also click the Hound option, **Fig. 5**. If you get an error message pop-up, you can click OK to ignore it. You'll see a red Hound displayed on your main WSJT-X operating screen.

All that remains to do is to find the DXpedition Fox, adjusting your VFO so that you are receiving it *below* 1000Hz above your dial frequency. Make sure you choose a transmit a clear spot on the waterfall *above* 1000Hz relative to your dial frequency. Note that the DXpedition Fox will always transmit in *even* periods (at 00 and 30 seconds after each minute). Click on the DXpedition's frequency, just as you would if you were working it normally on FT8. WSJT-X will then transmit your call and exchange to the Fox during *odd* periods (15 and 45 seconds after each minute).

You now need to wait for the DXpedition Fox to reply to you. Note that there may be responses to more than one Hound station, each separated by a semi colon, **Fig. 6**. You can sit back and watch until the DXpedition Fox sends RR73 to your callsign, at which point the program will automatically disable the transmission.

Don't forget to change your settings back to normal WSJT-X operation when you have finished working the Fox.

General Hints and Tips

In the early days of activity, DXpeditions are likely to be called by high power stations with large antenna systems. If you have a 'typical' station (say up to 100 Watts to a dipole, G5RV, long wire, vertical etc.), then it often makes sense to wait for a couple of days, until the 'big-guns' have had their fill on at least some of the band/mode slots, before attempting to break the pile-ups. Don't leave it too long before trying, as sometimes DXpeditions have to pack up early due to impending bad weather or phase their packing up – another reason for keeping up-to-date with their plans.

The pile-ups can sometimes be less on the WARC bands (30m, 17m and 12m), so it is often worth trying these if you can't crack the pile-up on other bands. Listen carefully in case you can make a contact before a new band/mode slot appears on the DX Cluster.

To maximise throughput, always call with your full callsign (using standard phonetics on SSB). Using partial callsigns only results in repetition, which slows the DXpedition's throughput of contacts.

If you are using RTTY, then check your macros to ensure that they are not resulting in unnecessarily long messages.

Logs

It's a good idea to check that your contacts with the DXpedition have actually made it into their log. In really big pile-ups it is not unknown to think that you've worked the DXpedition when in fact they were working a different station to yours. Unfortunately, there are also unscrupulous stations who use DXpedition callsigns to trick operators into thinking they have had a contact with the DXpedition when in fact they have worked a pirate.

The DXpedtion's website will often include a basic search by callsign, showing which band/mode slots you have worked. Usually there is an indication of when the online log was last uploaded. Many DXpeditions use the Club Log DXpedition logging facilities for this purpose,

```
154615  Tx        1181 ~  CY0S G6MXL IO80
154630 -12  0.1   814 ~  4X4DU RR73; EA7JKP <CY0S> -04
154630  -8  0.1   994 ~  G6MXL CY0S -14
154645  Tx        994 ~  CY0S G6MXL R-08
154700 -15  0.2   815 ~  DJ4FAN RR73; EA7JKP <CY0S> -04
154700 -16  0.2   934 ~  G6MXL CY0S -14
154715  Tx        934 ~  CY0S G6MXL R-16
```

6

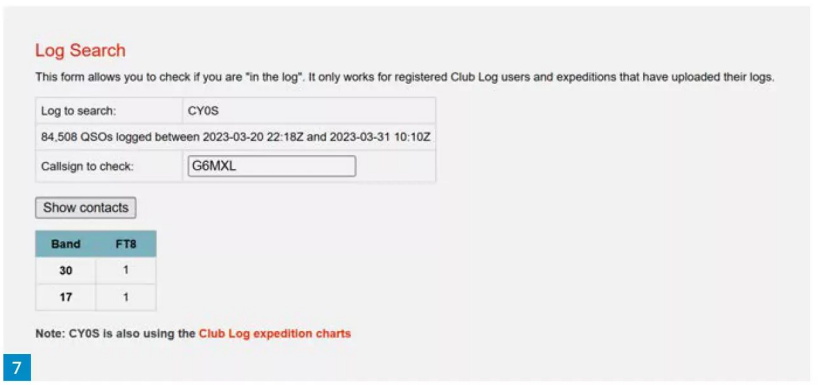

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Fig. 7. This is probably the best definitive guide while the DXpedition is still operating. Making a repeat contact (same band/mode combination) is frowned upon, as you are denying others the opportunity to make their contacts.

Internet connections in really remote places of the world can be unreliable or expensive, so it is unrealistic to expect real-time log uploads. That said, most DXpeditions will try to update their online log approximately daily. As separate computers are used for logging at each operating position, it is possible that updates from some computers may miss a particular upload, so a bit of patience may be needed before you can check a particular QSO.

Confirming Contacts

Each DXpedition will have their own policy regarding confirming contacts. For many of the major DXpeditions, you'll have to wait to get a contact confirmed by Logbook of the World (LoTW) until the DXpedition returns home. Even then, priority may initially be given to those who sponsored the DXpedition. Others may have to wait some months. It is not uncommon to have to wait for six months for contacts to be uploaded to LoTW.

If you want to receive a QSL card, then it is worth checking the DXpedition's QSLing guidelines on their website or QRZ.COM. Many DXpeditions only provide cards using an OQRS system, which enables automation of QSL production – an important consideration when there are many tens of thousands of contacts in the log! Often there will be a fee to be paid for a direct card (not via the QSL bureau), and some require a smaller fee even for cards sent by the QSL bureau system. The cost of printing and posting tens of thousands of QSL cards even to the bureau is a significant cost. **PW**

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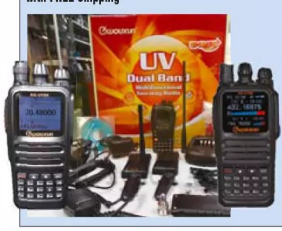

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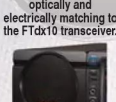
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Roger J Cooke G3LDI
roger@g3ldi.co.uk

1

GB2CW and More

Roger Cooke G3LDI has another miscellany of Morse-related tidbits.

I am pleased to announce that we have a new GB2CW volunteer. **Michael GM5AUG** will be using GB2CW on 80m and also 2m FM on two evenings per week. This is pleasing news and helps make up for the losses that we have suffered over the last couple of years. The losses were mainly due to lack of students, but that situation seems to be reversing with more students coming along and the interest in Morse increasing.

I think the fascination with FT8 is waning somewhat now with the improvement in propagation and more activity happening using the legacy modes, especially CW.

With this in mind it might bring about an increase in Bootcamps too. Michael intends to run one up in the Glasgow area so hopefully that situation will also improve, especially now that we are learning to live with Covid and generally mixing more. If you or your club intend to run a Bootcamp, please let me have the details so I can publish it in this column.

Buying a Paddle?

Buying a paddle can be an expensive time and there is nowhere you can try before you buy. Even at the shows the Morse keys are just an item displayed in a cabinet above the front desk. So, if you are looking for a cheap paddle and one that behaves fairly well, try printing one! If you have a 3D printer, it would help of course, but you can buy a printed one for around 30 dollars. They are well made, utilise neodymium magnets and work quite well, They are mostly designed for portable operation, but will work in the home station. You would have to provide a method of stabilising the paddle, however, because it is very lightweight, unlike some of the more traditional paddles that are available.

The advantage is that they are cheap. You won't lose much on one and you can always select which type you wish to use, single or double lever by buying two of these first.

Use Google and search for K7OB 3D Printed CW Paddle. In fact, there are several 3D printed paddles available so do your research first. You can also find reviews on YouTube. **Fig. 1** shows the final printed key.

Using a straight key with a portable station also has the need for a small key, rather than the ones with a heavy base that I normally recommend. Here in **Fig. 2** is a homemade one by **Malcolm Rivers G0VIM**. I like the use of the knob and also a skirt. Some keys do not have that, as I mentioned in my last column.

Morse to Music

In a recent *QST* article somebody had written an article about learning Morse Code with a musical approach. Looking at **Fig. 3** you will see the representation of two letters, C and W in musical format. **Peter M0RYB** sent this to me for comment. We spent some time discussing why the dot was one note and the dash was another. He was confused and it also confused me until I realised that the author was only meaning to use the TIME signature to indicate dots and dashes.

I used to play a lot of **Dave Brubeck** compositions from his album *Time Out* and this reminded me of those days. Getting to grips with 5/4 was difficult enough, much less 11/4. Anyway, I finally worked it out and obviously it transpires that any note on the stave could have been used because the actual note bears no relation to the CW.

Personally, I would not like to teach this method. I think students would soon give up were I to adopt that method! It was interesting, however.

While on the subject of music to CW take a look at this video, especially if you play drums:
www.youtube.com/watch?v=6XHwygN9CKM

This came from **Rich K1DJ** and just shows how the rhythm of Morse can be shown quite demonstrably here. He is quite a good drummer too!

Catch'em Young!

If only we could make Morse another subject to learn in school, it would be so easy to get everyone, girls included, to be great CW operators. Look at this 9-year old for example running a contest:
www.youtube.com/watch?v=iBoglqzF_-k

He looks quite relaxed too and is not receiving prompts so obviously has been doing it for some time. How about it school teachers? Can we include Morse in the syllabus?

SSS

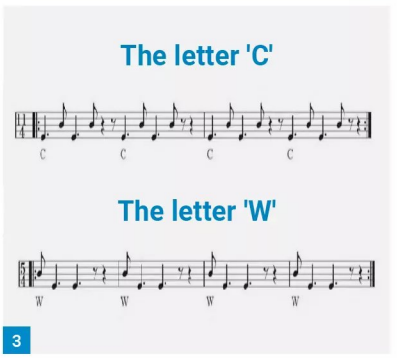
This is an interesting historical CW fact. It was in the *Maritime Radio Historical Society Newsletter 91*.

Everyone knows that SOS is the universal Morse code distress call. But what about SSS? This almost forgotten and rarely used call means "Under attack by submarine." It was used on 7 December 1941 by UASAT CYNTHIA OLSON/WUAP, *the first US ship to be torpedoed after the attack on Pearl Harbour. Her relayed call was recorded in the log for KPH on that day by station manager* ***Frank Geisel 'FG'****. No survivors were found. In the MRHS Treasure Room at the KPH receive site we have a rare artefact – an emergency lifeboat transmitter. These are common. They can be set to send SOS automatically. But this particular example, a Mackay Type 168B, is unique in our experience – it has a setting to send SSS as well as SOS. We've never seen another like it.* (See **Figs. 4** and **5**)

Skimming a Skimmer

James Webber has designed a new web page, dedicated to working CW in the UK. It snatches a chunk of spots from RBN and presents them in different categories, from regional contacts at less

Fig. 1: The 3D printed Morse paddle.
Fig. 2: G0VIM's home made key.
Fig. 3: Morse music – the letters C and W.
Fig. 4: The lifeboat transmitter. Fig. 5: Close-up, showing alternatives of SOS or SSS.
Fig. 6: Selection page from G8NDH, as seem on your Smartphone. Fig. 7: A typical display of CW 'spots' from the G8NDH site.



than 20wpm to the best DX at any speed.

The important thing is that the spots have all come from UK skimmers within the last few minutes. Home page is below. It is intended for mobile devices, to see what's going on when away from the shack.

g8dnh.com/lp

James says, *"It is very new and needs more eyes to catch any shortcomings, so critical feedback would be welcome.*

"There have recently been several contacts from kind individuals who want to link to 'Little Pages' or promote it in various ways, but I am in danger of losing sight of my original goal. Rather than being made generally available, I had in mind that I would offer it to UK clubs for usage only in their 'members only' areas.

"I see this as supporting the grass roots of the hobby, because it adds value to club membership, and it would encourage pockets of CW promotion. Additionally, it would be less costly for me than running a website open to the whole world."

Perhaps you would like to send James your comments and then he can decide what is best to do. His email address is:

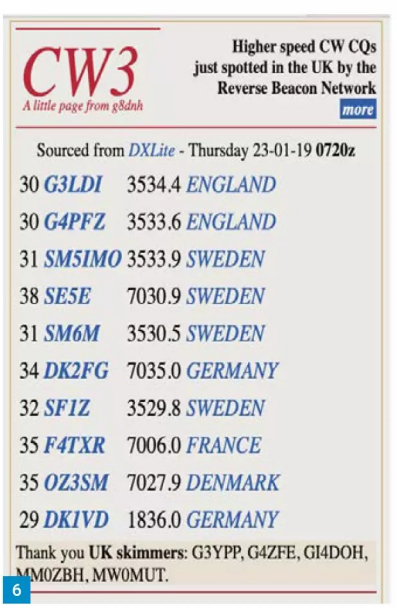
ge8dnh@gmail.com

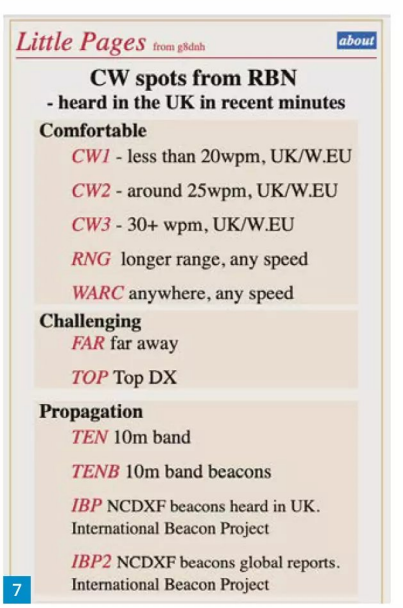
See also **Figs 6** and **7.**

Please send all your comments, offerings, information and especially pictures to:

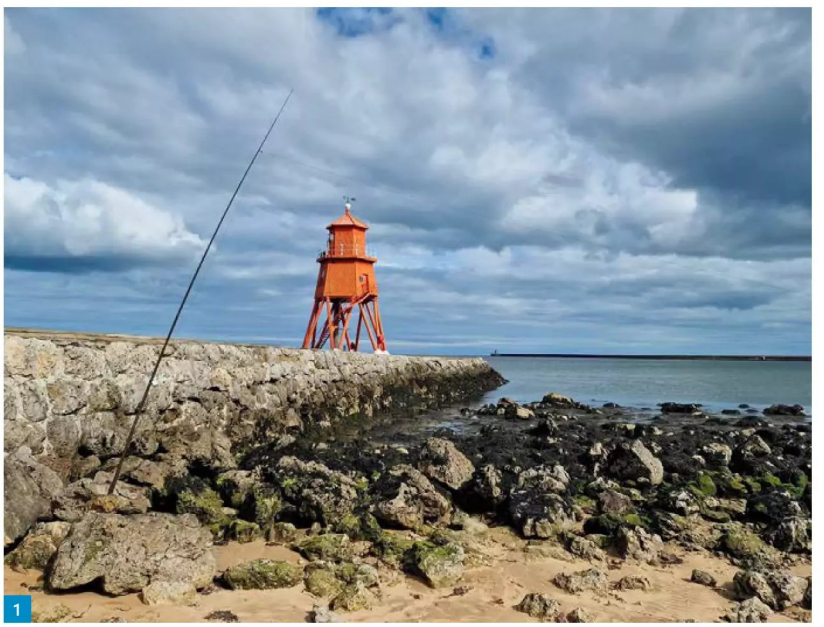
roger@g3ldi.co.uk

73 and may the Morse be with you! **PW**





Steve Telenius-Lowe PJ4DX
teleniuslowe@gmail.com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Plenty of Activity!

Despite a slight downturn in propagation compared with the previous month, there was plenty to be found on the HF bands during March reports **Steve Telenius-Lowe PJ4DX**.

Although good, propagation was not quite as exceptional in the March-April period as in previous months, as noted by several of our correspondents and confirmed by **Neil Clarke G0CAS** in his 28MHz beacon report. Neil said that on the 24th and 25th, for example, the only beacon heard was PY4MAB 28270. Paths to North America were good, especially to the East Coast with 4U1UN (New York) 28200 heard on 20 days, though W6WX (California), also on 28200, was heard on only two days. There were no days when beacons in all ten US call areas were heard, although on three days of the month beacons in nine of the call areas were logged. In South America, PY4MAB was logged on 28 days from late morning till into the evening. Looking towards the Pacific and the Far East, VK6RBP and VR2B, both on 28200, were heard on 17 and 14 days respectively. In Europe OH9TEN 28267 on the afternoon of the 5th was heard with an auroral tone. The Greek beacons SV2RSS 28265 and SV6DBG 28269 were heard every day except on the 24th and 26th. CS3B was heard on 26 days. DB0TEN 28245 and C30P 28256 were heard right at the end of the month, perhaps signalling the start of the summer Sporadic E season.

The Month on the Air

CDXC, the UK DX Foundation, runs an 'LF Challenge' every March. The idea is to work as many DXCC entities as possible during the month using the 1.8, 3.5 and 7MHz bands and upload your log to Club Log. All amateurs, worldwide, may participate. Each entity counts once, even if worked on more than one band. There are separate sections for CW, SSB and 'MGM' (Machine-Generated Modes, i.e. FT8, RTTY etc). This year I decided to enter the MGM category and worked 145 DXCCs, taking second place, **Fig. 2** (the winner was **Andy Goldsmith M0NKR** with 149). An important aspect of these Challenges (CDXC also organises an HF Challenge on 21, 24, 28 and 50MHz in September) is that it encourages greater activity on the bands: I would certainly not have made as many QSOs as I did in March had I not been participating in the LF Challenge.

https://clublog.org

The Russian DX Group was on its travels once again, this time as 9X5RU from Rwanda, starting on 19 March. They made over 167,000 QSOs and were easy to work on most bands, both in the UK and here, thanks to good signals and good operating.

The day after 9X5RU, CY0S started their operation from Sable Island, off the east coast of Canada. Here on Bonaire I worked them on SSB, CW and FT8, including QSOs on all bands from 5 to 28MHz.

The CQ WPX SSB contest took place on 25/26 March and despite solar flares, which caused visible auroras over much of the UK, propagation was actually quite good. Some very high scores were made, for example three single-operator entries, PJ4K, **Fig. 3**, operated by **Rich Smith N6KT** here on Bonaire, as well as D4Z on Cape Verde and 8P5A on Barbados made well in excess of 6000 QSOs each.

SP9FIH and SP6CIK were active as E6AF and E6CI from Niue, **Fig. 4**, between 28 March and 9 April on CW, SSB and FT8 and had good signals both in the UK and here on Bonaire.

Finally, members of the Rebel DX Group started operations as T30UN from Tarawa in Western Kiribati on 9 April. This DXpedition is scheduled to last around five weeks.

June DXpedition

At the time of writing the only DXpedition announced for June is T31TT from Kanton Island (IOTA OC-043), Central Kiribati, which is expected to start in early June and last for around ten days.

Readers' News

There's a particularly international theme this month, with reports from no fewer than seven countries. First is **Carl Mason GW0VSW**, who used 5 watts from a Xiegu G90 transceiver to an 'inverted G5RV' to work some good DX on CW in the RSGB Commonwealth Contest in early March. Many QRP operators use CW (or FT8) only, but Carl also made 164 contacts with 41 DXCC entities on 14MHz SSB in the CQ WPX contest. See 'Band Highlights' below.

Kevin Hewitt ZB2GI wrote that **John King ZB2JK** *"made up a quarter-wave vertical for 40m mounted on a 9m fishing pole, with two radials attached. We erected it outside the GARS club and I spent a few late nights operating 40m FT8. S9+ of noise made it impossible to operate SSB."* The results of Kevin's activity on 40m FT8 can be seen in **Fig. 5**.

Jim Bovill PA3FDR thought that *"despite several days with little or sometimes no activity in the 15m – 10m bands, March in general produced a good, if not spectacular, collection of DX QSOs, with often good openings to North America and the Far East. As usual Japan was especially active with close to 40 contacts... Once again, the Russian DXpedition Team was very active on all bands, this time operating out of Rwanda as 9X5RU, and my QSO with them gave me a new African DXCC entity. Other contacts worth mentioning were the Caribbean islands of Guadeloupe (FG/F6HMQ) and Trinidad and Tobago (9Y4DG)."*

Across the border to Belgium, where **Etienne Vrebos OS8D** *"made about 1400 QSOs this month, essentially castle (WCA) activations... Of course, it's mainly a European activity as most castles in the world are in Europe... About 75 castles*

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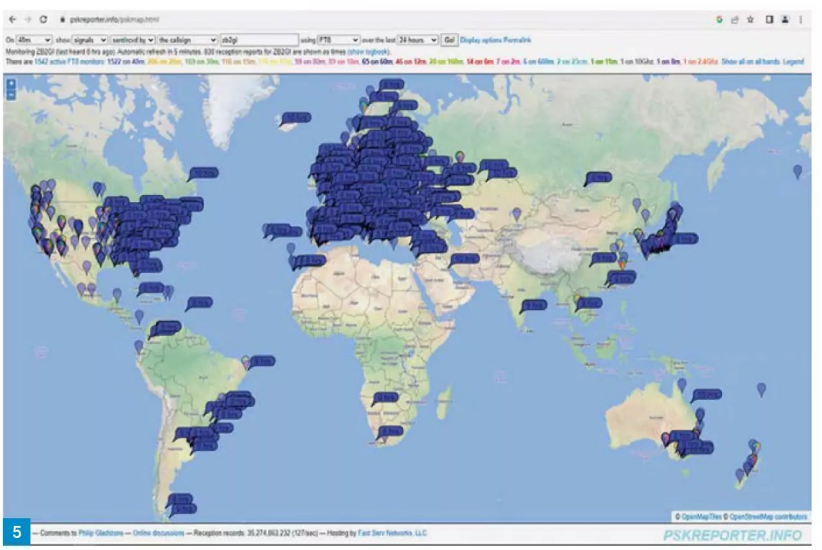

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Fig. 1: Carl 2E0HPI/P operated from the Herd Groyne lighthouse, South Shields. Fig. 2: CDXC LF Challenge certificate. Fig. 3: Some of the antennas at the PJ4K station on Bonaire. Fig. 4: The Niue radio licensing office in downtown Alofi, the tiny capital of Niue. Fig. 5: Results of ZB2GI 40m FT8 activity using a quarter-wave vertical. Fig. 6: The royal castle of Ciergnon in the Belgian Ardennes, activated by Etienne OS8D/P. Fig. 7: The shiny new Hustler 4BTV vertical at the VK4CG station. Fig. 8: The EA5/G4VZV sack trolley station at a salt lagoon near Alicante.

activated since January; that's a good average. My biggest surprise was a reply from ZL4RMF with a strong 55 coming back to my 'CQ WCA/BCA' early one morning on 40m, and an unbelievable surprise [when] all other callers/chasers went silent: it meant great respect for myself and for the New Zealander. After a few seconds the pile-up started again, but I never heard that silence from Europeans during our short QSO. It seems we have well-educated ham radio operators too!" Activating castles, lighthouses, flora and fauna locations etc gives amateur radio operating a clear focus that appeals to many: **Fig. 6** shows one of the castles recently activated by Etienne.

It was good to hear from **Victor Brand G3JNB** again. Victor sent a brief note with some of the stations he had worked on CW during March (see 'Band Highlights').

Likewise, it was good to hear from **Martin Burch VK4CG** again after a long time. Martin *"recently replaced the end-fed wire antenna with a Hustler 4BTV vertical trap antenna* (**Fig. 6**) *made by DX Engineering in Texas, which has improved the overseas capability but although there is a 4ft earthing stake driven into the ground I've got to lay a decent ground plane under the lawn... These antennas are still a compromise when compared to beams although you do get a more omnidirectional transmission and when conditions are good using haste to get your call in they work well. Basically, I don't use a 'burner' (linear amplifier) running 100W, which makes it all the sweeter when you do get that long-range contact, although it's a bit of a fight when there is a pile-up on the bands."*

Carl Gorse 2E0HPI has not been quite as active this month, though he worked D4NA/P in Cape Verde on 21 and 28MHz SSB for a new DXCC. Carl operated portable from the Herd Groyne lighthouse at South Shields, **Fig. 1**, this month.

Tim Kirby GW4VXE has been using a SDRplay RSP2Pro connected to an indoor loop, using a G8CQX amplifier, to monitor 28MHz FT8 for some months now. More recently, Tim became aware of the SparkSDR software, which is available for multiple operating systems, and decided to give it a go. Tim wrote that he quickly found that *"it did a much better job of decoding FT8 than the SDRUno plug-in, useful though that is. SparkSDR can pass decoding responsibility to the 'official' WSJT-X program, without any need for Virtual Audio Cables or similar. As with SDR Uno, you can set up multiple receivers."* Tim monitors the 28MHz FT8, FT4 and WSPR frequencies, which give an excellent idea of propagation. Even using an indoor loop Tim regularly sees 28MHz signals from around 100 countries in a 24-hour period and up to around 140 countries in a week.

Operating as GW4MM on CW and GW4VXE on digital modes, Tim found conditions a little poorer than in recent months although there were still plenty of interesting QSOs to be made. The Russian DXpedition to Rwanda, 9X5RU, gave the opportunity for lots of contacts and Tim worked them on 10, 12 and 17m CW and on 15m FT8. Tim felt the CY0S Sable Island expedition was harder

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to work, though he managed a 40m CW and 30m and 40m FT8 QSOs.

Owen Williams G0PHY said that *"most activity this month was during the CQ WPX phone contest. Conditions were a little different from recent contests due to the auroral event a few days before... I did not hear many contest stations in the Caribbean nor many of the big contest stations in north-east USA. I did, however, work two VK stations; one on Saturday evening and the other on Sunday morning. Propagation was good on Sunday morning on 14MHz to south-west USA with two stations worked in Arizona and one in New Mexico... Outside the contest I was pleased to work V26EI on six bands, and 9X5RU on two. CY0S were, as one would expect, very strong during the contest but I was a bit disappointed that they seemed to neglect SSB after the contest: I had contacts with CY0MM on 18 and 24MHz from 2002 and was hoping for some new band slots. I also managed a new band slot with E6AF on 21MHz; he was really strong with plenty of Gs going through."*

Ken Churms EA5/G4VZV has been active again from the salt lagoons of Bon Mati and Santa Pola near Alicante, Spain. He uses a station mounted on a sack trolley, **Fig. 8**, and can be found on 10 to 40m from the salt lagoons or by the Mediterranean Sea. In March he worked around 70 VK and 17 ZL stations on the early morning long path. Other stations worked include BG8KVC, ZS1H, JY4CH, SU9VB, K7MIX and KT0W/KL7. Ken says he will be active again throughout May.

Reg Williams G0OOF reported that he spent some time chasing both CY0S and 3B7M on FT8, resulting in QSOs on 7 and 10MHz. He wrote *"I spend too much time on FT8 so thought it was about time to have a change of mode and moved on to working in the CQ WPX SSB Contest. No serious entry on my part but just working stations for DXCC and other award purposes. A joy as always to work PJ4DX on the 21MHz band. Early on the Sunday evening of the contest I had tea and came back to the radio. CY0S were working the contest in split mode on 21MHz with the usual pile-up. Their signal was very strong, so I gave a couple of calls. The operator heard me and the contest exchange was completed."*


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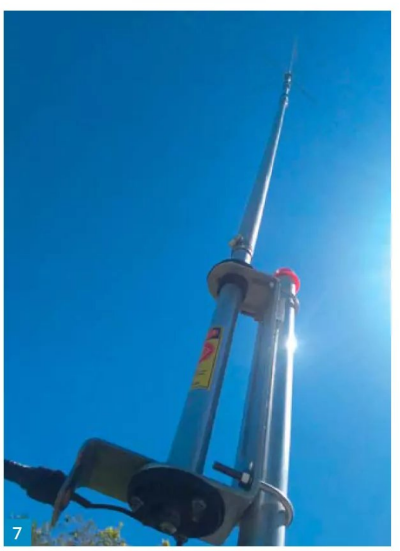
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Band Highlights

Carl GW0VSW: 14MHz SSB: A44A, J68HZ, PJ2T, PX2A, V26K, WP4X. **14MHz CW:** VE3EJ, VK2GR, ZF2CA. **21MHz CW:** CF3A. **28MHz CW:** 5Z4VJ, 9G5XA, 9J2BO.

Kev ZB2GI: 5MHz FT8: FG8OJ, VE1YX. **7MHz FT8:** 7X3WPL, A71AE, AB8JL, C6ACB, HK6P, LU4FW, LU8EHV, OD5YA, PS8CW, PY2GG, VA3DXA, YB5QZ, YY4FRV. **14MHz SSB:** CF3A, W7RM. **21MHz SSB:** 4U1ITU, K9RS. **24MHz FT8:** JA8RVP, JH7BKN, K0TLG, VE7TOM, VK1MA, WH6CPT, XE1SAX, ZL1LC, ZL2DD. **28MHz SSB:** KF0LCQ, LU9A, NW7US, VE3AD, ZL1RO, ZS1S. **28MHz FT8:** 3C3CA, 4S7KKG, 6K5YIA, C5C, CX3OE, JA4EPE, JA6FIO, JG8FWH, N6GR, N7NT, VE3RH, XE2WF. **28MHz FM:** K5BR, KF4WE + KQ2H (Catskill Mountains repeater).

Jim PA3FDR: 10MHz FT4: KP4JRS. **10MHz FT8:** 9Y4DG, CO8LY, NS9I, R9CS. **14MHz FT4:** BA4TB, FG/F6HMQ, VK2WTF, VK3OI, VK4EW, VK5PO, VK7NET, YB4LYD, YC3DOC. **14MHz FT8:** V31DL, YV5JLO, ZL3RIK, ZS4AW. **18MHz FT4:** JA0UUA, KG7V, UN9PQ, V31MA, YB6EN, ZS4JAN. **18MHz FT8:** BG0BBB, CO8WZ, JA0FVU, R0QAF, VK4AFU, VK5NEC, ZL2BX. **21MHz FT4:** 9X5RU, HL5BLI, JR3AKG, N8BNE, PY5BH, R9ON, YD2ULK. **21MHz FT8:** BG7SFE, EK1KE, JE3WWJ, RX0F, UN7PAK, VK3BAC, VU3YDA. **24MHz FT4:** DS5USH, JA0IAA, N7BT, PU4MMZ, UA0SU, VA7KO. **24MHz FT8:** BH6LIG, JH0MXV, UA9YK. **28MHz FT4:** 7Z1IS, DS3EXX, JH8XVH, N6WS, PT7AZ, PU5FLP, RG0S, TR8CA. **28MHz FT8:** BG6HNO, D2UY, RK9UN, YB6MIX.

Etienne OS8D: 7MHz SSB: ZL4RMF. **14MHz SSB:** KH6PE, KT0W/KL7, WH7T. **18MHz SSB:** DS3EXX, V26EI. **21MHz SSB:** 6M23VGC, BY1RX, OX3MC, P43A, ST0HQ, UK8OM. **24MHz SSB:** 6W7/ON4AVT, 9X5RU, D4K, TO1Q, V26EI. **28MHz SSB:** 8P5A, 9X5RU, B7C, CB6I, CE6CGX, DU3/F4EBK, EK6TA, HD8M, HI0LT, J69Z/M, JT1BV, JT1CO, LT1C, PJ4R, PT1K, PZ2YT, V26K, VP5/N9EHA, VP5P, XQ6CF.


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Victor G3JNB: 10MHz CW: TC100TC. **14MHz CW:** FM/F8AAN, VA5DX, VK6GR, VL6M. **21MHz CW:** 3B7M, ZD7BG. **24MHz CW:** PJ7AA. **28MHz CW:** 5Z4VJ, 9G5XA, FR4KE, VK6T, VK6VZ.

Martin VK4CG: 7MHz SSB: VJ9N (Norfolk I). **14MHz SSB:** YB9SS, YJ0CA. **21MHz SSB:** ES9UKR, FK8GM, S58FA. **28MHz SSB:** B7P, BY1RX, JJ0LYY, NR6O, VE5MX, ZL1DK.

Tim GW4VXE / GW4MM: 7MHz CW: 4L4DX. **14MHz CW:** PJ2ND, V26K, VK2GR. **14MHz FT4:** PJ4DX. **18MHz CW:** EP2ABS. **21MHz CW:** CO8NMN, HI3A, J68KC, K2KRG/M, P40L, PJ2/K5PI, PJ2/N2BA, V26K, VK6T. **24MHz CW:** EA8/G3XTT, FY5KE. **28MHz CW:** 5Z4VJ, 8P0P, CA4OMQ, HL5IVL, HS2JQC, KP2M, P40L, PJ2/K5PI, PJ7AA, CE2ML, V26K, VU2TMP, YB1DOL, ZS1WO.

Owen G0PHY: 7MHz SSB: 8P5A, CF3A, V26EI. **14MHz SSB:** 9X5RU, A60A, BD7MM, KY7M, V26EI, VJ4K, VL4U. **18MHz SSB:** V26EI. **21MHz SSB:** E6AF, V26EI, VA5AA. **24MHz SSB:** V26EI. **28MHz SSB:** 8P5A, 9G4X, 9X5RU, PV2G, V26EI, ZS6BRZ.

Reg G0OOF: 7MHz FT8: 3B7M. **10MHz FT8:** 3B7M, CY0S, LU1ZV, V31MA, VK5HS, VR25XMT, W6MOB. **14MHz SSB:** B7C, D4Z, J68HZ, KL7RA, VL4R. **18MHz FT8:** JL4CVG, VK2IR. **21MHz SSB:** CY0S, FG4KH, FY5KE, PJ2T, PJ4DX, WP4RF. **28MHz SSB:** CE6CGX, CX1AV, LT1E, V26EI, V26K, ZS1OPB. **28MHz FT8:** JH4ADK, PJ4EVA, PY2DPM.

Signing Off

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

Homebrew Transceiver Switch

Daimon Tilley G4USI addresses the challenge of switching multiple rigs to multiple antennas.

Daimon Tilley G4USI
practicalwireless@warnersgroup.co.uk

You will have read in my last instalment that a shack move has taken place at G4USI. A significant benefit of this is that many of my HF rigs can now be permanently left out and connected, ready for use, rather than stored away. While that is great news for operating, it brings with it the challenge of switching antennas between those rigs without constantly un-plugging and re-connecting coax.

A Commercial Solution?

This led to an ambition to switch a total of ten QRP transceivers/transmitters/receivers to an existing four-way antenna switch for HF use. As is often the case, I started looking at commercial solutions, but soon ended with a homebrew one at a fraction of the cost! In this instalment I will talk you through the design, build and efficiency of exactly such a switch for a cost of less than a single commercial three-way coax switch!

Before I do, however, let us briefly look at the cost of a commercial solution. I found two main options. First, I could buy two MFJ 1701 switches. These one-in six-out switches cost £120 each. In addition, I would need a further two-way switch at £45 to switch between them. It would allow me to switch 12 rigs but cost a total of £285.

Another alternative was to buy two, four-way switches (£70 each) and a three-way (£55), each selected by a three-way (£55). This would allow switching of 12 rigs at a total cost £250. Neither sets of costs were very palatable, nor very pretty!

Design Thoughts

I decided to build this switch for QRP use, well, for no more than 20 watts of RF, thinking of the output of my TenTec Century 22. Don't get me wrong, I believe it to be capable of switching 100 watts without issue, but it is the isolation of the switching contacts that would concern me at these power levels. In a commercial switch of decent quality, unused outputs are switched to ground when not in use. This is good practice and helps prevent the overloading of other connected rigs that may be in use. In my quest I searched high and low for a two-gang rotary switch that would allow that, but found nothing. I therefore ended up with a switch without the ability to ground unused contacts, and this was a factor in using the switch with my low power rigs.

This really wasn't an issue for me as most of my rigs are low power in any event. I decided to combine my homebrew switch with a commercial four-way one for my 100 watt HF rigs and another commercial four-way one for antennas, both of which I already owned. **Fig. 1** shows my (simplified) connection network.

I decided to loosely copy the design of the MFJ 1701 and ended up with a professional looking ten-way rig switch for the bargain price of £43.27 – a project definitely worthy of the *Amateur Radio on a Budget* series!

I went shopping on the internet and pulled together the following bits:

Hammond 1590BXFLBK Diecast Box in black, with flanges for screwing down, measuring 254 x 70 x 50mm, £22.67

Ten x SO239 four-hole chassis sockets, £13.90, plus one for input from the junk box

Single pole, 10-position Ceramic rotary switch, with an 11th input terminal, £6.70

Chunky gauge copper wire in junk box (free)

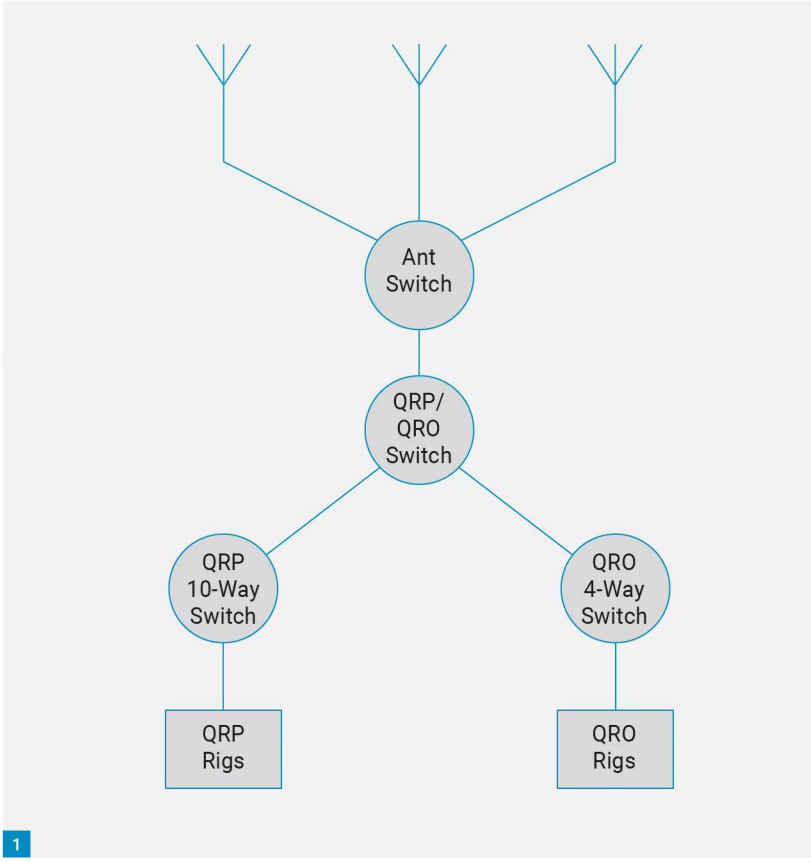
The Build

The first step, **Fig. 2**, was to carefully measure and mark out the box. As the box was a nice black finish, to protect it while marking and drilling, as well as allowing me to see the marks, I covered it in blue masking tape. Eleven SO239 connectors were fitted, as well as the rotary switch, as shown in **Figs 3, 4** and **5**. The SO239 bulkhead connectors had four holes, but I just used two diagonal ones and pop-rivets to secure them.

To wire the connectors to the switch I used heavy gauge copper wire from the junk box for the coax centre connection. A common ground was provided by the physical connection of the SO239s to the un-painted inside of the aluminium box, **Fig. 6**. The finished switch, with rigs connected, is shown in **Fig. 7**.

In Use

I am aware that a number of readers might be concerned about the efficiency of this system,



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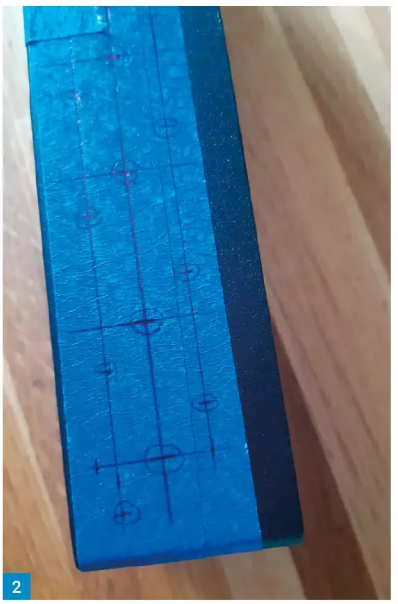


Fig. 1: Switching arrangements at G4USI. Fig. 2: Marking out. Fig. 3: Fitting SO239 connectors. Fig. 4: Internal view before wiring. Fig. 5: External view before wiring. Fig. 6: Wiring complete. Fig. 7: Completed switch in use.

and I do understand that. In a perfect world we would have a direct connection from antenna to rig with no intermediate switching. In my case I have a series of three switches for my precious QRP watts to navigate. Actually, there are more hurdles than that, because not shown in Fig. 1 is a Hardrock 50 linear amplifier immediately after my ten-way switch. Nor is my ACOM 1000 linear shown, and that sits between the QRP/QRO switch and the antenna switch.

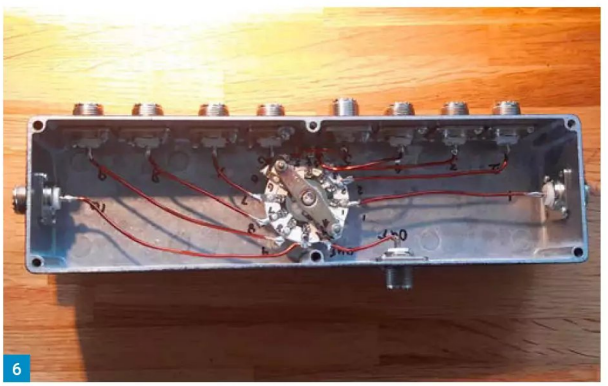
By now, I am guessing some readers will be apoplectic with the huge losses involved. Well, I have two responses to that. First, there has to be a balance between efficiency and practicality. I cannot mount all my HF rigs neatly and have to pull each one out to plug and unplug a single antenna cable – it would drive me mad and also not allow for comparison between rigs. Second, I decided to measure the loss and isolation out of curiosity.

What a wonderful machine the NanoVNA is! A decade ago I could never had made these measurements without highly expensive lab-grade equipment. I split my measurements into two. First, I measured the insertion loss and switching isolation of my homebrew switch alone. The results are shown in **Table 1**.

So, I can hear the purists say – *"Ha – a 14% power loss at 30MHz – are you mad?"* and my answer is *"No, just practical!"* Yes, at QRP levels, 14% of 5 watts gives me a power, on the output side of the switch, of 4.3 watts – but will the other station notice a difference? I doubt it, and I am not bothered if they do, it is practical! Besides which, at 14MHz I have a three element Yagi, with about 9dB gain over a dipole. That is equivalent to multiplying my power by a factor of 8, giving my 4.3 watts an ERP of about 34 watts. Again, I challenge you to listen to a friend operating at 40 watts and then 34 watts and noticing the difference.

But as you know from Fig. 1, my setup is more complex than a single ten-way switch, and with two linear amplifiers (almost hardly used) sitting in line. So, I next measured the insertion loss of the total system from first QRP rig to the point that the antenna coax joins the antenna switch. The results are in **Table 2**.

The losses here are as expected, somewhat higher. The route from QRP rig to antenna goes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through three coax switches and two linear amplifiers, so that is inevitable. In the worst case, at 30MHz, my 5 watts becomes about 3.7 watts – enough to notice? I doubt it. Besides, these losses have not prevented me from having many successful CW QSOs at powers as low as 100 milliwatts – good enough for me.

So, practicality outweighed absolute efficiency in this case, and I made the right decision for me, saving well over £200 in the process. I hope this has been of interest and I look forward to my next *On a Budget* instalment. **PW**

Frequency	Insertion Loss	Insertion loss as percentage reduction in power	Switch isolation
1.8MHz	0.01dB	–0.002%	–55dB
14MHz	Forgot to record	Forgot to record	–37dB
30MHz	0.66dB	–14%	–30dB

Table 1: Insertion loss and switching isolation of homebrew switch.

Frequency	Insertion Loss	Insertion loss as percentage reduction in power
1.8MHz	–0.59dB	–12.7%
14MHz	–0.84dB	–17.6%
30MHz	–1.13dB	–23%

Table 2: Insertion loss of complete system.

NEWS EXTRA

FLIGHT 777: At 0735 on 1 June 1943 the roar of twin Wright Cyclone engines broke the silence as a Douglas DC3B tore down the runway at Lisbon Portela de Sacavem international airport. This thundering beast was *IBIS*. Originally Dutch registered as PH-ALI, she was leased to and re-registered by British Overseas Airways Corporation (BOAC) as G-AGBB. She was stationed at Whitchurch, Bristol after being evacuated from the Netherlands in May 1940 along with her crew just as the German army invaded.

The 13 fare paying passengers on board (including Hollywood actor and heart throb Lesley Howard) settled back for the seven and a bit hours flight back to the UK and the IBIS home airport. The extended route took the aircraft out into the Atlantic away from the Portuguese coast and the risk of enemy fighters before heading north over the Bay of Biscay and finally the English Channel.

IBIS was not flying in her commercial silver bare aluminium skin (to save weight and maximise her range) nor KLM Orange. A colour used by KLM to not only to promote the Dutch national colour, but to highlight to all warring parties the civilian status of their aeroplanes. IBIS had recently been repainted by B.O.A.C. in full British camouflage!

Around 1050 co-pilot Derk De Koning shouted that he had spotted aircraft in the mirrors that had been retrofitted to the DC3. Those aircraft were shadowing IBIS as the commander of an enemy squadron was trying to identify the aircraft as it faded in and out of the cloud. What is known of the last few moments of flight 777 comes from the very last radio communication from IBIS and the reports made by the officers of the German Luftwaffe that had come across 777.

At 1053 Cornelis Van Brugge signalled that they were being followed. At 1054, he reported they were taking fire. This was the last transmission from IBIS. One of the German pilots that attacked flight 777 in his flight report states that they came across a DC3 while returning to base following an aborted mission (due to poor weather) to escort two U-Boats.

The poor visibility and the camouflage markings of IBIS as well as the lack of information that commercial aircraft were flying in that area led them to conclude they were following a military flight. The Commander gave the order to attack. Shortly after the same pilot reported the port (left) wing and engine were on fire. He reported seeing four persons exit the aeroplane and fall to their deaths as their parachutes caught fire as they inflated. Shortly after the aircraft rolled and flew into the sea just over 200miles north of the Spanish coast. The Junkers circled a few times, and witnessed IBIS slip under the water, no bodies were seen.

Search vessels were dispatched to the area, but IBIS was never found. One of the flying boats involved in the search to came under enemy fire and had to ditch off the coast of Cornwall.

On board were many dignitaries, including Hollywood actor Leslie Howard and his accountant, Alfred Chenhalls, who happened to look like Churchill from a distance. Also on board was Wilfrid Israel, who was instrumental in saving 10,000 children in the Kindertransport to the UK. Conspiracies are rife, only exaggerated by the fact all official files are locked for 100 years and not the normal 50 or 70 years. Sadly, all lives were lost.

2023 is the 80th anniversary of the loss of Flight 777 and the death of her passengers and crew. To commemorate the occasion, the North Bristol Amateur Radio Club in collaboration with the South Bristol Amateur Radio Club have a special event station GB80AGBB to be run between the 30 May to 4 June at the old Whitchurch Airport Bristol.

BROADCASTER SHUTS LONGWAVE RADIO TRANSMITTER IN ICELAND: (From *ICQ Podcast*) A longwave radio transmitter in Iceland has been shut down and demolished, as Iceland phases out that form of broadcast. A team of police stood nearby to oversee safety concerns.

Destruction of the mast, standing 218m, Iceland's third tallest structure, took place because of a decline in the number of listeners to longwave radio broadcasts. The transmitter had been operated on 207kHz by Icelandic broadcaster RUV, which is now giving priority to FM. Another RUV transmitter will continue operating for a little longer in West Iceland on 189kHz. This is Iceland's tallest structure at 412m. There are also plans for that transmitter to close, once FM broadcast replace all of its functions.

The change is being driven in part by Iceland's Civil Defence and other organisations looking to improve emergency notification capabilities. That role is going to be transferred to FM, which is slowly being upgraded throughout Iceland.

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Mike Richards G4WNC
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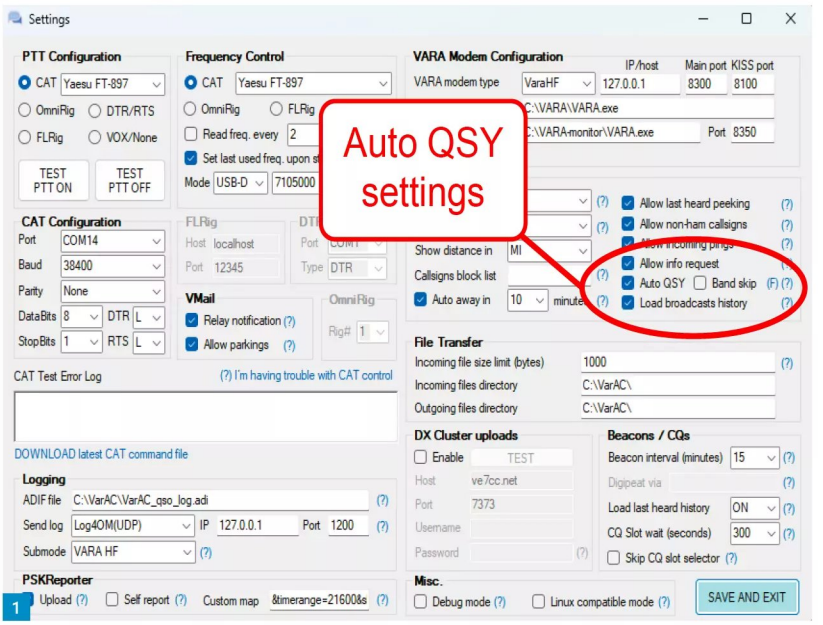


Even more on SDR & VarAC

This month **Mike Richards G4WNC** continues his in-depth look at SDR technology, plus we have a brand-new release of VarAC to enjoy.

Following last month's mention of the need to QSY from the calling frequencies, the new VarAC v7.0 makes the process even easier and adds some shiny new improvements. The QSY change adds an automatic QSY mode that's turned on by default. Previously, a QSY request from one station had to be acknowledged by the other station before it would proceed. The new system still allows the distant operator to cancel the request but, if there is no response, the QSY will occur after a few seconds. The automated process has several applications. First, it will simplify QSYing, which will help new operators relocate away from the calling frequency.

Another important application is the sending of large emails or files. These can now be sent to a station using a QSO slot without operator intervention from the distant end. This will again help keep traffic clear off the calling frequency and has special significance for emergency communications. In fact, VarAC is an ideal candidate for HF and VHF emergency communications. Being a fully error-corrected link, you can be certain that your messages will be received accurately. Also, being able to remotely QSY a distant station will be useful when probing a station for more information.

Operators with multiple antennas may also need to restrict the auto QSY feature to avoid remote band changes. VarAC includes a couple of ways to limit the QSY. The simplest is the Band skip option, **Fig. 1**. QSY will be restricted to the currently selected band when enabled. For more sophisticated QSY control, you should use the Settings menu to select 'Auto-QSY Allowed Frequency Ranges'. This simple text file, **Fig. 2**, lists all the allowed frequencies. You can edit this file in a text editor to match your station configuration.

The new release also includes a four times faster ping process, which is great for checking the path to a station or just confirming that your station is working. Also improved is the start of a QSO, where the initial SNR exchange is sent immediately after a connection request. There are several other improvements along with the usual bug fixes, making v7 a must-have upgrade. You can download it from:
www.varac-hamradio.com

I recently tried some HF file sharing to see how well the VARA-HF modem worked under real HF operating conditions. I was in QSO with **Wolfgang DL7XK** and he attempted to send a photo to me. The transfer worked well and the VARA-HF modem displayed the achieved transfer for each packet. It was interesting to see that the VARA-HF protocol monitors each packet and adjusts the rate for the best possible reliable throughput. In **Fig. 3**, I've shown a screenshot with the rates. As you can see the rate changes between packets to match the variable conditions on 20m. Although not visible in Fig. 3, the best rate we achieved was 800bps, a useful speed.

SDR—Inside the Analogue-to-Digital Conversion (ADC)

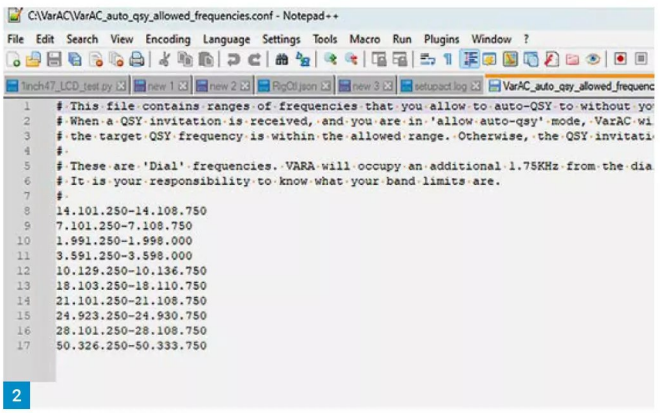
In last month's column, I offered the simplistic explanation that we digitise a signal by taking frequent voltage measurements. In our example of a high-end receiver, that means taking a measurement 122 million times per second. That translates to a measurement every 8 nanoseconds! I'm sure you can see that is a very tall order and one that's further complicated by having to measure tiny signals in the µV range accurately. If you've used a bench DMM (Digital Multi-Meter), you will have noticed that they take a second or so to display their final reading. This is because many use a pulse-counting technique to determine the voltage. That system is far too slow for use in an ADC, so a different approach is required. This has been a major headache for ADC manufacturers, but they have developed some ingenious solutions. The flash technique is the fastest of the systems developed so far because the total measurement can be completed in a single sample cycle. Let's take a closer look at that system.

Flash ADCs

The flash system employs a two-input comparator for each measurement step. Each comparator has one input connected to the input signal and the other to the reference voltage for that step. When the input voltage is equal to or greater than the reference, the output from the comparator flips from 0 to 1. If we connect the output of the comparators to exclusive OR gates and a few diodes, we can get a near-instant digital conversion. To help you understand this ingenious circuit, I've shown a diagram for a 2-bit ADC in **Fig. 4**. The comparators are labelled C1 to C3, while the exclusive OR gates are OR1 to OR3. The exclusive OR will only output a logic 1 if one or other of the inputs is logic 1. If both inputs are 0 or 1, the output remains 0. In logic design, a truth table is a simple matrix showing the input and output values range. **Table 1** shows the truth table for our 2-bit ADC. Here's a circuit description:

At 1V Input: C1 output and OR1 inputs is 1 so OR1 output will be 1 so point A = 1 & B = 0

At 2V Input: C1 and C2 output will be 1 so OR1 output will be 0 but OR2 will be 1 so point A = 0 and point B = 1



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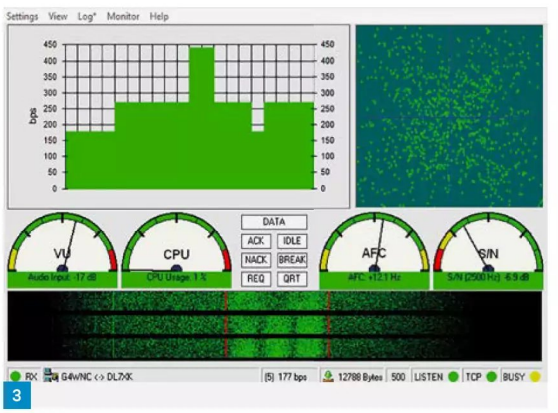

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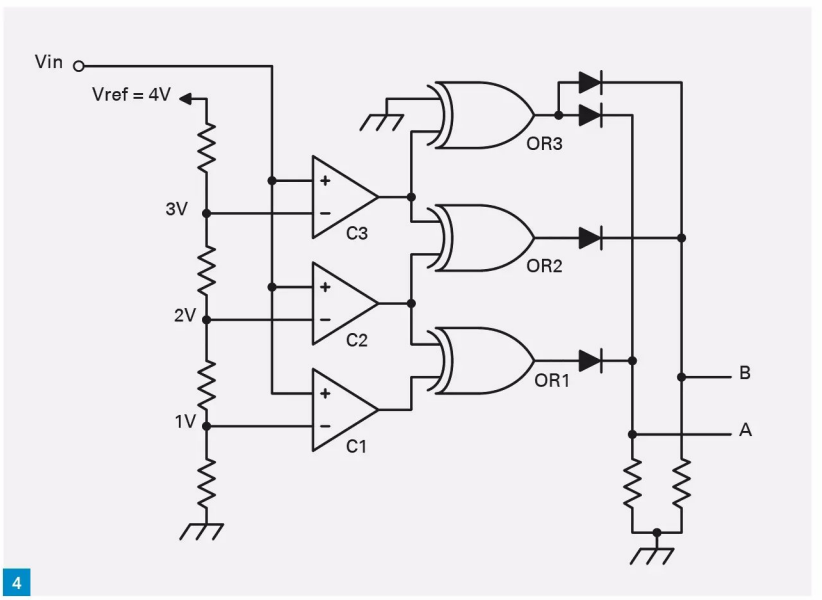
Input	Value at A	Value at B
Binary weight	1	2
1V	1	0
2V	0	1
3V	1	1

Table 1: Truth Table for Fig. 4

At 3V Input: C1, C2 and C3 output will be 1 so OR1 and OR2 output will be 0 but OR3 will be 1, so point A = 1 and B = 1

This 2-bit ADC would be a very crude measurement system as it can only measure 0 to 3V in 1V steps. However, it does serve to illustrate the principles behind a flash ADC. In this example, you can see that we used three comparators, three exclusive OR gates and a few diodes and resistors. If you scale that up for a 16-bit ADC as used in our high-end SDR, we would have 65,535 measurement steps, which would require 65,535 comparators, the same number of OR gates plus diodes and resistors! In other words, an impractical number of components. An accurate 65,535-step voltage divider chain would also be a challenge.

The solution for high-end RF ADCs is to use what's known as a pipelined flash ADC.



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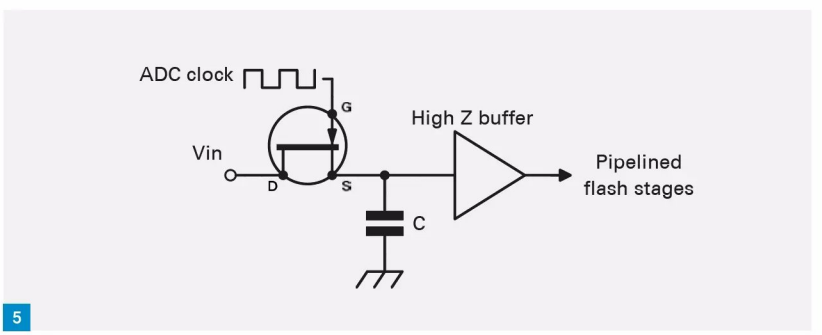

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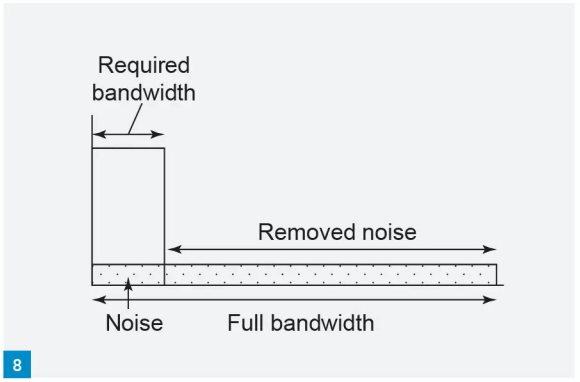
Pipelined ADCs

This model's conversion process occurs in several consecutive stages, hence the term pipeline. The first stage is to capture and freeze the input voltage so that it can be worked on. This uses a sample and hold circuit, which generally comprises a capacitor and FET switch, **Fig. 5**. The switch closes momentarily to apply the input voltage to a capacitor that stores the voltage. This voltage is then passed to the ADC circuitry via a high-impedance buffer. The high impedance is necessary to avoid discharging the capacitor. The signal is then applied to the first comparator-based flash ADC. This would typically be a 3 or 4-bit converter used to extract the 3 or 4 most significant bits of the conversion. The digital output is applied to a matching DAC (Digital to Analogue Converter), the analogue output of which is subtracted from Vin. The residue is then applied to a precision amplifier and passed to the following flash ADC. Let me give you an oversimplified example to help explain the process.

Let's assume the input signal is 12.5766 volts. The first stage would digitise 12 and use the digital output to regenerate the 12V and subtract it from the input, leaving 0.5766V to pass to the next stage. That could be amplified by precisely 10 times (5.766V) to make it easier to measure and the 5.7 digitised by the next stage. That output would be used to regenerate the 5.7V and then subtract it from the input, leaving 0.066V to pass to the final stage. I've shown a block diagram of the first stages of a pipelined ADC in **Fig. 6.** This technique enables high-speed 16-bit ADCs to be produced using just 60 comparators. In a real ADC such as the LTC2208, five pipelined stages are provided



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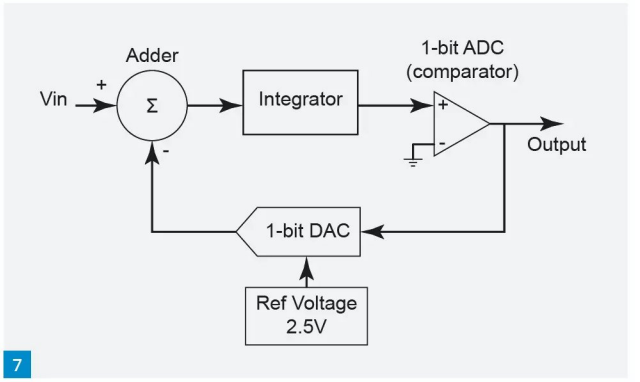

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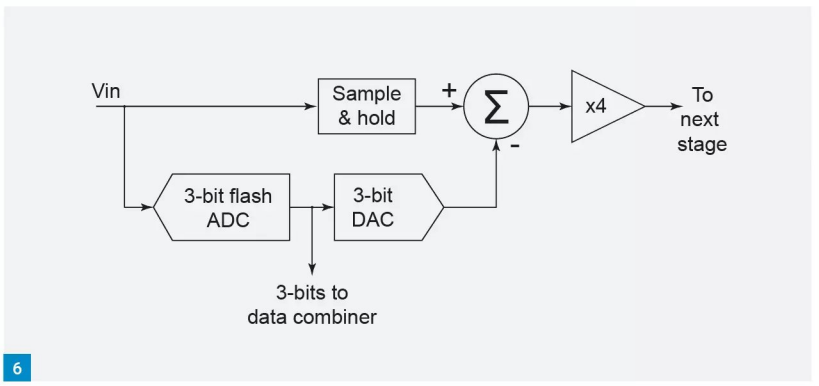

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Fig. 1: Auto QSY configuration.
Fig. 2: Text file to set available QSY frequencies.
Fig. 3: VARA-HF speed results.
Fig. 4: 2-bit ADC block diagram.
Fig. 5: Sample & Hold circuit for pipeline ADC.
Fig. 6: Block diagram of a pipelined-ADC.
Fig. 7: Block diagram for a 1-bit Sigma-Delta modulator.
Fig. 8: Noise reduction by filtering in oversampled sigma-delta ADC.

that deliver more than the specified 16-bits. However, the additional bits are used for error correction.

Dithering

Many high-performance pipelined ADCs use a technique called dithering. This applies a controlled noise source to the ADC input to reduce certain output noise components and improve the SFDR (Spurious-Free Dynamic Range). This may seem counterintuitive, but it works! In any ADC, there will be some non-linearity in the reference voltage steps. This can give rise to spurs in the ADC output. However, if we apply some out-of-band noise to the ADC, we can change the position of the signal on the conversion scale, which will reduce the impact of the error and reduce the spur.

ADCs—the Future

While pipelined flash ADCs dominate high-end HF and VHF rigs, other ADC techniques could soon take over. One likely contender is the Sigma-Delta ADC. This employs a totally different architecture that I'll attempt to explain here. The maths for this technique can get quite complex, so we'll avoid those. As a result, I apologise in advance if this is an oversimplified description but I think it does cover the underlying principle.

The name sigma delta comes from combining two maths terms; Sigma Σ, which represents a summation of values and Delta Δ, which is a difference between values.

A simple sigma-delta ADC will typically use a 1-bit ADC that comprises a single comparator. In addition, we need a delta adder and a 1-bit DAC (Digital-to-Analogue Converter). I've shown the configuration in **Fig. 7**. Here's a description of the function of each block:

Adder: This subtracts the DAC output voltage from the input signal Vin.

Integrator: This has a memory and adds the current input voltage to the last received input voltage.

1-Bit ADC: This is a simple comparator with a 0V reference. If the input is positive, the output will be 1, while a negative input will result in a 0 output.

1-bit DAC: This will output +2.5V if the input is 1 or −2.5V if the input is 0.

Analog Devices have an excellent interactive tutorial that demonstrates Sigma-Delta operation. You can find it here:
https://tinyurl.com/fh2ujkza

The 1-bit ADC output will be a stream of 1s when the input signal rises and 0s when the signal falls. For a realistic representation of the incoming signal, the sampling frequency needs to be extremely high, at least 20 times the highest input frequency. A rig covering up to 60MHz would require a sample rate of at least 1.2GHz. While that is very high, it is easily achievable with today's silicon technology.

The Sigma-Delta technique was originally developed as a modulation system, but to use it as an ADC, we need to add some additional processing in the form of a digital filter and decimator. The decimator and filter act like a down-converter in analogue technology, i.e. we extract a narrow band segment from the original sample. This has the added benefit of increasing the resolution by adding bits to the conversion process. The filtering also reduces the ADC quantising noise. If you recall, quantisation noise comes from sampling the signal in steps rather than continuously. This noise is distributed throughout the bandwidth of the ADC. In the case of the Sigma-Delta ADC this is a very wide bandwidth thanks to the high sample rate. When we decimate and filter down to a narrower bandwidth, we also filter out a large proportion of the quantisation noise, **Fig. 8**.

In practical examples of the sigma-delta ADCs, multiple stages are used, often with multi-bit sampling at each stage.

I think that is probably as far as we need to go with ADCs, so next month, I'll examine how the ADC output is processed and introduce you to the I & Q signals at the heart of SDR processing.

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Sigma-Delta ADC basics: Analog Devices MT-22 and MT23 Tutorials:
https://tinyurl.com/2p9fwbbz
https://tinyurl.com/2r9nd2de

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A Homebrew Cubical Quad

Rod Angel G4ZUP uses garden canes, cocktail sticks and elastic bands make a 4m beam antenna.

This month we look at another two-element beam, only now in the form of a cubical quad: Cubical because the antenna occupies a volume which is approximately a cube, and Quad because each of its elements has four sides. Each side is λ/4 (one quarter wavelength) long, so the diameter of rotation is smaller than either a two-element Yagi or λ/2 dipole.

Like the two-element Yagi [**1**], this antenna comprises a driven element and a parasitic reflector. The reflector is slightly bigger than the driven element, and the element spacing is just under λ/4. It can easily be rigged for either vertical or horizontal polarisation, and it provides a near-perfect match at 50Ω.

The quad, however, has more directional gain than a comparable Yagi; and is reputed to be less affected by proximate objects. The price of these advantages is a modest increase in mass and complexity.

Design considerations

The size and weight of a 4m-band quad is close to the maximum for safe and convenient single-handed rigging, especially in windy conditions. Partly for this reason, the elements are made from flexible wire rather than tube. This reduces windage, but also bandwidth, compared with a tubular design. Some tuning adjustment may therefore be needed, and this is provided by a variable capacitor at the feedpoint.

Having flexible elements also makes this antenna easy to fold up and put in a bag. That greatly simplifies deployment for /P operation. The design featured here was actually inspired by a 2m antenna, which is attributed to WA9GDZ, and was originally published in 1980 [**2**]. I have simply scaled up the dimensions for the 4m band, and modified the structure to use materials that are readily available in the UK.

There is nothing exotic in this design; and it should be possible to build the antenna, as described, on a pocket-money budget using only hand tools and basic skills.

Construction

Construction begins with the diagonal spreader bars. These are made from bamboo garden canes. The bars of each pair are joined at their centre points by a nut and bolt. Near the end of each bar, a small hole is drilled through the cane to enable a cocktail stick (or something similar) to be pushed through, thus making a small cross piece. **Fig. 1** shows the details of these parts.

The antenna boom is made from a white plastic drainpipe, with notches cut into its ends to hold the spreader bars in place. A hole is cut through the centre of the boom to take the mast. In the original, this was sized to jam onto one of the higher sections of a telescopic fishing rod. The spreader bars are held tight to the boom by a strong bungee cord, which runs through the plastic pipe. **Fig. 2** shows these details.

With the rigid parts complete, the elements are made and fitted as shown in **Figs 3** and **7**. Plastic-covered automotive wire, having a DC current rating of about 20A to 30A, is ideal. Small tie-wraps are fitted tightly onto the element wires at the corner points. This gives the elastic bands a purchase point on the wire, and generally helps to keep the elements in shape.

Although it wasn't done on the original, fitting a short length of heatshrink tubing over the soldered joint on the parasitic reflector element

Fig. 1: Construction of diagonal spreader bars.
Fig. 2: Securing the bars in a cross tube.
Fig. 3: Element and feedpoint detail.
Fig. 4 and 5: Feedpoint detail.
Fig. 6: Completed feedpoint with matching stub.
Fig. 7: Fitting the elements and initial rigging.
Fig. 8: Final rigging.

would be good. This would effectively prevent both inadvertent contact with the wire, and any ingress of moisture.

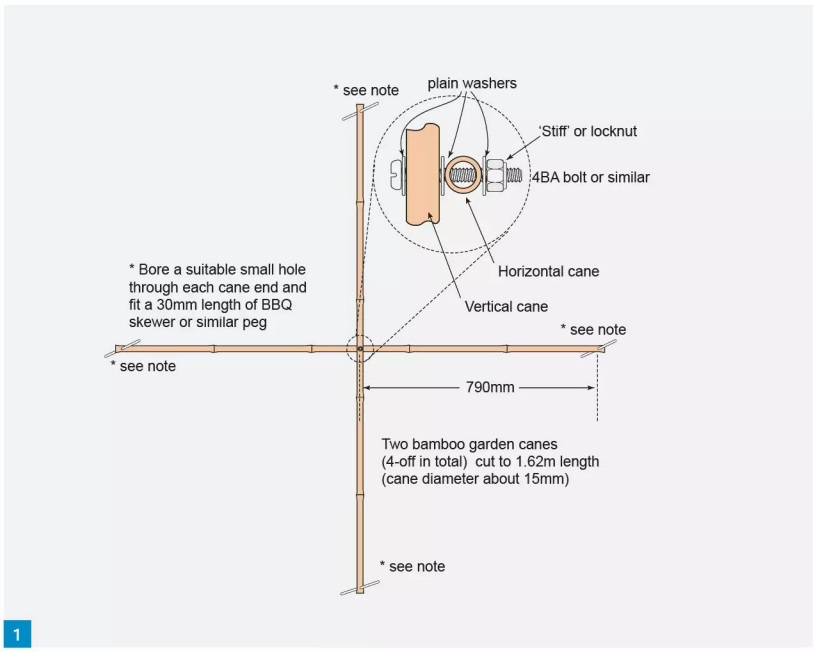
A fairly rigid feedpoint assembly is needed and, in the original, this was built from a junk-box plastic bridge piece. A scrap of perf board provides a suitable mounting for the trimmer capacitor. Details of the feedpoint are shown in Fig. 3, and in the photos **Figs 4** and **5**. **Fig. 6** shows the matching stub secured, alongside the feeder, to the adjacent spreader bar.

Rigging

A quad antenna can be rigged either as a square (ie with element wires horizontal and vertical) or as a diamond (with diagonal spacers horizontal and vertical). Either will work, but there are pros and cons. The square form has the smallest possible diameter of rotation, but feeding it at a point halfway along one side (to obtain vertical or horizontal polarisation) can be a bit of a faff. The diamond form takes slightly more space to rotate – still less than a dipole – but can conveniently be fed at one corner. This makes for a simpler and more robust construction, mainly because the coaxial feeder and its associated bits can all be taped to the adjacent spreader bar. The diamond form is also likely to be easier if you are minded to try this antenna in a loft space.

The weight of the elements, with their bamboo spreaders, can cause the plastic boom to droop a little at each end – and it only takes a small amount of bend in the boom to make the antenna look very wrong. This is easily corrected with a light string across the top corners, as shown in **Fig. 7**. There is no great strain on this top string, but if you use something that is reasonably strong (still non-conductive, of course), it can double as a tool for pulling the bungee cord through the pipe when assembling the antenna.

In operation, the antenna could be hung from an overhead support, but in most cases it will be mounted on some kind of mast. In any event, the supporting hardware needs to be of non-conducting material, at least in the immediate vicinity of the cube volume. I have successfully used the lower sections of a telescopic fishing rod, with at least two sets of guys anchored by 50cm angle-iron pegs. In that configuration, it is essential to tape all the joints on the fishing rod – because it can be quite exciting if the thing suddenly and unexpectedly telescopes down under the weight of the antenna. (Been there, done that!)



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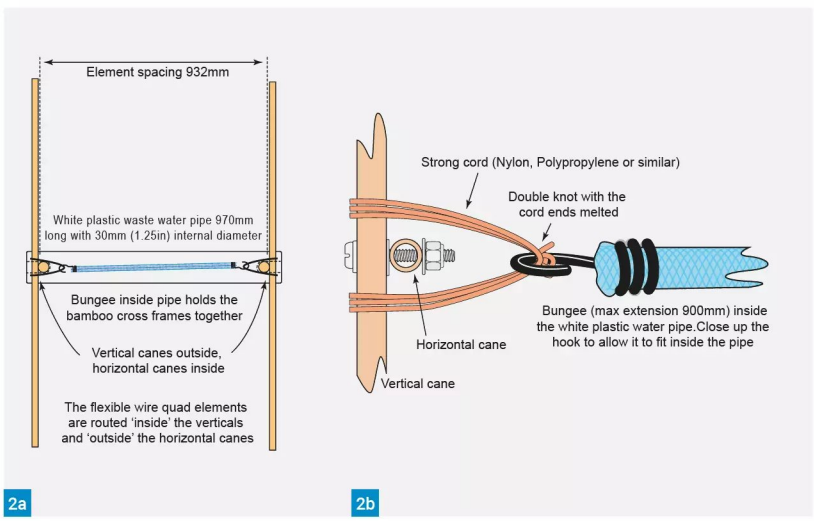

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Normal best-practice rules for rigging VHF antennas should be followed with this antenna. It will work best if it is mounted reasonably high up in a clear space.

The lowest corner should ideally be above head height, although this is primarily a mechanical consideration since the element wires are covered with plastic. The only 'hot' part is at the feedpoint, which is some 70cm higher than the bottom corner.

The general arrangement of the completed rig is shown in **Fig. 8**.

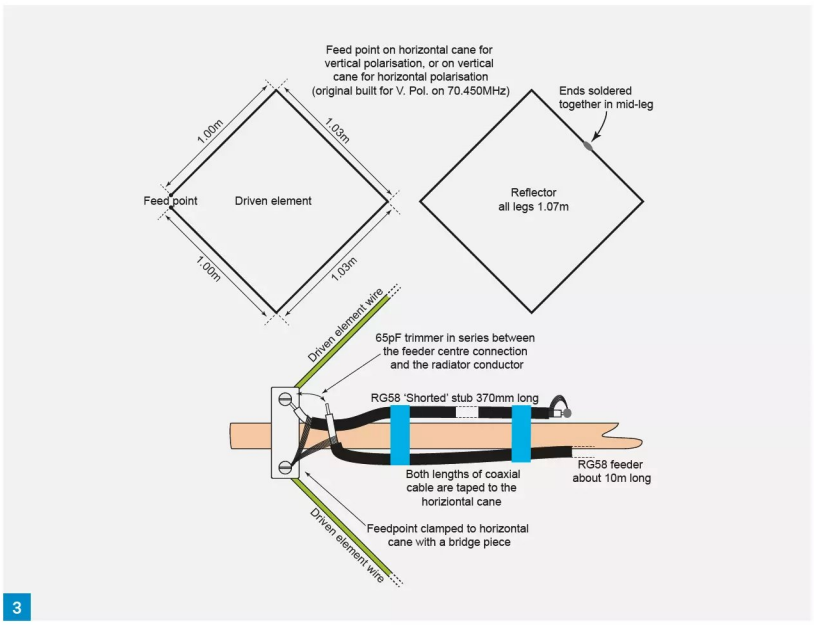
Testresults

With the antenna rigged for vertical polarisation, atop a 6m mast, the indicated VSWR at 70.425MHz was 1.1:1. While this is a near-perfect match in the FM portion of the band, some adjustment may be needed for CW/SSB operation; and in that case, the antenna would also need to be turned on its boom axis to put the feedpoint at either the top or bottom corner.

Operation

Once the antenna is tuned and rigged, operation is straightforward. The only adjustment needed should be beam heading. Rotation by the 'Armstrong' (arm strong) method is easy enough when operating /P, and any ordinary rotator should be fine for permanent installations.

As described, this is not really an antenna to be left out in all weathers. If you do intend to leave it outside for long periods, the feedpoint assembly will need a waterproof cover. You'll also need to



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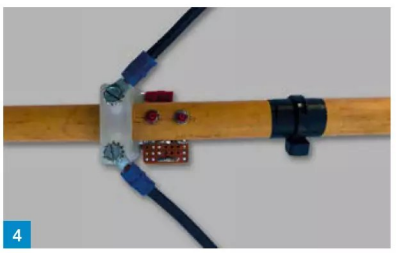

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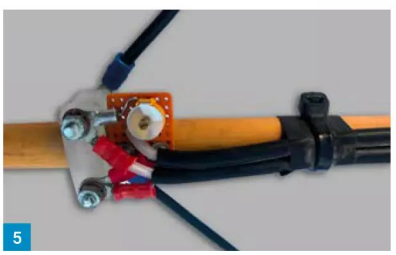

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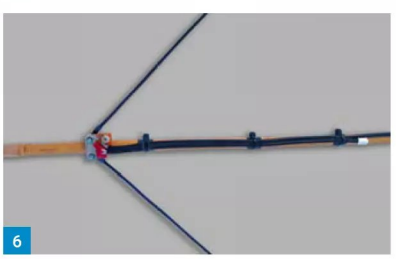

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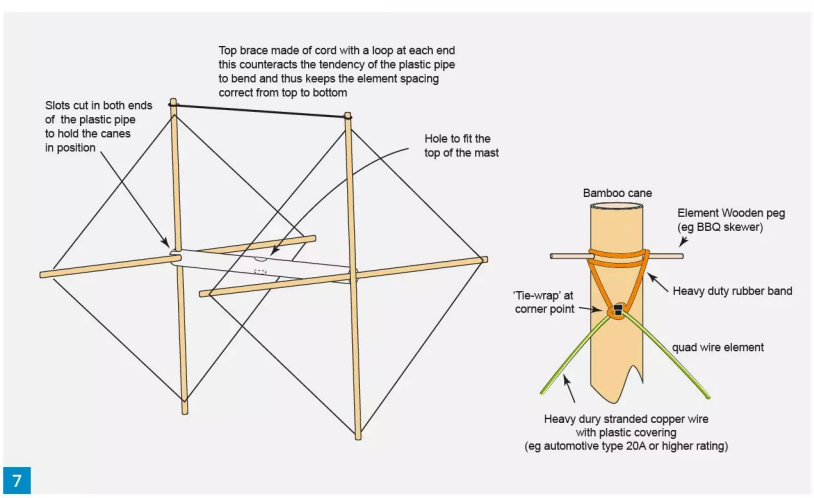

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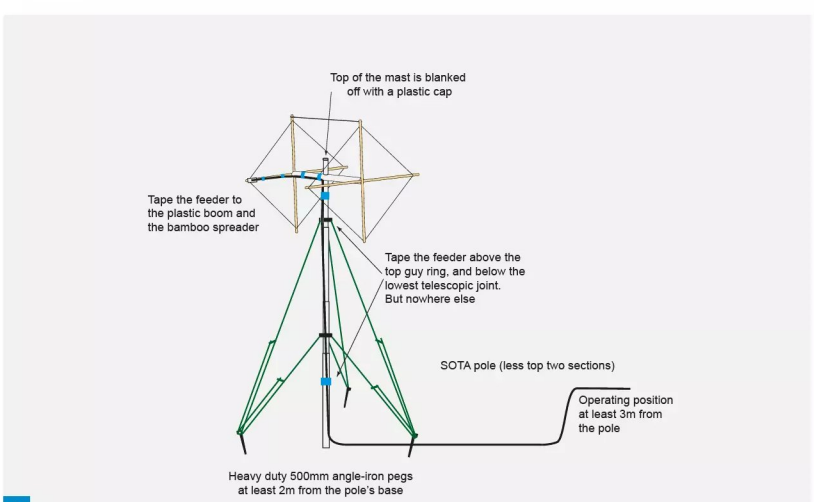

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replace the elastic bands from time to time, as prolonged exposure to sunlight will eventually cause these to perish.

Finally, due consideration should be given to EMF safety. If in doubt, use the RSGB/Ofcom tool [**3**] to estimate a safe separation distance.

Conclusion

The cubical quad is a reasonably compact beam antenna with a useful amount of directional gain – enough to turn marginal FM contacts into 'armchair copy'. It is ideal for /P operation on nice summer days, and can be rigged single-handed in calm weather.

Only hand tools and basic engineering skills are needed to build it; and while measured lengths do need to be reasonably accurate, most of the component parts are not at all critical. There is certainly scope for recycling junk-box bits and pieces to minimise cost.

So, a few hours spent in the workshop on a wet miserable day should be enough to produce a foldable beam antenna that will be effective and fun to use when the sun comes out. Enjoy!

References

[1] *Repurposing an old Band I TV aerial*, by Rod Angel G4ZUP, in *PW* February 2023.
[2] *The ARRL Antenna Book*, 15th edition, Ch 15, pp 8 – 10.
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1

Trap that Coax

Billy McFarland GM6DX explains how to make a multiband antenna by building your own coaxial traps.

Antenna theory and design is one subject within the hobby that every amateur has an opinion on. Some opinions are well informed and others are based purely on personal experience and practicalities. For most people there will be some form of compromise on antenna design and performance, possibly due to garden size or other limitations at their home QTH. One common method of an antenna compromise is to install and make use of antenna traps. By making use of antenna traps it will allow the one antenna to work on multiple bands but will load the antenna making it electrically short. Meaning we are compromising on antenna performance in order to give us a single feed antenna for multiband use.

At HF the use of a dipole or inverted-L antenna is common and the use of traps even more so in these antenna designs. The RF will travel along the wire to the first trap and depending on the frequency that the trap is tuned to, it will stop and not pass any further. This is known as a rejector circuit and consists of a capacitor and inductor connected in parallel, **Fig. 2**. A half-wave dipole can work on two bands, let's say for the 10m and 20m band. By inserting two traps (one in each leg, as it's a balanced antenna) for the 10m band it will stop RF on the 10m band from passing along the wire any further meaning the antenna length stops at these traps. When the 20m band is used the RF passes through the traps to the end of the remaining length of wire. You can clearly understand how the use of these traps can be very helpful. Antenna manufacturers make use of various designs depending on the type of trap installed, whether on a Yagi or wire antenna. However, you can, at home make your own coaxial trap using very basic items but you will need an antenna analyser for tuning. I constructed an 80m coaxial trap using the following parts;

1. 1 x length of uPVC pipe (I used 54mm OD pipe)
2. Length of coax
3. 2 x M5 bolts and nuts
4. Some heatshrink

Fig. 1 shows some of the parts needed for this project.

The Construction

To make this trap the first step we need to do is visit this link and download the coax trap calculator:

https://tinyurl.com/y4dahfn4

Once you download the software, run the setup.exe file and install. Double-click on the software icon and you will see the calculator screen appearing. You simply enter the following information: Frequency of trap operation (3.6MHz); the outside diameter of the form, in my example it was 54mm UPVC; the coax diameter, I used Messi & Paoloni Ultraflex 7 so this has a diameter of 7.3mm; the pF per meter, you will find this on the coax data sheet, for the Ultraflex 7 it is 75pF/m. Once all this information is entered into the fields it will calculate some results. The results provide you with the number of turns needed of coax on the form, the length of the coil as well as the total length of coax needed (leave some extra for practical fitting). **Fig. 3** shows the calculator software for my example.

Now we know the number of turns and length of coil it is time to start making the trap. First step is to take a piece of your uPVC pipe and drill a 6mm hole for the M5 bolt. Measure along using a ruler the calculated coil length and drill the second bolt hole away from the first hole. Ensure that you have left enough room for the bolt and nut to be fitted without impeding the actual coil. Once these two bolt holes have been drilled it is time to drill the holes for the coax to enter the form. In my case it was 8mm holes. Again, the distance between these holes should be the calculated coil length that the calculator application provides. Now fit the 2 x M5 bolts with ring connectors into the pipe using nylon locknuts to secure them in place. You will find it helpful to bend the ring connector slightly to take the shape of the inside of the pipe former to help keep the bolt and nut tight with the electrical ring connector. **Figs 4** and **5** both show the bolt assembly and the position of the holes on the tube. It is also worthwhile at this stage drilling two holes on the sides, at the ends of the tube, to allow the antenna wire to pass through. This provides the antenna wire with some strain relief at the electrical connections onto the trap.

Next stage is to look at the calculated coax length and trim some coax for use. At first I

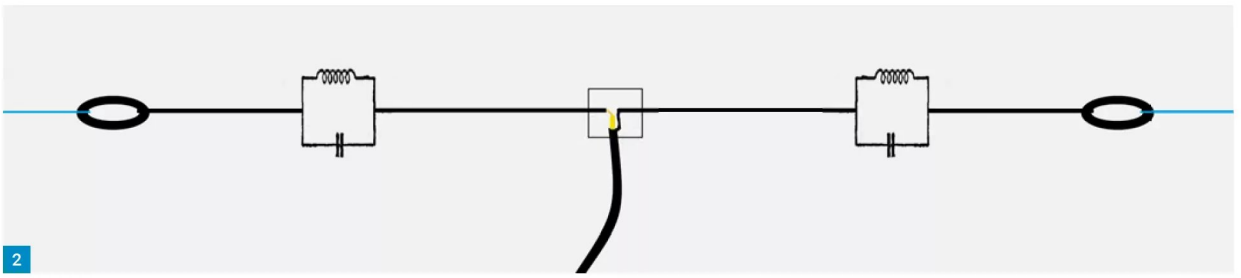
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Fig. 1: The parts you will need for the project. Fig. 2: Simple traps in the two legs of a dipole antenna. Fig. 3: Using the online calculator. Fig. 4: Bolt assembly. Fig. 5: Bolt assembly, end view. Fig. 6: Separating the coaxial shield and inner core.

made a mistake and misread the length to be 345mm, where it was in fact 345cm or 3.45m. When I took out the coax and trimmed it to length I thought no way will all this coax be used making the trap but it actually does. So, if your calculated length has a few metres of coax, then don't be alarmed. This is probably correct. Strip back the coax jacket to the length of the coil and separate the shield and inner core as seen in **Fig. 6**. Insert this end through the first hole you have drilled in the tube former and turn the coax onto the former. Ensure all turns are tight to the former as well as the spacing between each turn. If you have drilled out the holes correctly, you should have the same number of turns on the former that the calculator application has provided. **Fig. 7** shows the turns being made on the former. As the remaining coax passes into the second hole of the coax former it is time to mark the coax and trim it to length. I left about 40mm of coax from the hole. Now trim the outer jacket of the coax and separate the shield and inner wire from each other.

We are now ready to make the electrical connections of the trap. Take the piece of the coax that you stripped first (this should be the longest stripped back coax and was the first end fitted into the former – hole 1) and with this centre coax connection attach it to the shield of the opposite coax end. This connection can be seen in **Fig. 8,** remembering that all electrical connections are made inside the former. Now take the shield of the longest stripped back coax and trim this to size soldering onto the ring terminal of the first hole as seen in **Fig. 9.** This now leaves only one more connection to be made and that is the centre coax connection of the shortest stripped back end of coax (hole 2). Simply connect this onto the remaining ring connector as seen in **Fig. 10**. Please take a look at **Fig. 11**. This drawing shows the coax turns on the former as well as the electrical connections made within the tube. This should provide clarity of how the connections are made.

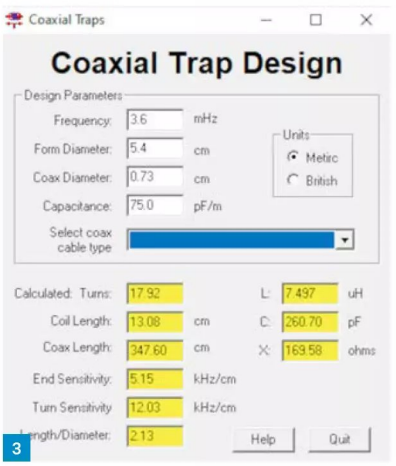

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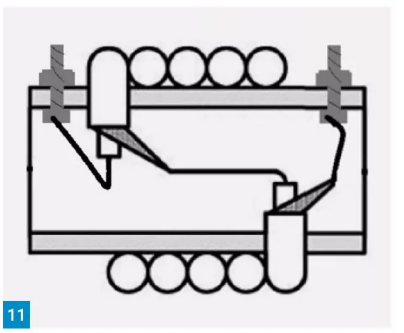
Fig. 7: The coaxial cable wound onto the former. Fig. 8: Attach shield to inner of opposite end. Fig. 9: And attach the combined connection to the ring terminal (1). Fig. 10: Attach remaining inner to ring terminal (2). Fig. 11: A diagram showing the overall arrangement. Fig. 12: Adapter for test purposes. Fig. 13: Coupling to the trap for measurement purposes. Fig. 14: Dip too high in frequency. Fig. 15: New dip after adjustment – perfect. Fig. 16: The finished trap, ready for use.

The Tuning

In order to measure the resonant frequency of the trap and for minor tuning of the trap we need to first make an adapter to fit into the analyser. Take a short piece of 50Ω coax (about 200mm or so) and ensure a PL259 plug is fitted to one end. Strip back the opposite end, about 40mm of coax, and separate the shield and inner connections. Now take a piece of enamelled copper wire and form a loop so that it has an inside diameter of about 200mm. Connect, with solder, one end of the loop to the shield/braid connection of coax and the remaining end of the loop to the inner connection of coax. Once soldered use some hot glue to help any connections form breaking and to provide structural support. The complete adapter can be seen in **Fig. 12**.

Sit the trap on its end and connect the adapter to your analyser. Set the analyser for SWR scan at the frequency required. In my case it was set for the 80m band. Now place the loop over the trap so that the trap is coming up vertically through the loop. Do not allow the loop to touch any part of the trap or surface that the trap is sitting on. **Fig. 13** shows this taking place. Simply scan as you would for SWR on your analyser and look at the frequency dip. Using **Fig. 14** for reference you can see that the frequency is too high for the 80m band. This means that there are insufficient turns on the trap (not enough inductance), actually one turn short in this example.

Having made many of these it is very difficult to increase the inductance value of the trap. Even forcing the coax turns closer together doesn't increase the inductance value enough. In this particular instance you would need to add a further one turn onto the trap in order to get it near the 80m band. If the trap was showing a dip around 4MHz, then this trap would work for the 80m band. It doesn't need to be perfect. If the trap is in the upper range of the band limits, then the trap will work fine. Now looking at **Fig. 15** for reference it shows a dip in the middle of the 80m band. This trap will work well also but should you wish to raise the frequency of the trap to, say, 3.9MHz, then by decreasing the inductance it will raise the frequency. Again, this is very limited but by spreading the turns of the coax, usually it will be the underside of the trap that gets spread, then this will increase the frequency enough for you. It is easier to decrease inductance on these traps than it is to increase the inductance. If you are making a balanced antenna such as a trapped dipole, then both traps must be of the same value. So, when it comes to tuning try and make sure the dips are at the same frequency or the antenna is at risk of becoming unbalanced.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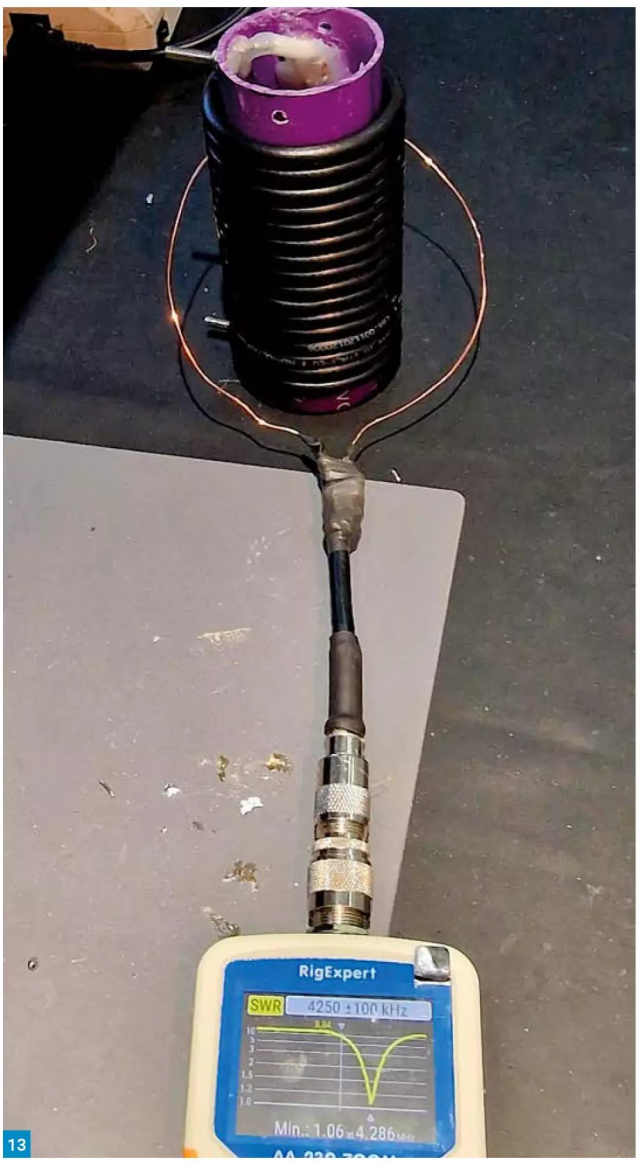

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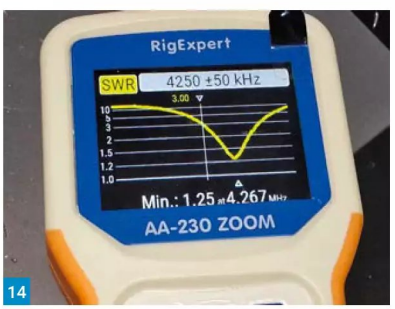

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Once we are happy with the tuning it is time to seal all the connections inside the tube. Liquid electrical tape/sealer works well for this. Also, we need to make sure the coax turns don't move. Some glue and amalgamating tape will prevent the coils of coax from shifting during use. **Fig. 16** shows the finished trap.

This simple trap design can be made very cheaply and performs well. Like always, should you have any questions about this project then drop me an email at **gm6dx@outlook.com**

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The R 209

Philip Moss M0PBM takes a look at the R209 Communications Receiver for Mobile use.

This set, as seen from the front in **Fig. 1**, I bought from a school friend when I was about 14, for £5, which on my pocket money was quite a lot, though not unreasonable. It came with a battery charger to power it. My radio was the Mk2 version, which unlike the 6V Mk1, ran off 12V. The charger proved more useful than the set to be honest, when I had a car, somewhat later. At the time I was told by him that the set was used in tanks – not true. The closest to a tank is its use in an APC (armoured personnel carrier), FV432. Well they look a bit similar… Mine had an intermittent fault, it would just stop. I did know that when I bought it. It was an awkward one, more of that below.

Its Uses

On the subject of how this set was deployed, there are too many ways listed by *Meulstee* (see references) to list here, but apart from the above they were fitted in many vehicles, and despite its colour (perhaps there was an RAF grey-blue version) it was used by the RAF in an ASSU Tentacle vehicle, an Air Support Signal Unit, in a car, 5 cwt 4x4. I use the military nomenclature. It was used in some cases with a WS No. 52. This radio was the first deemed truly hermetically sealed, and duration tests showed it lasted without diminution of performance in adverse conditions far longer than any previous set.

Development work started long before it became a reality. Introduced in 1946, it started in 1942. Pye, Philips and Murphy all worked on it. Production started in August 1945. Pye dropped out after the initial development work, due to other commitments. Murphy produced a complete set, but when tested by being parachuted, their version of mounting the tuning capacitor came detached from the gears. The capacitor was mounted at three places in a flexible way. One assumes that it was not possible to modify their design to avoid the problem. Eventually then Philips got the order, but to twin-source it, RGD (Radio Gram Developments) Ltd, who were not involved earlier, were also awarded an order. The original orders were 6,000 to RGD, and 14,000 to Philips. However, with the easing of tensions, the RGD order was scrapped and the Philips order reduced to 3,000. But, oddly there was a Mullard-badged version, called the GFR 509 and sold commercially.

Modifications

I carried out two modifications. Firstly, I replaced the headphone connectors with a ¼in jack socket as it didn't come with the original two-pin connectors (predictably, nor for that matter the special three-pin power plug), and much later I added an external PSU, bolted to the back, as seen in **Fig. 2**. At that time, I didn't realise there was a much more elegant way of doing it. I could have got a transformer in it, more of that later.

Frequency coverage is Range 1: 1 – 2.3MHz, Range 2: 2.3 – 5.6MHz, range 3: 5.5 – 12.5MHz, Range 4: 12 – 20MHz. IF is 460kHz. It therefore misses the bottom of the medium wave, as is often the case, an inconvenience to general radio listeners. Bandwidth is fixed, and 4–6kHz at –6dB, and slope of 9dB per kHz. OK-ish for communications voice, but not good for CW. The set is described as general purpose, and the Mk1 was for R/T either AM or FM and CW. The Mk2 and later did not have FM, though the position was still shown on the selector switch, but it just stayed in AM. AM sensitivity is quoted as 4 – 8µV for 20dB SNR, and for FM 4µV for 20dB quieting.

Front-panel controls are fuse holder and then desiccator. This has a glass window and if the crystals turn a deep colour, then it is damp. The Mk2/B (see below) has a voltage selector switch in the top LH corner. The others have an on/off and lamp on switch here. The Mk2/B has a separate toggle switch bottom RH corner for the lamp. There are three push-to-insert antenna wire connectors with a slot in their sides for the wire. Two are for a dipole, and one doubles up for a rod or random wire antenna. The big window is frequency display. A rotating disk with a slot in it covers the three bands not switched to, leaving only one exposed. The little window has a logging scale. There is a lock on the tuning knob: which predictably is the big one. The bottom RH knob is waveband and below it is the IF output connector. This is not fitted to the Mk2/B. Other controls are audio gain, BFO frequency, mode switch (bottom LHS by the power connector), and aerial trimmer. As mentioned, there are two pairs of twin sockets for headphones.

Variations

The main differences between the marks were power. The Mk1 was for 6V DC at 1.7A. The Mk2 was for 12V at 1.5A. The 2/B was 12, 24V DC, and 115 and 220VAC, switchable from the front panel. A six-pin power socket was fitted to the latter, with different wiring for DC and AC supplies: some protection, but still allowing the wrong voltage to be selected at the front panel with predictable consequences, it would appear. I have not seen one, so it is possible that one was unable to select the wrong voltage accidentally because it wouldn't have aligned with the way the power connector was wired. Note the 12V set uses a lot more power than the 6V. This is almost certainly due to the very inefficient way the filaments/heaters are powered, with the voltage excess dropped in resistors, and also the increased current for the heater for the RF amplifier.

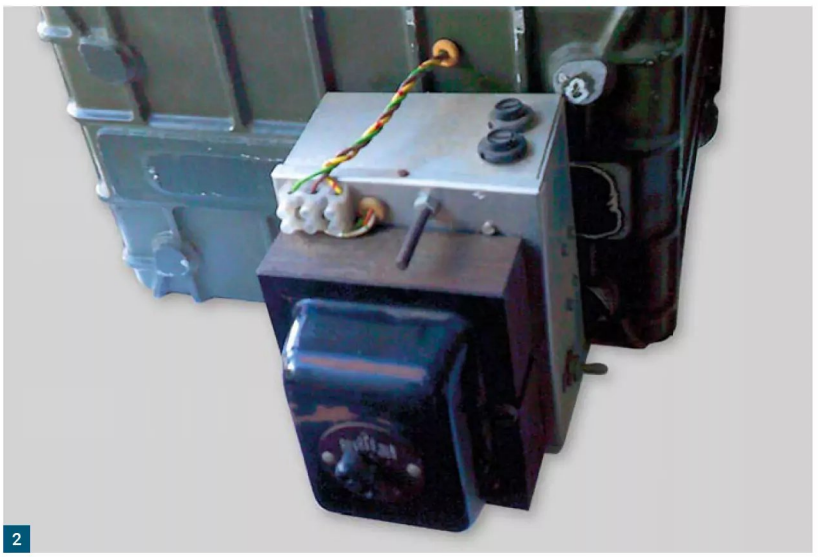
The range of sets are all basically the same although the power requirements are very different. More of that later. They are all hermetically sealed, which apart from a gasket around the joint between the set, built onto the back of the front-panel, all

Fig. 1: The R 209. Fig. 2: The author's addition of a PSU. Fig. 3: A view from the top. Fig. 4: Rear view. Fig. 5: Interior views of the BFO and IF modules. Fig. 6: An idea of the construction – no general chassis as such.

controls are waterproofed. The speaker is in its own small compartment, part of the diecast front of the set, and additionally has a door on the front, which is itself hermetically sealed when closed and secured by the lock. The set runs from 12V DC, and this drives a vibrator to supply the HT. With the exception of the RF amplifier, which is an indirectly heated pentode, being a CV131 = EF92 orW77 in the Mk2 version, and beyond, though a CV785 = 1T4 or DF91 in the Mk1. I would think it predictable that the 1T4 would be unsatisfactory, unable to handle large unwanted signals without falling over. All other valves are directly-heated 1.4V filament. As is often the case all specified valves are in the CV-series, and the shown equivalents are the American numbers. I have translated them into European numbers, not quite as easy as it seems because as one often finds, looking up the equivalents not only shows several, but also if one checks back the other way, it does not always work, with another type shown. I have not included ones that are rather obscure, but the USA, European and Marconi/MOV types only. I have a copy of the official military equivalents register. Each valve has its own series dropper resistor, and despite the very low power dissipation, it is a wirewound: probably more for long-term stability than reliable dissipation. A result of this is that the 12V version uses a lot more power, as more than twice as much power is wasted in the dropper resistors – 50 mA times 10.6V instead of times 4.6. One may have thought they would series-chain the filaments, as anyway if one valve fails in this set, it is unlikely to work at all anyway.

Circuit Arrangement

The valve use is as follows: there is one RF amplifier as above, followed by a mixer, then three IF amplifiers, all 1T4s, then a discriminator (FM in Mk1 only) also the detector for AM, a BFO (beat frequency oscillator) and then two AF amplifiers in push-pull. Unusually they are not the same valve, and the phase splitting is done by taking the signal from the first valve's screen grid and feeding the second valve's control grid. Not designed for Hi-Fi! The input valve, V9, is a 1T4/DF91 or W17, the other is CV784 (1S5 or DAF91), these two produce a huge 50mW between them, feeding the speaker and also the parallel pair of two-pin sockets for 150Ω headphones. Strangely, the 1S5 and 1T4 are cross-listed as equivalents, which is not true. The 1S5 is a diode-pentode, not a simple pentode. Later an external crash-suppressor unit was made available to protect the operator from the likes of lightning crashes. It was simply four diodes in anti-parallel series pairs. I think the peak power would have still been quite painful, and one diode would be enough each way.



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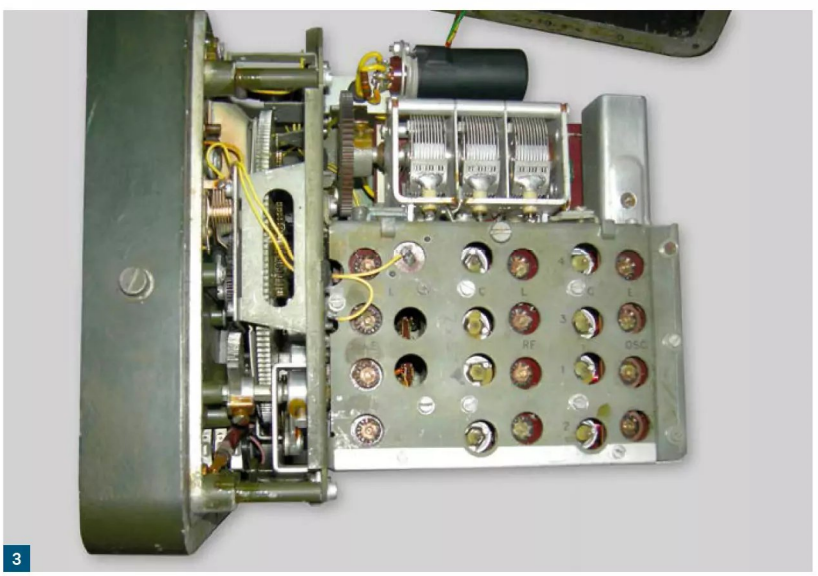

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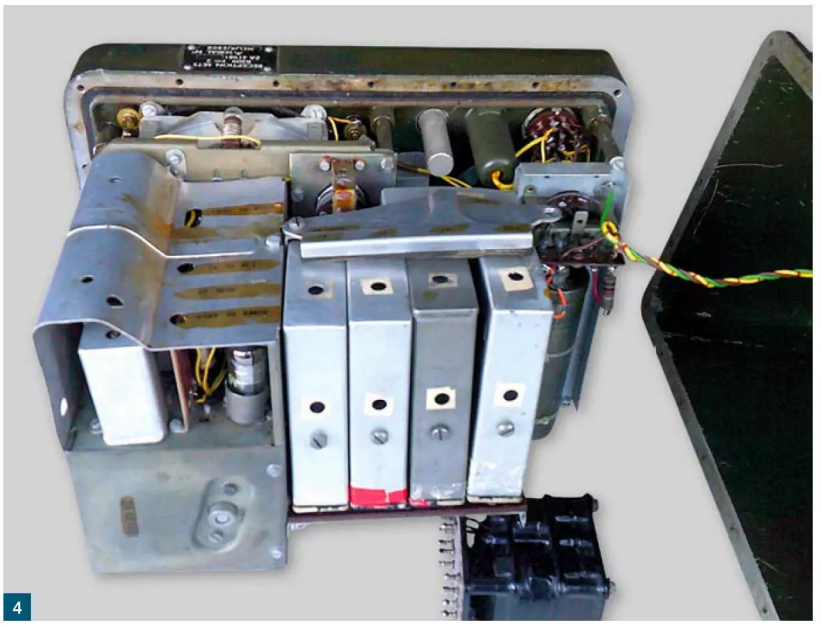
A 1S5 as BFO completes the line-up, the HT rectification being by solid-state bridge rectifier, with stabilisation of HT to the local oscillator by a neon, without a designation in the Mk1 and by a proper plug-in valve, CV284 or 75B1 in the Mk2. Predictably the sets use a vibrator to convert the DC input to AC for the step-up. HT is 90V.

As can be seen, the set is substantially modular: **Fig. 3** shows the set from the top, and **Fig. 4** from the rear. There are three IF stages, the BFO and discriminator, all plug in. **Fig. 5** shows the BFO and IF module interiors, the BFO being on the left, with the smaller can. Unlike the IF transformers, it only has one coil to adjust. There is no general chassis, and part of the set is built on two sheets of SRBP (synthetic resin bonded paper), which carries the sockets for the modules, and the output valves, as can be seen in **Fig. 6**. The RF amplifier, local oscillator (LO) and mixer are a sub-assembly, on a metal chassis, which as can be seen, is a much-perforated side in metal, for access to all the cores and trimmer capacitors involved, and with an easily removable cover to access the three valves. These are retained by clips, which easily lift and have grommets to protect the valves.

A Fault

The fault with mine was the local oscillator stopping. I didn't get really into finding this fault for years, which was a good thing as it happened, as by that time I had bought a Mullard High Speed valve tester. I was preparing to go looking for the fault in the LO section of the RF box, when I decided to test the valve, much easier than getting too far in the box. It is a forbidding unit, with very little access to components without removing others.



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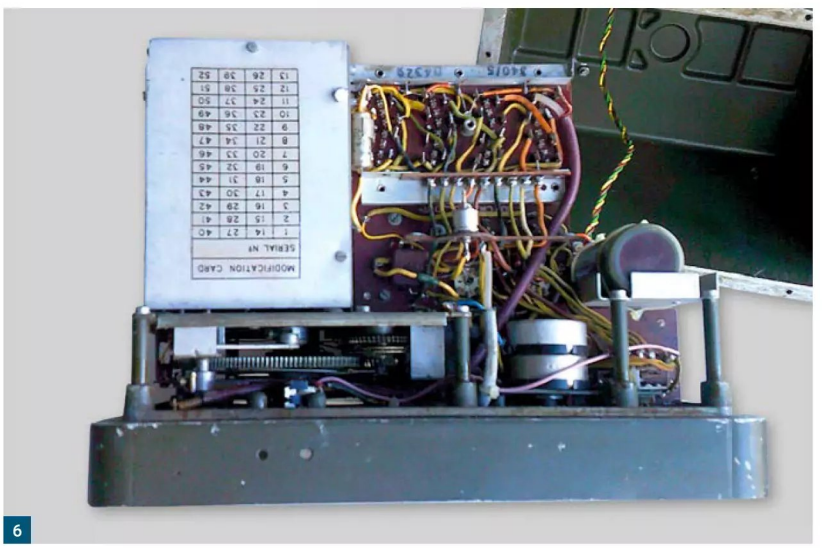

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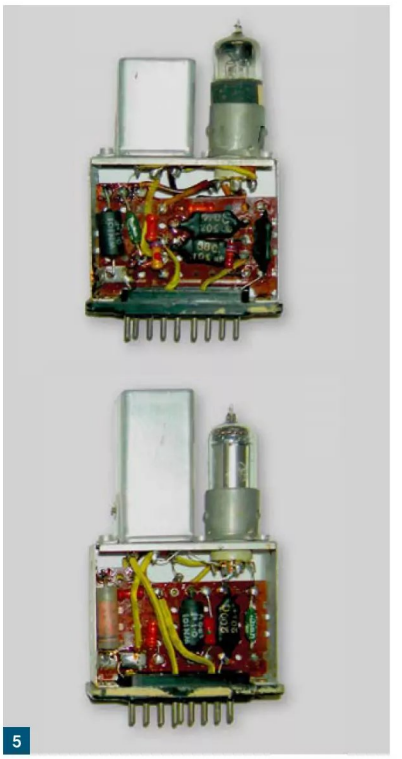

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To be avoided if at all possible. The fault would turn out to be an intermittent short between the filament and control grid. These little valves are rather delicate compared to mains valves. Later I would have another fault, the gain seemed to drop. Searching with a 'scope, it seemed that one IF unit had precisely unity gain. Again, a check on the valve showed the same fault. These are very common valves so replacements were found from stock.

Back to my modification for a PSU not involving the battery charger. That was inconvenient as I did not have the three-pin plug for the power input on the front panel. I used a transformer from stock: I was decidedly short of money at the time, thanks to the then mortgage rate (and an ungenerous employer!). It was intended to run an amplifier, so the HT winding was far too high a voltage. It was 300-0-300 but tapped at 240. I used one side, 300 and 240, and bridge rectified it so it was still full-wave rectified, into a wirewound before the smoothing capacitor. The transformer had two 6.3V LT windings. These were wired in series, and again bridge-rectified into a large electrolytic.

What I could have done is used a 12V 25VA transformer internally, rectified that and kept the original transformer. The theoretical voltage would have been not 12, but 12 times 1.414 minus two diode drops, or about 15, so a smoothing resistor would have to have been selected, as indeed I did have need for in the way I have done it. Currently I must admit the set could do with renovation: mainly mechanical, to restore it being solid, and a new PSU, internal this time.

Conclusion

From the point of an SWL, or general-purpose radio listener, the set is rather limited, but it is sealed, relatively small and probably offered a decent performance at the likely price ex-military. Clearly at the time CW was more in use than now by amateurs, and its bandwidth is far from ideal. At the time though I found I could get many an overseas station on it with very little for an antenna, and I suspect many others did too. It was probably good enough for many learning the ropes before starting on their journey to becoming licensed amateurs. Its design is interesting.

Acknowledgements & References

As ever, **Louis Meulstee's *Wireless for The Warrior, Vol 3, Reception Sets*.** This has full details of all variants, and also pages of the installations it was used in.

The official equivalents book I referred to is **C. V. Register of Electronic Valves** (including Semiconductor Devices) 1963. Issued by the **Technical Valve Committee of the Joint Electronics Standardization Committee.** Distributed by **Ministry of Aviation DLRD(T)/TL5b/TVC Office. Document reference: Admiralty: BR 1758 War Office: Code Number 10206 Air Ministry AP 1186 V (issue 3), Ministry of Aviation Av P 59**. Bureaucratic? How could one think such a thing!

There are 11 references to the set to be found on the **VMARS website:** **vmars.co.uk**

The Radio War

David Harris reviews a book that covers the way radio was used by both sides to influence the French population during the second World War.

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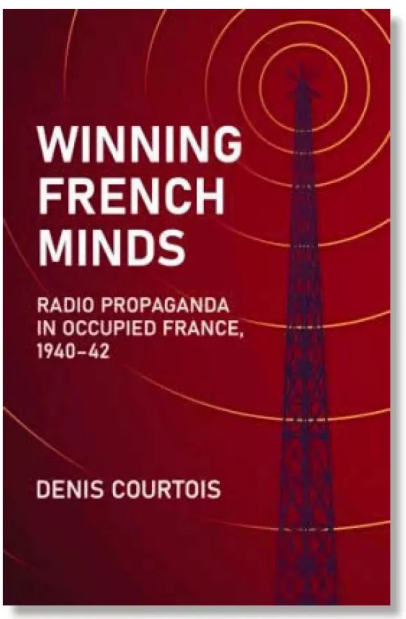
This book is based on research carried out in the UK, France and Germany by **Dr Courtois** for his PhD, which he studied for at the University of Warwick from 2012 -2017. He was born in Belgium and also has degrees from universities in the USA and UK. He begins the book by stating that World War II was a 'radio war' in which radio penetrated the homes of millions of people and narrated the war to the listeners. At the beginning of the war there were 6.5 million radios in France with over half of all households owning a radio. The book focuses on the period from June 1940 (the defeat of France) to November 1942 (German invasion of Vichy France). During this period France was divided into two zones: German occupied France (northern and western France) and the Free Zone or Vichy France (central and southern France).

There are few recordings available of radio broadcasts from this period but in various archives Dr Courtois has found the transcripts of many radio programmes, which has enabled him to build up a picture of how life in France was presented to French radio listeners. The main focus of the book is on the output of the three main French language stations that could easily be received on a domestic LW/MW radio. The stations were: the BBC French Service; Radiodiffusion Nationale (RN), which broadcast from Vichy; and Radio Paris, which was based in Paris and under the direct control of the German occupiers.

Wartime listeners in France could also listen to 'black' stations such as Radio Revolution, Radio Inconnue, France Catholique, Patrie, Gaulle and Travail. These were clandestine stations that purported to be based in France but were broadcast mainly from the UK. French listeners could also tune into Radio Bruxelles, a German controlled station broadcasting from occupied Belgium. Many radios could also cover the shortwave bands, which enabled people to hear French stations, including Radio Brazzaville, Congo, which was controlled by the Free French who supported **General de Gaulle** who lived in exile in London. They could also hear RNB Leopoldville (now Kinshasha), which was in the Belgium colony of Belgian Congo. (now Democratic Republic of Congo). Other SW stations broadcasting in French included Radio Moscow, the US station WRUL and Swiss Radio. WRUL broadcast programmes supplied by the British Intelligence Service up until the USA entered World War II in December 1941. WRUL later became WNYW, a shortwave station that was very popular among British DXers in the 1960s and 1970s.

Dr Courtois devotes most of his book to the BBC, Radio Paris and RN. The BBC began international broadcasting in 1932 and by 1938 had regular broadcasts in French, German and Italian to Europe. In 1940 there were 17 hours a week of French broadcasts rising to 35 hours a week by 1942. Both the Germans and the Vichy authorities tried to jam BBC broadcasts but it appeared that most programmes were well received by the French. One of the major topics that the author focuses on is food provision in France. The German invasion had meant that much of France's agricultural production was being taken away to feed the German population. There were also shortages of labour because many French men were being held in prisoner of war camps in Germany. In addition many French people were encouraged to move to Germany to work in factories where rates of pay were much higher than in France. There had been local protests about food shortages, especially potatoes and milk, which were reported by the BBC who urged action to stop French food being sent to Germany. It has always been difficult to evaluate the effectiveness of external broadcasts but some letters were received by the BBC from French listeners (sent via third countries) praising the programmes.



Winning French Minds. Radio Propaganda in Occupied France 1940 -1942
Denis Courtois.
Casemate. 2023. Hbk. 251 pp. £39.95.
ISBN 9781636241463
www.casematepublishers.co.uk

Radiodiffusion Nationale (RN) broadcasting from Vichy promoted the themes of education, youth, national unity and work. It also published a popular weekly magazine *Radio National*, which listed programmes and contained articles that reinforced the patriotic messages of the Vichy regime led by **Marshal Petain**. He was keen to promote youth to enable the regeneration of France and encouraged mass sporting activities. Courtois points out that any dream of a healthy strong, virile, youth was somewhat thwarted by food shortages, which led to many children becoming vulnerable to childhood diseases.

Radio Paris represented the German occupying forces and encouraged collaboration by the French people. It also promoted anti-Semitism and anti-communism. Germany had an urgent need to recruit workers for its factories, which were geared up for war production. Many programmes featured interviews with French citizens who had moved to Germany and enthused about the modern working conditions, high rates of pay, food and accommodation. In 1942 the Royal Air Force began to bomb Paris, which resulted in many civilian deaths and injuries. Radio Paris was able to interview families whose homes had been destroyed by allied bombing. Radio Paris had its own weekly magazine *Les Ondes* which, like RN publication *Radio National*, provided another channel for disseminating pro-German collaborationist propaganda.

In his concluding chapter Courtois makes the point that the BBC has been credited by both historians and listeners with providing accurate and timely news. This is despite the fact that most BBC programmes were studio based talks or news bulletins. Both Radio Paris and RN could travel around their zones and do outside broadcasts and live programmes. An important point made at the end of the book is that the essence of propaganda remains similar today. It is to release news and present interpretations of the truth to influence an audience. Radio is still an important source of news to many people and international broadcasting, especially by respected broadcasters such as the BBC World Service, remains a vital channel of communication for many people throughout the world. **PW**

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

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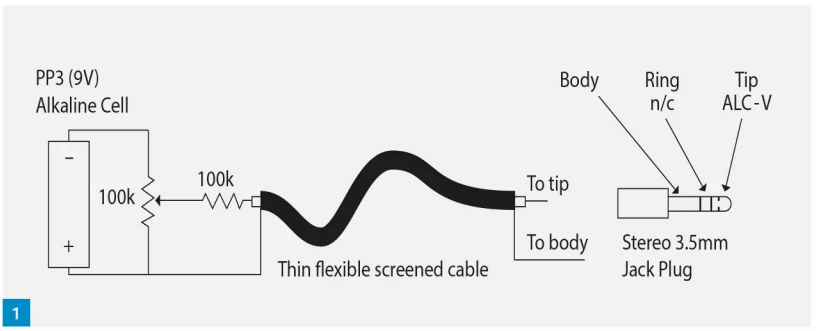

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The 40th Annual Practical Wireless 144MHz QRP Contest

Colin Redwood G6MXL, our QRP Contest adjudicator, introduces the 2023 event, which takes place on Sunday 11 June 2023.

The popular *Practical Wireless* 144MHz QRP Contest is the ideal way for newcomers to the VHF bands and contesting to get a good feel for many aspects of amateur radio contests. It is an excellent way to experience the thrill of making contacts over many km on the 2m band. This year the duration has been reduced by one hour at the request of many of last year's entrants.

Power

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

Equipment

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

Location

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

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

Contest Exchange

For each contact to count towards your score, you'll need to exchange your callsign (**including any /P**), signal report using the standard RS(T) code, serial number and locator. The RS(T) code consists of readability on a scale of one to five and signal strength from one to nine. The serial number starts at 001 for your first contact and increases by one for each subsequent contact you make. So, the fourth contact you make will have serial number 004. For Morse contacts there is also the tone (on a scale of one to nine).

Exchange Example

Imagine your callsign is M7ABC/P, you are located in IO91GI and have a contact with M6ZXT/P as your fourth contact. You might transmit, "*Mike six Zulu X-Ray Tango Stroke Portable from Mike seven Alpha Bravo Charlie Stroke Portable, you are five and six, zero zero four, in India Oscar nine one Golf India*". Using phonetics will make sure that similar sounding letters (e.g. B, D, P, V) are clearly understood by the station you are in contact with.

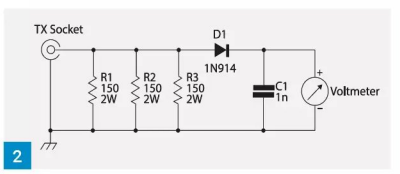

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Fig. 1: A useful technique to reduce power to 5W on higher power transmitters. Fig. 2: A small power meter, to verify the power output. A 21.7V level indicates 5W output. 2W metal film resistors are available from CPC (Farnell).

Hints and Tips

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

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

Directional Antennas

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

Batteries

Many entrants use rechargeable batteries for power. Make sure you have enough power to run your station for the full duration of the contest. I'd suggest making three diary entries: the first a couple of days before the contest as a reminder to charge your batteries, the second for the day of the contest (Sunday 11 June 2023), and the third a few days after the contest to remind you to submit your entry.

The rules appear on the next page. The contest website is also a valuable source of information and has a link for downloading log sheets and an online entry form (known as a cover sheet). **www.pwcontest.org.uk**

Submitting an Entry

Don't forget to submit your entry after the contest. Although electronic entries via email are much preferred and make the task of adjudication easier, paper entries are also welcome. All entries that provide an email address will be acknowledged. **entries@pwcontest.org.uk**

Have a Go

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

The 2023 Rules

1. General: The contest is open to all licensed Radio Amateurs operating fixed or portable stations, using SSB, CW, AM or FM in the 2m (144MHz to 146MHz) band. Entries may be from individuals or from groups, clubs, etc. The contest runs from **0900 to 1500 UTC (one hour shorter than previous years)** on **Sunday 11 June 2023**.
All stations must operate within the terms of their licence. Entrants must observe the band plan and must keep clear of normal calling frequencies (144.300MHz and 145.500MHz) even for *"CQ"* calls. Entrants must allow other users of the band to carry out their activities without hindrance. Please avoid frequencies used by GB2RS (144.250MHz and 145.525MHz), ATV talkback (144.750MHz) and other frequencies in use for non-contest purposes.
The station must use the same callsign throughout the contest and may not change its location.

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

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

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

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

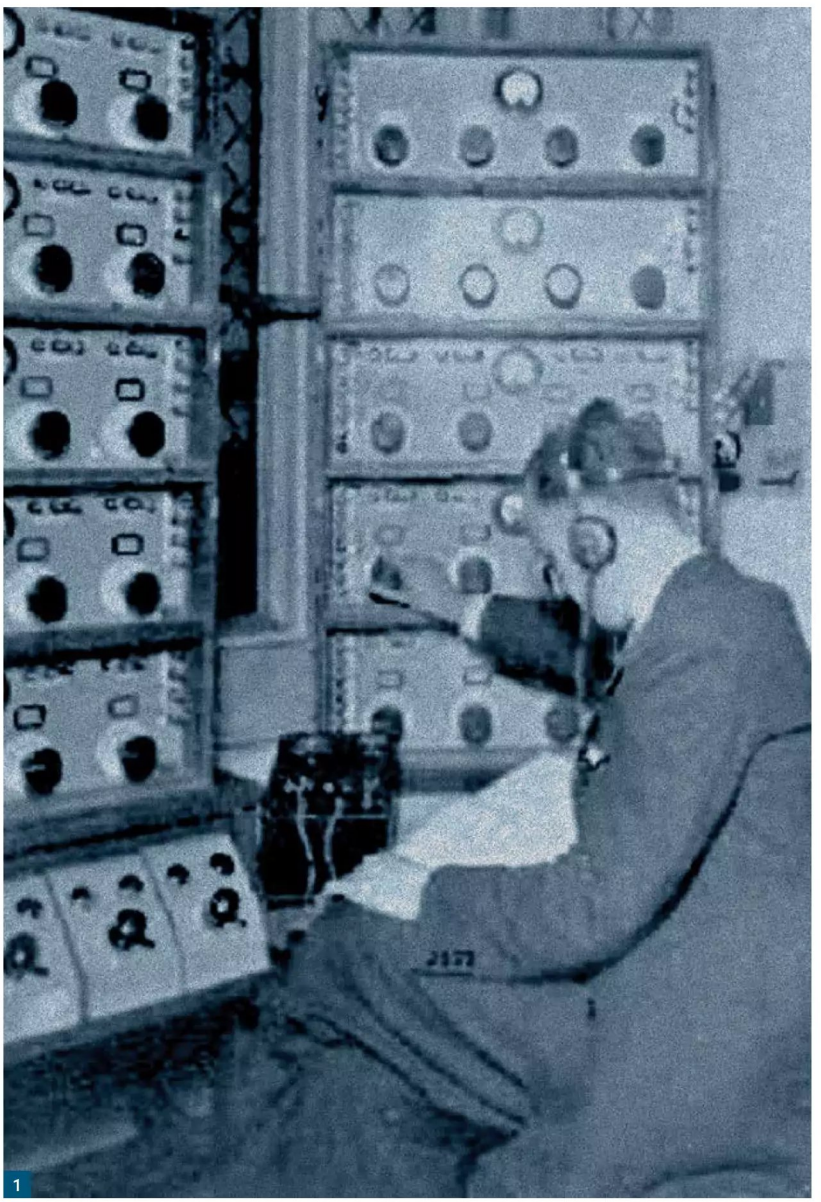
The preferred form of a log is a computer file in REG1TEST, .log, .adi or .edi formats sent by email. This may be generated by contest logging software such as MINOS or EI5DI's SDV, provided it contains all the information listed above. Alternatively, a file in any other suitable format (such as the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

6. Entries: The covering information listed below must be provided with each entry. Please submit this using the online facility on the website. For postal entries, it should be written on a separate sheet of A4-sized paper.
The information required for every entry is:
name of the entrant (or of a club etc. in a group entry) as it is to appear in the results table and on the certificate
callsign you transmitted during the contest, **including any /P suffix** (e.g. G6MXL/P)
name and address for correspondence
location of the station during the contest
full 6-character locator you transmitted during the contest
whether single or multi-operator (a single operator is an individual who received no assistance from any person in operating the station, which is either his/her permanent home station or a portable station established solely by him/her); if multi-operator, include a list of operators' names and callsigns
a full description of the equipment used, to include transmitted PEP output power
if the transmitting equipment (including any transverter employed) is capable of more than 5W PEP output in the 144MHz band, a description of the methods used to (1) **reduce** and (2) **measure** the 144MHz output power
antenna used and the approximate station height in metres above sea level (ASL)
the following declaration must be included in the email text or written and signed by the entrant: *"I confirm that the station was operated within the rules and spirit of the event, and that the information provided is correct"*.
Failure to supply the required information may lead to loss of points or disqualification.
Entries by email must be sent to
entries@pwcontest.org.uk
Paper entries should be sent to: Practical Wireless Contest, c/o Colin Redwood G6MXL, 53 Woodpecker Drive, Poole BH17 7SB.
Entries must be received not later than Tuesday 4 July 2023. Late entries will be disallowed.
Any other comments about the station, the contest and conditions during it are welcome along with photographs. Please note these cannot be returned and may be published in Practical Wireless or on the contest website. Please send them by separate email or post, **to arrive by Tuesday 4 July 2023**.
When entering, you will be asked to agree to the storing and processing of your entry and to the publication of the results. Warners Group Publications data policy can be seen at:
www.radioenthusiast.co.uk/privacy-policy

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

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

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



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BBC Coronations (Pt II)

Keith Hamer and **Garry Smith** continue the special series looking back at how the BBC have covered coronations since 1937. There is also a special Coronation vintage radio advertisement from the archives. Also featured this month are the commemorations to mark the anniversary of the BBC 6BM Station in Bournemouth, the BBC Cymru-Wales Centenary, and 100 years of BBC Scotland-Alba. We also have more details relating to BBC-2 Colour films, continue the series about the development of Swiss Radio and Television since 1933, and conclude the story about Ludwig Blattner and his Blattnerphone.

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

For the 1937 Coronation of **King George VI** and his wife, **Queen Elizabeth**, the BBC provided technical facilities for commentators from 14 overseas radio services, each of whom broadcast a commentary in his own language direct to his native country. This was an added complication for BBC engineers. It had already become clear that the existing equipment in the Control Room at Broadcasting House would not be able to cope with all the technical requirements. It was eventually decided that two extra Control Rooms should be constructed. One was located on the south-west side of the nave in *Westminster Abbey*. This became the focal point of the broadcast from all *Home* and *Empire* transmitters. The other special Control Room was housed in *Middlesex Guildhall*. This was used to send the direct broadcasts to countries overseas.

Only 275 sq. ft. of space were available for the *Control Room* in the Abbey, **Fig. 1**. Amazingly, the three sections into which the room was divided accommodated all the necessary apparatus. In one of these compartments (the nerve-centre of the broadcast), **R H Wood**, *Engineer-in-Charge, London Outside Broadcasts Section*, sat at a panel of controls, which enabled him to mix the output of the microphones, both in the Abbey and, through sub-control points, along the processional route. Part of his 'homework' included a detailed study of the whole of the Coronation Service, and his copy of it included essential notes as to which combination of microphones would be in circuit at each stage of the Service. Sitting next to him was **S Joly de Lotbinière** who could hear the effect of the microphone mixing and immediately make any necessary changes to the input from the 'atmosphere' microphones.

The wiring between the microphones and the mixing panel was installed by *General Post Office* engineers. The total length of wire used during the entire broadcast was almost 500 miles, while the equipment, including seven tons of batteries, weighed 12 tons. In the *Foreign Control Room*, the engineers chosen for the mixing of effects at each position were, in most cases, capable of understanding the language being spoken, so were able to vary the ratio of 'effects' to 'description'. Interpreters were also available. The Engineer-in-Charge, **H H Thompson**, *Superintendent Engineer of Outside Broadcasting*, had been responsible for the technical arrangements of many notable Outside Broadcasts, dating back to the speech by **King George V** who officially opened the *British Empire Exhibition*, held at Wembley Park, London, on *St. George's Day*, 23 April 1924. This was the first broadcast of its type by a British monarch. The King also sent a telegram, which travelled around

Fig. 1: The special Control Room used in Westminster Abbey for the 1937 Coronation. (Photo: The Keith Hamer+Garry Smith Archive Collection) Fig. 2: An advertisement for the 'Ekco New Coronation Radio' in May 1937. (Photo: The Keith Hamer+Garry Smith Archive Collection) Fig. 3: The first electronically-generated Test Signal, known by BBC engineers as the 'Art Bars'. (Photo: Keith Hamer+Garry Smith) Fig. 4: The Blue Plaque commemorating the BBC 6BM Station in Bournemouth. (Photo: David Morris (Lytchett Matravers, Dorset) Fig. 5: An improved version of a Blattnerphone, used by the BBC for broadcasts to the British Empire. (Photo: The Keith Hamer+Garry Smith Archive Collection) Fig. 6: Ludwig Blattner, inventor of the Blattnerphone. (Photo: The Keith Hamer+Garry Smith Archive Collection)

the world in just one minute and twenty seconds before being returned to him by a messenger boy.

Vintage Coronation Wireless Equipment

This month's excursion through vintage copies of dilapidated newspapers and magazines has revealed an advertisement for the *Ekco New Coronation Radio*, **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 four Ekco radios originally featured in an advertisement, dated May 1937:

"NEW CORONATION RADIO

A GREAT SET FOR AN HISTORIC OCCASION

If a radio technician, an engineer and an artist were your three closest friends, and you asked them their advice on choosing a radio, undoubtedly their choice would be – Ekco nine-stage superhet Model 108! Enthusiastically, the technician would demonstrate its luxury all-wave all-world superhet performance, its High-Fidelity Reproduction in perfect balance from a whisper to 'concert room' volume. The engineer would examine its construction and give you his complete 'O.K.' on reliability. The artist would tell you that the magnificent cabinet was his idea of an artistic design.

Maybe you haven't three such friends – but if you see and hear Model 108 in action you will be convinced that this new Ekco receiver is radio's supreme production – a masterpiece of design!

9-stage A.C. mains All-wave Superhet, Model AW108. All-wave operation – 19/49, 200/550 and 1000/2000 metre bands. High-Fidelity reproduction. Magnificent cabinet of fine-grained Walnut.

16½ GNS.

H.P. terms from: Initial payment £1.1.0 and 18 monthly payments of £1.1.0."

The following radios were also featured in the advertisement:

***"UA W78**, 7-stage Universal All-wave Superhet, Walnut finish. **10½ gns.** Black and Chromium 7/6 extra. H.P. Terms: Deposit 12/10 and monthly payments of 12/10.*

2

BA W78**. Battery version (without batteries) **10 gns.

***C78.** Powerful 7-stage All-wave Superhet Console for Universal mains, housed in a magnificent fine-grained Walnut cabinet of outstanding design. **14 gns.** H.P. Terms: Deposit 17/10 and monthly payments of 17/10.*

***AD38**. Superinductance receiver for Universal mains. Walnut finish. **8 gns**. Black and Chromium 5/- extra. H.P. Terms: Deposit 10/6 and monthly payments of 10/6.*

B38**. Battery version (without batteries) **£6.19.6

***E.K. COLE Ltd.,** Dept. T.R.4, Ekco Works, Southend-on-Sea. Please send me free details of EKCO Coronation Radio."*

This advertisement was placed in a daily newspaper and not a technical magazine. It's quite amazing that technical terms such as *superhet, superinductance*, and *nine-stage* were mentioned. Whether the average potential purchaser understood this in 1937 is open to discussion. However, fast-forward to 2023, customers visiting certain well-known High-Street electronics stores who are willing to part with £199 for a radio such as the *Roberts Stream 94L*, are lucky if they are given any additional in-store details except that it's available in 'Black & Cherry Wood'!

For younger readers who may not be familiar with 'guineas' (or 'gns'), one guinea was worth £1 and 1 shilling (£1.05 today). Many companies used guineas to make their prices seem less. For example, a price of '39 gns' may have seemed around '£39', whereas it was, in fact, almost £41!

BBC Cymru-Wales Centenary, Pt 2

The BBC's *5WA Station* in Cardiff began broadcasting on 13 February 1923, from a very small studio above a music shop at *19 Castle Street*. Today, the building is occupied by a well-known brewery and taproom, which depicts a mad dog in its company's logo. There is a very small stone plaque on the wall of the brewery commemorating the beginning of radio in Wales.

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Prior to 1929, there was considerable irritation among listeners because of the apparent neglect by the BBC of the Welsh language, literature and music. A new series of all-Welsh programmes was introduced into the *Daventry 5XX* programmes for the benefit of those Welsh people outside the range of Cardiff and Swansea. This development, taken in conjunction with the effective co-operation of the BBC in forming and sustaining the *Welsh National Orchestra* in Cardiff, dissipated most of the complaints that were prevalent in the Principality.

The BBC began a huge technical project in 1929 to expand their *Regional Scheme* with the opening of two co-sited transmitters in Daventry. The complete scheme consisted of a distribution of stations designed to radiate two contrasting programmes from two separate transmitters, but from effectively the same geographical location. The experimental system initially began on 21 October 1929, with the opening of the *Brookman's Park* transmitter. This was the BBC's first high-power regional station, which was initially used on a 'single-wave' basis; with the 'twin-wave' system, just one transmitter was energised making only a single programme available throughout the Home Counties. By contrast, the *Daventry 5XX* and *Daventry 5GB* transmitters, located at the same 40-acre site, combined to form the world's first twin-wave broadcasting system. The twin-wave system was brought into service on 9 March 1930.

BBC Scotland-Alba Centenary, Pt 2

Television began in Scotland with the opening of the Kirk O'Shotts transmitter on 14 March 1952. Prior to the official opening, test transmissions were broadcast consisting of the first electronically-generated Test Signal, known by BBC engineers as the *Art Bars*, an abbreviation for 'Artificial Bars', **Fig. 3**. People began noticing the test transmissions and sales of television receivers began to steadily increase north of the Tweed, particularly in Glasgow. Although very few residents bought sets outright, many paid deposits and delayed their selection of equipment until stocks became more plentiful. Further south, in Newcastle to be exact, thousands of receivers were bought despite the fact that work had been abandoned on the Pontop Pike transmitter and the nearest station was at Holme Moss, some 115 miles away. Thousands of football fans were hoping that the Kirk O'Shotts transmitter would be ready in time for the Scotland-England international soccer match at *Hampden Park* in Glasgow. The Scottish Director of the BBC, **Melville Dinwiddie**, together with the Assistant Postmaster-General, **David Gammans**, visited the transmitter and reassured fans that the BBC would indeed televise the match, pending an agreement with the *Football Association*.

When the Kirk O'Shotts transmitter opened on 14 March 1952, a programme was aired called *Television Comes To Scotland*. It was broadcast from Edinburgh's large music studio and shown throughout the UK. The show featured a prayer of dedication and a vote of thanks from the Lord Provost of Edinburgh. This was followed by ten minutes of Scottish country dancing. It didn't go down too well with the BBC Controller south of the border in London. He was heard to mutter: *"Speeches dreadful. This sort of television dullness is most depressing."* Fortunately, viewers in Scotland enjoyed this, and many subsequent programmes including Scotland's first television play, **J M Barrie's** *The Old Lady Shows Her Medals*, news reports, parliamentary coverage, and the nation's first television Outside Broadcast from the *Edinburgh Festival Tattoo*.

BBC-2 Films On DVD

Following on from the request in the April column by **Godfrey Manning G4GLM** for a recording of the BBC2 Trade Test Colour Film, *Lure Of The Bahamas*, **Andy Howlett G1HBE** (who became a licensed radio amateur in 1984, together with his partner, **Hazel G1HTF**) has written from Cheshire with details of other films which may be available on DVD or Blu-ray. Andy writes: *"I always enjoy reading your pages, and in the April edition of* PW *you briefly brought up the subject of the 'Trade Test Colour Films', which were shown on BBC2 in the 60s and 70s. I must have seen these hundreds of times in my previous life as a TV engineer, shackled to the bench from 1969 to 1990.*

"It would be great if there could be a release of these films on DVD or Blu-ray, but in the meantime it pays to keep your eyes open as they can 'escape' into the public realm unnoticed.

"I recently bought the short film 'Lunch Hour', directed by ***James Hill****, who went on to direct several feature films, including 'Born Free'. His name also crops up on several ITC filmed dramas such as 'The Persuaders' and the 'The Avengers' series from ABPC.*

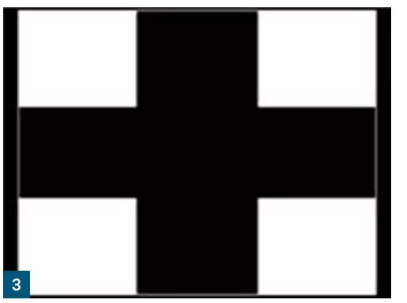
"Anyway, imagine my surprise when I saw that the bonus features on the disc were three Trade Test films – 'Skyhook', 'The Home-Made Car' and the wonderful 'Giuseppina', which is one of my favourites, conjuring up life at a roadside filling station in sunny Italy and the comings and goings of various quirky customers, all seen through the eyes of a little girl. These films were included as a 'bonus' on the disc to showcase productions directed by ***James Hill****.*

"I don't know if this BFI release is still available, but it's worth keeping an eye out for it. It is a dual-format release (DVD and Blu-ray) and the reference number seems to be BFI-B1042.

"Keep up the good work."

BBC 6BM Station Commemorated, Pt 2

The *BBC 6BM Station* in Bournemouth originally had a rather unusual callsign due to the strong and refreshing aroma of the well-known pine trees which are still there today. The phrase, *"We do hope you can smell the pines"* was used. **John Reith** described the station as *"the jewel in the crown of the BBC"*.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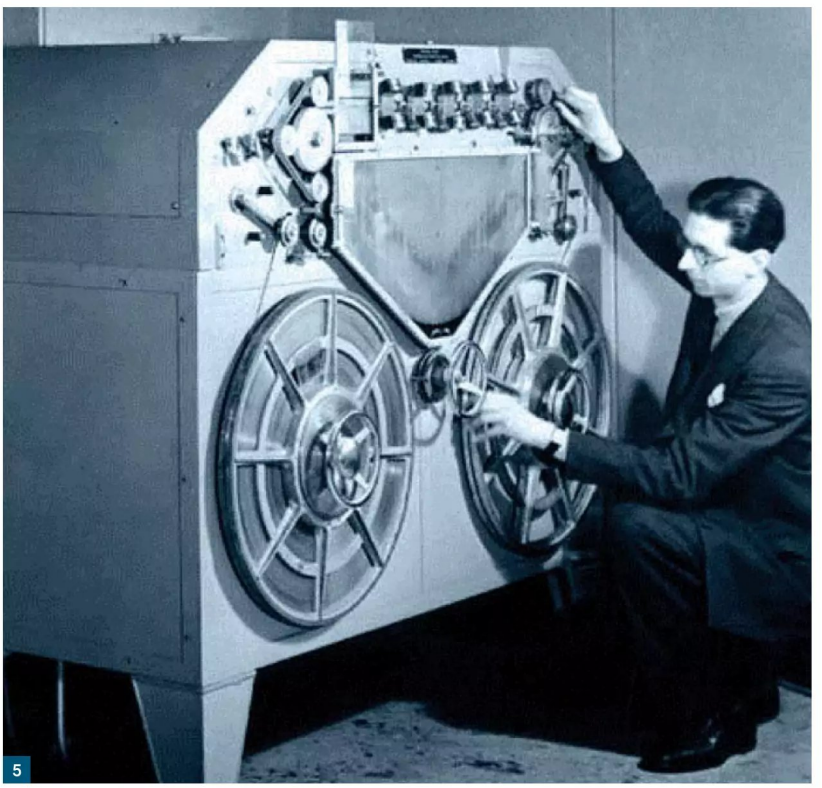
The final programme from 6BM was broadcast on Tuesday 13 June 1939. Entitled *A Farewell Programme*, it was organised by **Felix Felton** and **W Farquharson Small** and introduced with the following announcement: *"This is the last day of service of the Plymouth and Bournemouth local transmitters, though their studios will continue to be used in conjunction with the new transmitters at Start Point and Clevedon, which open tomorrow. Bournemouth was opened on 17 October 1923, Plymouth on 28 March 1924. Tonight, a gathering of artists, listeners, and members of the staff in each studio will give their reminiscences of the early days, and will recall some of the old programmes radiated from 6BM and 5PY. The programme will open at Plymouth and go over to Bournemouth at approximately 9.45pm."*

Two months after the closure of 6BM, with the outbreak of World War II, all local stations were consolidated into the *BBC Home Service*.

While proudly unveiling the commemorative plaque, **Fig. 4**, Bournemouth's deputy mayor said: *"It's a great pleasure for me to unveil this plaque – it's really important to have this place recognised."*

Unfortunately, the ceremony wasn't held at the actual original location of 6BM because the building had been demolished a number of years earlier. Instead, the plaque, paid for by the *Bournemouth Civic Society*, was installed on the

Ocean 80 building – a 10-storey office block, but at least it was the correct road! Could any *PW* readers enlighten the authors as to why the plaque was installed to commemorate the station's 99th anniversary rather than the 100th later this year? One suggestion is that the BBC were in a hurry so that the unveiling ceremony would take place during their main *BBC 100 Years* celebratory year. Our thanks to **David Morris** (Lytchett Matravers, near Poole) for sending the photograph.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Service Information: Switzerland, Pt 4

In 1950, *SRG-SSR* was one of the 23 broadcasting organisations instrumental in the formation of the *European Broadcasting Union* (*EBU*). The BBC were the main proponents for its inception. The EBU was officially inaugurated on 12 February 1950. Most people will have heard of the organisation because of the *Eurovision Song Contest*. Indeed, the BBC hosted the event this year on 13 May, 'live' from Liverpool. The UK (*BBC*), together with Germany (*ARD Das Erste*), France (*France 2*), Italy (*RAI*), and Spain (*RTVE*), known collectively as the *Big Five*, have automatic entry to the grand final because they pay the most towards the EBU's general running costs, which also includes funding for the EBU's radio programme exchange network, *Euroradio*.

In reality, the annual song festival is only a relatively small, but extremely important, part of the day-to-day technical activities undertaken by the show's organisers. Originally, the *EBU Technical Centre* was located inside the *Palais de Justice* in Brussels and the *Administration Centre* based in Geneva, Switzerland. Today, both centres are situated in Geneva. There is a strict bilingual policy whereby everything is, as far as possible, written and spoken in both French and English, hence the *European Broadcasting Union* (*EBU*) / *l'Union Européenne de Radio-télévision* (*UER*).

The Blattnerphone, Pt 4

Originally, **Ludwig Blattner** intended the Blattnerphone to be used as a system of recording and playback for talking pictures, but the BBC saw its potential to record and 'time-shift' radio programmes for use with their *Empire Service* and purchased several Blattnerphones from 1930 onwards, **Fig. 5**. One device was used to record the speech by **King George V** at the opening of the *India Round Table Conference* on 12 November 1930.

The BBC also used three types of wax recording machines for broadcasting work. The first was a standard recording running at the normal gramophone speed of 78rpm and cut to the equivalent of approximately 80 grooves to the inch. This type of recording was invariably used if there was no chance of the recording being longer than five minutes. For recordings of up to a maximum of seven minutes, a fine cut equivalent of 150 grooves to the inch was used at a standard turntable speed of 78rpm. This was to enable the record to be played on ordinary gramophone turntables without any inconvenience.

Where there was a possibility of the record extending over seven minutes, fine cutting was used with the turntable speed being reduced to 60rpm. This gave a playing time of nine minutes, although there was a possibility of a slight depreciation of quality due to needle wear in the last minute.

Many gramophone motors could not be governed steadily at this slow speed and, therefore, those records could only be used on specially adjusted turntables. In the 1930s, disc recording for the BBC was carried out by *The Gramophone Co.* and *The British Homophone Co. Limited.*

Of German origin, Blattner emigrated to Great Britain in 1897, aged 16. He had two British-born children, **Gerry Blattner** (born 1913, in Liverpool) and **Betty Blattner** (born 1914, in Cheshire). They both followed their father into the film business, Gerry as a producer and Betty, a make-up artist.

Ludwig Blattner, **Fig. 6** was a brilliant engineer and inventor but, unfortunately, he wasn't a good businessman. In 1932, the banks repossessed his Elstree studios in Borehamwood and he subsequently thought of himself as a failure. He booked into the *Edgwarebury Hotel* at the *Elstree Country Club* and, at the age of 53, took his own life on 30 October 1935.


6

DX-TV & FM News

The latest DX news, plus details of changes to broadcast television and radio services, is available online via the *Radio Enthusiast* website by searching for the *Latest Articles* section.
www.radioenthusiast.co.uk

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Classified Adverts

Wanted

VINTAGE FIREWORK COLLECTOR. Do not light the blue touch paper and burn British Heritage, private collector will pay cash and collect from anywhere, licensed explosive storage. **Call Tony on 07956 506300**

Valves

VALVES AND ALLIED COMPONENTS? For free stock list and/or advice, Please contact me: **Geoffdavies337@Gmail.com Telephone 01788 574774**

Repairs

REPAIRS TO RECEIVERS, TRANSMITTERS ETC. New/old, valve/transistor. **Call 07903 023437 for details. www.kent-rigs.co.uk**

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CTCSS ENCODER AND DECODER KITS. DTMF kits and modules. Pic development kits. **https://cstech.co.uk**

Bargain Basement

Free to Collect

SHACK CLEARANCE! Free to collect: Two TF 2015 Sig Gens, Marconi one Marconi TF 2002B Sig Gen, two scopes, Advance 05 250, and telequipment D66. All working. Free to collect. **Call: 01789 840529**

Wanted

HELMHOLTZ COIL. Teltron type D fitting. Working or repairable. No calls before 10am or at all on Sunday mornings, thanks. **Godfrey G4GLM, Call: (020) 8958 5113 or Email: cgmm2@btinternet.com EDGWARE**

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

The 8m 'Band'

Dear Don,
Many thanks for a great magazine and the absorption of *RadioUser*, which has made it even better.

I would like to comment on the letter from **Ben Nock** in the last edition. I fully support his comments and would like to add the following. I do not see that having access to 8m will teach us a great deal as it is situated between 10m and 6m. We can follow the MUF from 10 to 6 to 4 and then to 2 if we want. What extra help is access to 8m? I am concerned that due to the lack of use of some of our VHF and UHF bands, we could lose them or see them curtailed. I would liken it to the village bus, use it or lose it. The suggestion that it is for 'serious experimenters' is rather insulting I feel. Given the pressures on the spectrum from commercial interests, we should be making maximum use of what we have, not asking for more small segments for a small minority.
Tom Brady GW8HEB
Welshpool, Powys

The Yaesu FT-817

Dear Don,
That's a great shame that Yaesu (April 2023 issue) has decided to pull the proverbial plug on what was probably not only a firm favourite among ham-devotees worldwide, but also, perhaps one of the best-selling ham-radio transceivers. I remember that when the FT-817 first appeared, there was a collective gasp of incredulity that a rig so deceptively compact could actually do what it said on the 'tin'. It did. Apparently, at one point there was such a clamour for these multi-mode portable rigs, that the Japanese manufacturer couldn't keep up with the demand.

Once this portable communicating wonder box was in your hands, the world was literally your oyster. Since it first went on sale, there has never really been a credible alternative, then or now. Well, who would want to own a faux FT-817, anyway?

I succumbed to buying an FT-817 a couple of years after it was launched. It was irresistible. And it's been a well-travelled companion ever since. Wherever I went, it went. My late partner often told me that I loved my FT-817 more than I loved her – that when we were away on holiday I spent more time with it than I did with her. But that wasn't true of course. Really.

Thinking about it, me and my FT-817 have travelled all over the show. Hong Kong, China, the Caribbean, Malaysia, all over the US mainland, all over Europe, Hawaii, Canada, South Africa, India, we even sailed past Pitcairn, we saw the Northern Lights together, and saw in a New Year razzmatazz in Las Vegas. But believe it or not, the FT-817's favourite place is Sidmouth in sometimes sunny Sidmouth. Yep, together, we've had lots of adventures. And not only that, over the years cruising here and there, it's been an ambassador for amateur radio too. There I'd

★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

Early Home Brewing

Dear Don,
Many receivers and transmitters were built by radio amateurs as the most economic and good way or maybe the only way, of getting on air. The modes of transmission mainly used in the 1940s/50s were CW (Morse code) and AM (amplitude modulation). The receivers were usually regen (regenerative) and DC (Direct Conversion) as these were simple and used few components. In the later years, 1960s/70s, the more ambitious amateur built superhet receivers for the HF bands. Top Band (160 metres) was popular for across town QSOs and 80m for more distant contacts but within the UK. 40m was considered the DX band. Typical homebrew AM transmitters were built as separate units using readily available 'audio' type power valves such as 6V6 and 6L6 and the famous 807. The microphone used was either a carbon type (as used with the army 18 set) or a crystal type, because dynamic mics were comparatively expensive.

Home Brewing Today: There is something very satisfying operating a home-built station and the design can be made to one's own requirement. With the sophistication of modern commercial equipment available to the radio amateur it would be very difficult, albeit not impossible, to equal in performance with home brewed gear. The main advantage of building it yourself is that it can be made to do what the constructor wants it to do and not what the commercial manufacturer dictates in terms of the requirements. A dedicated home-made AM transmitter for a single or multiple bands using class E, for example, will outperform any commercial multimode transmitter but in general terms, it would be very difficult to compete in performance with today's commercial transceivers. Getting on air with a CW only transmitter is very affordable by being home brewed and can achieve very good results.

Junk Box Parts or Kits: It is really a decision of what is needed as to whether projects are made from the junk box (parts available in the shack) or by the use of a kit of parts from a kit supplier. If a challenge is needed to make a receiver or transmitter, then build it from parts already available and maybe buy some of the components not already to hand. It may not be the cheapest way to construct any projects but it can be designed for one's own requirements and a great deal of knowledge will be gained from it. Building from a kit of parts is convenient as the parts are all together in one place. This will suit a builder that wants a specific project, say a microphone processor for a transmitter, and there will be no modifications or any changes needed as it will probably have been optimised for best performance by the kit designer. The disadvantage, if considered, is that no technical knowledge will be gained by assembling from a kit of parts. It is down to convenience and personal requirements as to how a home brewed project is constructed.
Eric Edwards GW8LJJ
Barry, Wales

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be on a sun-lounger with me and the FT-817 melded together listening to the action on 20m, when a fellow cruiser would happen along and ask: *"are you listening to the cricket commentary"* (funny that, because I've never been asked if I was listening to a football commentary). I wasn't. So then followed an advert for ham radio – all the ins and outs. Our triumphs, our history and the few disappointments. But one thing that always got their immediate attention and rave reviews was the fact that we ham radio operators are able to communicate via satellites. And the fact that Royal personages have gotten in on the amateur radio act too. That nailed it.

Were my ambassadorial efforts for ham radio successful, I hear you say? Yes. One bloke I met again on a subsequent cruise, told me he'd signed up for an RAE course and gone out and bought, yep, you've guessed it, an FT-817.

A lot of people tell me that too at school, maths *"was a complete waste of time"*. I was introduced to carpentry skills at school – that was definitely a waste of time. Ditto, kicking a ball about. I was only taught arithmetic at school so I taught myself maths. *"Is it even relevant to amateur radio?"* For most wannabe hams, probably not.

Ray Howes G4OWY/G6AUW
Weymouth, Dorset

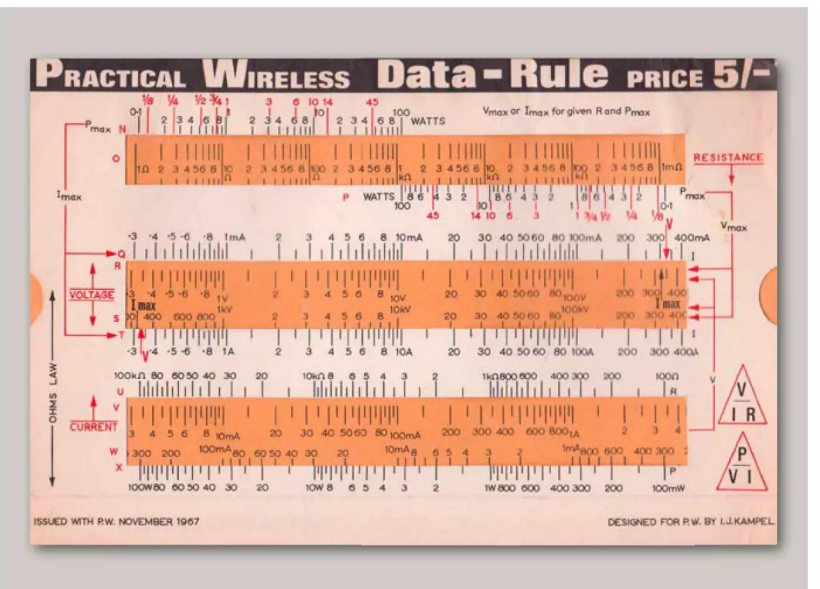
(***Editor's comment:*** *Thanks Ray. I suspect the problem is that the design is now quite dated and components are difficult to source. Amateur radio production runs are small compared with large commercial uses, so we have to go with what is available at any given time.)*

A Problem with Staples

Dear Don,

Just to inform you that since *Practical Wireless* have changed the quality of paper for the magazine, the staples keep coming through the paper as it is very thin quality. This results in the pages coming out from the centre as the paper splits. This has happened to my last three issues. Just wondered if any other readers have experienced this problem,

Neil Hemmings G4NQQ
Bridgwater, Somerset



(***Editor's comment:*** *Good question Neil. The change of paper was because of increasing paper costs but I hadn't come across the particular problem you mention (my own copies seem to be OK, fingers crossed!). Let's see if anyone else has run across that one. Incidentally, you are one of my nearest amateur radio neighbours nowadays!)*

PW Free Gifts

Dear Don,

I was just re-reading *PW* this month when the free gift from 1980 jumped out at me. A quick scramble in the odd tools drawer and hey presto (see photo). I wonder how many are still in shacks today (along with a pile of data cards and posters I still have)?

Ian Jones G4MLW
York

(***Editor's comment:*** *Yes indeed Ian! I particularly like my* PW Data Rule*, with a sliding scale to allow all sorts of radio-related conversions. Clever stuff and still useful, even in these days of laptops!)*

PW/Radio User

Dear Don,

Hello. After reading thoughts on **Richard Ware**, Gillingham, Dorset in my April *PW* Issue my thoughts have been exactly the same since our *RadioUser* Magazine has been amalgamated into *PW* and you would need a telescope to see the smallest of signs top right of this magazine and just maybe some people can very easily miss this and walk by in a newsagents if not on a subscription as mine has been for a number of years.

I too am very badly missing **David Smith's** Airband Column, **Robert Connelly's** Maritime and also **Chrissy Brand's** excellent articles, also the Editor's personal choices. I feel sure there will be quite a few disgruntled radio amateurs who also much prefer other articles they can more fully understand.

Up until recently I kept every *RadioUser* magazines but alas now I am passing them on to another radio amateur. Please give our thoughts some leverage and keep some of us very happy and buying, which after all is what you need.

Anne Reed 2E1GKY
Cheltenham

(***Editor's comment****: Thanks for your thoughts Anne. I'm sure many of us are disappointed that* RadioUser *magazine was no longer viable – a sign of the times, unfortunately. You will see that I have a very welcome* Airband *contribution from David Smith in this issue and I will continue to cover material outside the normal bounds of amateur radio, but at the end of the day the majority of our readership are radio amateurs who expect the main focus to remain on that particular aspect of hobby radio.)*

Whatever happened to the BVA?

Dear Don,

Back in the 1930s there was a lot of reference to the British Valve Association, if you bought a valve, it had their stamp on it. You were bound by their rules for the guarantee on any valve you bought and they had influence on set makers. At one point they didn't allow multiple valves, as in triode pentodes, although this rule seems to have been relaxed later.

As you know, I am an avid fan of *Practical Wireless* from the first edition up to the late 70s,

but I have read or seen anything about when the BVA ceased or what became of it? Maybe your enlightened readers may know?

On another subject, I took out a sub recently, but can't understand why you have so many articles on aerials, aren't they just bits of tuned wires? Can't we have more constructional articles on making your own kit?

OK, I might have the odd bits and pieces to make a Bijou Three in the loft, but surely the odd article on a DIY radio might be a bit of fun?

I had a letter in *PW* in 1977, making comments on a home-built radio I had made, and it was suggested I did an article on it, but a 16 year old boy can't write articles like the men of the press in those days, ie chain smoking boozy lunch journalists straight out of Journalist School, wearing loud suits with wide lapels. Seriously, how about an article on shortwave crystal set with LM 386 amplifier? Gotta be more fun than packet radio!

Someone mentioned that the BBC R4 long wave transmitter is to close soon, do we know when? I can never understand why we bothered with the Long Wave in the first place. You can't get many frequency allocations in the LW band. When I was a child in the 70s the signals were spoiled by the line timebase whistles from the older style TVs. Now there is a load of noise and hash from computer power supplies. I suppose when the LW transmission started this wasn't a problem, but given that TV has been around since 1936, there would only have been a golden decade of non-interference. What do you think?

I have often listened to VHF radios beyond the normal FM allocation, but I never hear anything but hiss. You can swing your tuning control from 100MHz upwards and hear nothing. Nada. Zilch. I am sure that many organisations have been allocated space on these bands, so why aren't they using them? I don't expect to hear station after station, but why are things so quiet? Maybe the space could be used for (shudder) more mobile phone channels?

Andrew Redding
Rotherham

*(**Editor's comment**: Good to hear from you again Andrew. With regard to antenna articles, while I agree that an antenna is inevitably a variant on a dipole, a full-wave loop or a quarter-wave against ground, there seem to be endless ways of reinventing these to suit individual circumstances and endless fascination in reading about them – witness the appeal of published compendiums of antenna articles! As for simple radios, I may end up having to revisit some of the excellent **George Dobbs G3RJV** articles of years gone by but I am expecting at least one constructional article for a simple DC receiver from our good friend **Tim Walford G3PCJ**, which will also be available as a kit. But I am always open to new features and, yes, we can help put them into readable English if need be! Your point about the emptiness of the VHF frequencies is an interesting one – we are often told our bands are under threat but it does seem that there is plenty of 'open space' that simply isn't used but presumably allocated to 'essential services' of some sort!)*

April PW Editorial

Dear Don,

Your mentioning of previous radio mags brought back memories, and reminded me of the piles of old mags in the loft! The one magazine that you did not mention was *Radio Bygones*, which was my second preference to *PW*.

Chris Harmer M0HMR
Stroud, Glos.

*(**Editor's comment**: Thanks for the reminder Chris, that's one I too subscribed to for a number of years but for some reason it passed me by in my recollections!)*

Radio & Maths

Dear Don,

Good timing! On page 77 of the April *PW* **Tony Jones G7ETW** recognises lack of maths awareness in his letter Radio Maths. It could be that my article (*still to be published – **ed***) is a small contribution towards filling the gap. Like you, I find maths a useful adjunct to the toolbox, not a pure academic study in its own right (which I leave to clever people!). Minor techniques do come into everyday life, for example, percentages and compound interest are needed to keep track of personal finances and Tony rates percentages as advanced! If there is scope for more explanations of Toolbox Maths (rather than pure maths for its own sake), you are welcome to ask and I'll see what I can do, in my usual, hopefully reasonably readable, style and keeping it relevant.

Godfrey Manning G4GLM
Edgware

Dear Don,

I feel I have to agree with **Tony Jones G7ETW** in the April letters column. My maths has never been very good, I just can't get my head around it. I passed my Foundation in June 2020 and scraped through my Intermediate in March 2021. Before that I was an SWL for over 20 years. In these days of buying radios off the shelf do we really need to know these calculations? Would knowing all this mathematics make me a better radio operator? It doesn't seem to have for some, you hear bad practice on the air every day. Don't get me wrong, I definitely believe that there should be an exam to get a licence. Everyone needs to know about propagation, licence conditions, band plans, antennas, operating etiquette,

safety and the basic workings of a radio. I must admit I for one am staying at Intermediate level, I'm having too much fun playing radio and as I work I would rather spend what little spare time I have doing that. Also to be considered is the £42 exam fee if I keep failing.

Andrew Green 2E0GYI
Barnsley

Dear Don,

Oh boy, what a can of worms **Michael Jones GW7BBY** and **Charles (Tony) Jones G7ETW** have opened in their excellent commentaries on amateur radio and mathematics (April, May *PW*)! Ahem, with a chuckle and a real twinkle in my eye, may I correct Michael's recollection of *"two unknowns, using quadratic equations"*: Michael probably intended *"simultaneous equations"*.

Don, you have requested comments on mathematics learning and about the relevance of mathematics to amateur radio from readers, so here goes:

In the recent past, people were reticent to admit having difficulty in reading, but would have no shame in proclaiming their weakness in mathematics. Now there is celebrity kudos in having dyscalculia and in being dyslexic, which is counterintuitive to me.

The desire for short cuts in learning is nothing new: in 300bce the **Pharaoh Ptolemy 1 Soter** was a little chagrined when **Euclid** informed him that there is no *"Royal Road to the Geometry"*.

Michael and Charles essentially ask these questions: What is the purpose of education? What is the function of schools? What is the purpose of the Amateur Radio Licence?

There is a legal requirement, 'even' for Foundation Licence holders, to address section 7(3) of the Terms and Conditions, which implies having the relevant skill set to do so, even when limited to commercial equipment use. I refer to

sections 1(1), 7(1), 7(3) of the Ofcom Amateur Radio licence Terms, conditions and limitations. Available on line:
https://tinyurl.com/3sa9a95a

This skill set is extremely broad and to be an 'Elmer' is a high qualification. Aspirants to this rank will require Inspiration in learning and Perspiration in application in order to be 'safe', no Royal Road here.

The other factor to consider is that any licence has the function of being a 'gatekeeper' to restrict access to an activity to those who are considered 'safe' to engage in it, whether it be driving a vehicle or operating amateur radio equipment.

The purpose of education has varied over the years. The study of the history and philosophy of education reveals a number of gems such as:

a) *"education can be cheap or it can be efficient, it cannot be both"*,

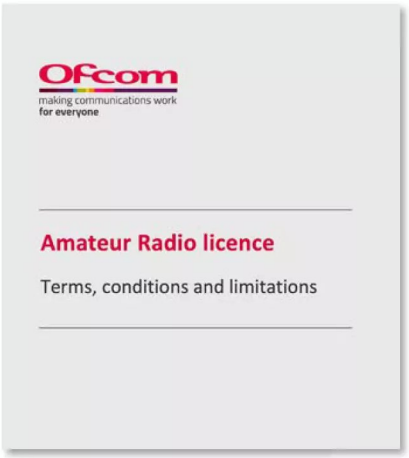
b) *"Learning is cheap, education is expensive"*.

c) *"Education is expensive, what's the cost of ignorance?"*

And what about *"education is preparing for life"* or *"life is education"*

I propose a definition: *"Education is the desire to learn new skills of one's own volition"*. Unfortunately, in the UK, most teachers of mathematics in state schools are not mathematicians per se. Similarly, the vast majority of teachers of science in state schools in the UK have no experience of radio technologies.

This shortage of qualified staff, combined with traditional syllabi, limits the availability of



a wider appreciation of various geometries, number systems, vector spaces, radio technology etc to very few students. A state 'education' system no longer exists in the UK. Teachers have been reduced from being educators to being instructors, following a prescriptive schedule with little opportunity to explore and inspire from the side passages of knowledge. Indeed, many schools have so narrowed their curriculum as to be considered detrimental to the 'education of their pupils.

Having written this, I will now go and extend my own skill set by replacing the garden fence panels.

Michael White G4HZG
Chesterfield, Derbys.

(***Editor's comment***: *Thanks all. I have a maths article from Godfrey awaiting space in the magazine. And who would have thought we would have a letter in* PW *mentioning an Egyptian pharaoh! Some strong views from Michael but he makes some excellent points. I guess maths will continue to be a controversial area and my wife always argues that she has never needed algebra, for example, but as a school bursar for many years she certainly needed arithmetic!)*

Your Letters from GW0TOI

Dear Don,

My views on Digital Modes are well known and documented in my letter published in January 2023 *PW*. I do take exception to Andrew's metaphor (*Letters*, April). My father died young from cancer. A few days ago I went to my neighbour's funeral – he also had died from cancer aged 59.

All modes are valid. Instead of criticising, maybe promote alternative modes? I have become interested in SSTV, it uses the same gear as FT8, it is easy to set up with MSSTV or QSSTV software. You have a QSO and you get nice pictures from around the world. Tuning the bands over the weekend all of the HF bands were busy and I suspect this will continue as the sunspot cycle improves propagation. I am more concerned with the silence on VHF and UHF. Initiatives such as G5TM's '145 Alive' are good news but we need more activity or else these bands may be lost.

Ron Piper G4LMN
St Albans

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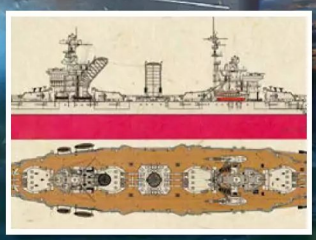

KEY NAVAL BATTLES

From sinking the Bismarck, Midway and the Atlantic, to the Battle of Leyte Gulf

ESSENTIAL NAVY MEDIA

Navy museums and warships to visit, online naval gaming, battleship models to build

»COLLECTING NAVY MILITARIA What to look for and how to start a warship-based collection

BATTLESHIPS OF WWII

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Cover image courtesy of World of Warships

▼ *USS Carolina pitching in heavy seas while screening Task Force 38.3 off the Philippines, 12 December 1944*

Welcome

While the battles on the ground in WWII have rightly been recognised as key events in the war, those fought at sea had an equally important role. Sea was the route by which American matériel kept Britain and the Soviet Union fighting in the darkest days of WWII. Without those supplies the war effort would have run dry, the population out of food and the efforts of those on the ground and in the air would have been in vain. There were four key areas – the Atlantic crossing to Britain; the Arctic run to supply the Soviet Union; the Mediterranean where British, Italian and German forces fought it out; and the Pacific, where the Allies took on the naval might of Imperial Japan. In this special, 132-page collector's edition bookazine, we take a look at the key naval battles and the ships that fought them.

While sea battles typically involved destroyers, cruisers, and in the Pacific especially, aircraft carriers, here we are looking at the role and specification of the battleships, the mightiest ships of all. At the start of WWII, the most powerful navies arguably belonged to Britain and Japan, but it didn't take the USA long to outbuild both, thanks to its vastly superior industrial capacity. Meanwhile, the German ships were a danger in the Atlantic and North Sea to both shipping and Britain's warships, which made it a priority of the Admiralty to send as many to seabed as fast as possible.

Here you will find 85 battleships and pocket battleships, with schematics for each class, a build history and their role in WWII. They are organised by country and then by class, such as the Queen Elizabeth class, where the ships had similar characteristics. There are specification panels for all classes and the ships where they differed from each other.

At the start of each section we take a look at the strategic situation for each of the navies represented here: Great Britain, France, USA, Soviet Union, Germany, Italy and Japan. Various treaties in the 1920s and '30s had restricted what could be built and so, on the eve of WWII, some navies were still equipped with WWI-era dreadnoughts. These were hastily upgraded as the main threat soon became apparent – that of attack from the air. After the early war clashes between ships, it was the aircraft carrier war in the Pacific that became the focus point, and finally, towards the end, the battleships were lending their awesome weaponry to support landings in France, Italy and the Pacific islands.

To conclude this special collector's guide to the battleships of WWII, we take a look at naval museums and floating warships around the world for you to visit; battleship models you can build; online naval simulations to play; and finally, how to take your interest to the next level by collecting naval militaria.

Duncan Evans, Editor

BATTLESHIPS OF WWII

ALLIED BATTLESHIPS

Starting with the British Queen Elizabeth class battleships, the *Valiant*, *Elizabeth*, *Warspite*, *Barnham* and *Malaya* these are the warships that held the empire together while it was assailed on all front. Then we move on to the French fleet and the controversial way it was dealt with by the Germans, French and British. After 1941 the industrial might of the USA came into play, building ship after ship to turn the balance of power at sea. Then there are the ageing Soviet ships, trying to hold off the advancing Germans.

BRITISH SHIPS

FRENCH SHIPS

AMERICAN SHIPS

SOVIET SHIPS

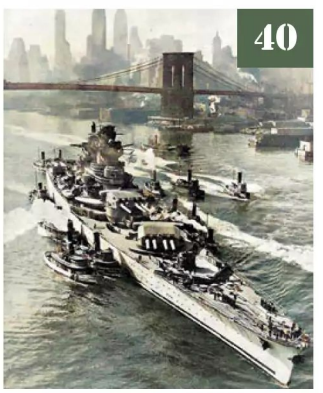
AXIS BATTLESHIPS

The Kriegsmarine was always of secondary importance to Hitler which meant it was at a significant disadvantage compared to the Royal Navy. The focus was on sinking Allied merchant shipping, rather than confront the British battleships. It was Italy in the Mediterranean and especially Japan in the Pacific that were the major Axis naval powers. Once Germany's capital ships had been put out of action and Italy had been knocked out of the war, it was in the Pacific that the naval campaign would finally be resolved.

GERMAN SHIPS

JAPANESE SHIPS

ITALIAN SHIPS

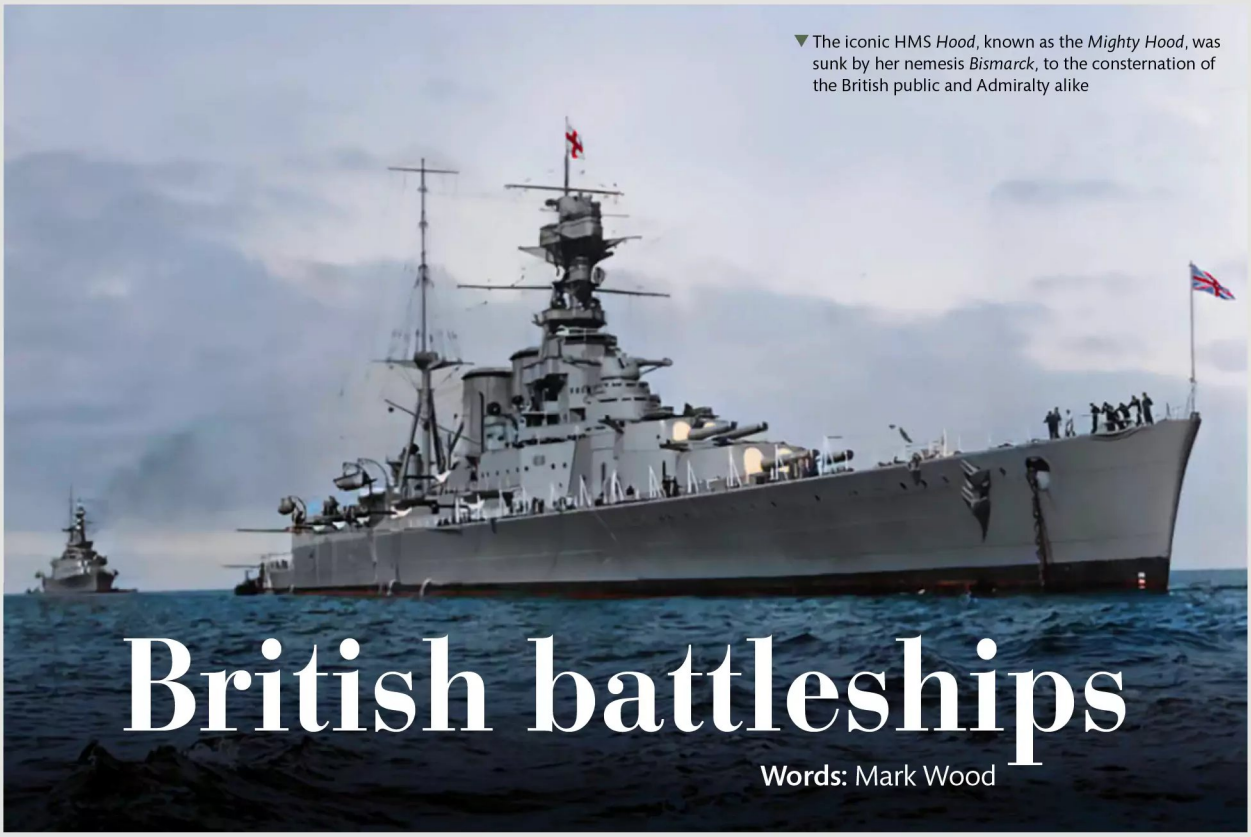


KEY NAVAL BATTLES

Whether it was the hunt for a German commerce raider, an attack on a home port, or a massive air and sea battle in the Pacific, these are the key naval battles of WWII that featured battleships.

NAVY MEDIA

Take your interest in all things battleships and nautical to the next level with museums to visit, games to play, models to build and militaria to collect.



▼ The iconic HMS *Hood*, known as the *Mighty Hood*, was sunk by her nemesis *Bismarck*, to the consternation of the British public and Admiralty alike

British battleships

Words: Mark Wood

At the commencement of hostilities in 1939, the Royal Navy was still the largest and most powerful in the world, able to call on over 1,400 vessels. There had been significant developments in both air and sea power since World War I and it became obvious that a second war would severely test the fighting capacity of the Royal Navy across the oceans of the globe, yet it was not until the late 1930s that the Admiralty set to work to upgrade Britain's ageing fleet.

Until the late 1930s Britain had relied upon a fleet of previous generation capital ships, most of which had seen service during WWI. The Queen Elizabeth class of five dreadnought battleships was completed during the first two years of the war and was designed to act as a rapid response squadron to counter enemy capital ships, being the fastest warships at that time. Between 1913 and 1917 a further five superdreadnought battleships of the Revenge class were launched and as with the Queen Elizabeth class, they were ordered during the pre-war arms race with Imperial Germany and were to be an updated design based on the *Iron Duke* blueprint with heavier armament. The Revenge class was originally intended to consist of eight vessels, but one was cancelled and the remaining two were redesigned as the Renown class with modifications to armament and protective armour.

▲ HMS *Barham*, one of five Queen Elizabeth battleships built for the Navy, was launched in 1914 and commissioned the following year

The post-war years saw drastic restrictions to warship design imposed by the constraints of the Washington Naval Treaty of 1922. The original G3 battlecruiser design, approved six months after the signing of the treaty, contravened the agreement and was adapted to become the lead ship of two, christened Nelson class battlecruisers. Although reduced in size, the ships were armed with 16in guns to maintain parity with the recent American Colorado and Japanese Nagato class warships. While the Nelson class were of a superior design to their predecessors, the trade-off for heavier armament was a reduced speed and the ships were considered ungainly.

The 1922 moratorium on large shipbuilding was continued by the 1930 Naval Treaty of London and a design that had been commissioned in 1928 was suspended. In 1935 it was reactivated and updated to become the King George V class of battleships of which five were built. The plans proposed a ship with far heavier belt armour and, with a nod to the age of sub-surface weaponry, improved anti-torpedo protection.

Perhaps the most revered of WWII Royal Navy ships, HMS *Hood*, was the only ship of the proposed four of the Admiral class battlecruisers to be realised. Despite its iconic status, *Hood* was acknowledged to be a flawed design on joining the fleet in 1920 and the remaining three were abandoned in favour of a new construction type.

As Europe teetered on the precipice of a new global conflict, Britain's Navy faced the threat of a more modern style of maritime warfare with a fleet that was already on the verge of obsolescence. ■

Artist rendition of the deadly force capable of being delivered from an obsolete plane ▼

Raid on Taranto

Words: John C Pursley

Before the war the British possessed strategically important locations in the Mediterranean and were very concerned about the Italian naval build-up.

Although at the time, the British Royal Navy was the strongest sea power afloat, it was spread out across the globe, and had no modern battleships. The number of Italian Regia Marina (Royal Navy) capital ships stationed in the Mediterranean theatre outnumbered British vessels, but the British did have an aircraft carrier, whereas the Italians depended upon airbases surrounding the contested waters.

Taranto, Italy was the home port of the First Squadron of the Regia Marina fleet. Their force consisted of six battleships (two of the modern Littorio class and their older ships had been extensively modified), seven heavy cruisers, seven light cruisers and 13 destroyers.

Although the Italians commanded a strategic central position, the British had bases at the western and eastern ends of the Mediterranean whose forces could, if brought together, pose a significant threat to the Italian fleet.

The base locations became a real problem for Britain when the war began,

▲ *Italian Naval harbour positions around the Mediterranean in 1940*

especially in June 1940 when fighting between British and Italian forces in North Africa broke out. Both sides now needed to transport men, equipment, and supplies onto the African continent.

For the Italians the challenge was minimal as they only had to cross one of the narrower parts of the Mediterranean. The British, on the other hand were not so fortunate and their options limited to two less than satisfactory choices. They could expose their ships to attacks from Italian air, surface naval ships, and submarines by traveling down the European coastline, through Gibraltar, then making a lengthwise crossing of the Mediterranean, past Sicily, and Italy.

The second choice was safer but time consuming and would expend a considerable amount of fuel as the route to Egypt required sailing down the entire west coast of Africa, back north along the east coast, through the Red Sea and the Suez Canal. The situation was compounded after France was invaded by the Germans which eliminated French naval assistance. The British could not sit by and lose the war in Africa simply because of supply problems. They had to do something to counter the Italian advantage.

The Italian posture in the central Mediterranean offered the opportunity to defeat the Royal Navy, except for two serious issues with their fleet. The Italians did not have enough oil to maintain their ships at sea for long periods as would be necessary to gain naval superiority in the Mediterranean and they lacked confidence needed to threaten or engage in a sea battle.

Planning the attack

Attacking the Italians at Taranto was not a new concept as the idea of launching

▲ A Swordfish practices shallow water torpedo attacks in preparation for the raid on Taranto

▲ Swordfish 4A torpedoed Conti di Cavour. Her crew survived but were captured

an air attack against the fleet was first conceived in the fall of 1938 when the commander of the British Mediterranean Fleet, Admiral Sir Dudley Pound, expressed concern over the survival probabilities of the aircraft carrier HMS *Glorious* in case of a war with Italy.

The Captain of the carrier, Lumley Lister, told the Admiral that Fairey Swordfish torpedo bombers were suitable for a nighttime attack, and that the Royal Navy's Fleet Air Arm was capable of such an operation.

The Fairey Swordfish was one of aerial warfare's improbable heroes. Entering service in 1936, it looked like a relic from WWI. In an era of all-metal monoplanes, it was a fabric skinned, two-seater biplane. With a top speed of 143mph the plane was incredibly slow. So slow, it could be argued that the lack of speed was a blessing in disguise as faster modern enemy planes kept overshooting them while attacking.

Admiral Pound had the foresight to realise the significance of this proposition and ordered training to commence for such an operation. At the time an airborne attack against ships from a carrier was considered so revolutionary, that training was performed in utmost secrecy.

The shallow waters of the Italian port posed a significant technological challenge as British aerial torpedoes could only be dropped into water at least 75ft deep lest they hit the bottom. The harbour at Taranto was only about 39ft.

BATTLE STATS

United Kingdom

COMMANDERS
Admiral of the Fleet Andrew Cunningham
Vice Admiral Lumley Lyster

FORCES
1 aircraft carrier • 2 heavy cruisers • 2 light cruisers
4 destroyers • 21 torpedo bombers

CASUALTIES
Killed: 2 • Captured: 2 • 2 aircraft lost

Italy

COMMANDERS
Admiral Inigio Campioni

FORCES
6 battleships • 7 heavy cruisers
7 light destroyers • 13 destroyers

CASUALTIES
Killed: 59 • Wounded: 600
2 fighters lost • 3 ships disabled • 3 ships damaged

▲ Swordfish lining up in anticipation of the Taranto raid (Warthunder.com)

To overcome the problem, engineers designed a system that would force the torpedo to land with a belly splash in lieu of a nose-dive. A rotating drum was attached under the belly of the Swordfish with one end of a cable wound around it, and the other end attached to the nose of the torpedo. Once the torpedo was released, it unspooled the cable as it fell. The nose of the torpedo was prevented from dipping downward by the tension of the cable. Once the torpedo hit the water, it would run close to the surface.

A month before WWII broke out Ad… Pound was replaced by Admiral Sir … Cunningham who was caught off… when Italian dictator Benito M… declared war on 10 June 19… military assets in the M… been previously red… transferred to th… the imminent … went to Ne… was ma…

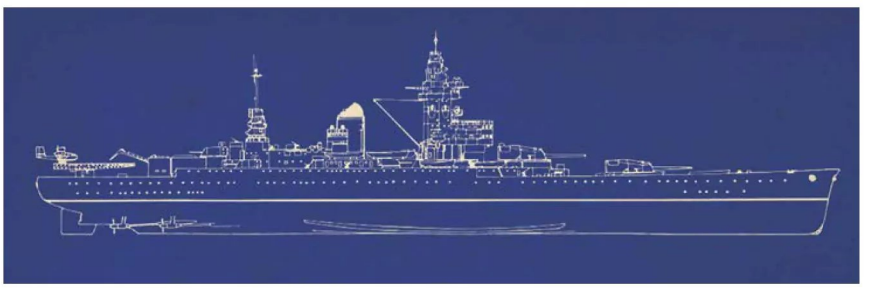
▼ A side profile of Dunkerque highlighting her forward facing armament

Dunkerque class

DUNKERQUE

It was 20 years after the Bretagne class before France commissioned further battleships, leading to the *Dunkerque* being laid down in 1932. This ship was very different from anything that had come before and was heavily influenced by the Washington Naval Treaty and the other treaty battleships around the world. Like the British Nelson class, *Dunkerque* had all her armament facing forward in two massive turrets, each of which housed four 330mm (8in) guns. Her armour was designed to counter the German *Deutschland's* 283mm guns and she had a top speed of 29.5 knots, far faster than the older designs of dreadnoughts that had previously served France. *Dunkerque* was launched in 1935 and entered service in 1937. With all her main armament facing forward, her fantail was an ideal launch point for aircraft so she had a catapult on her stern and carried two float planes to assist spotting for her guns and other general duties.

The outbreak of war saw *Dunkerque* serving in the Force de Raid alongside her sister ship *Strasbourg*, three light cruisers and eight destroyers. This force was based at Brest and was sent forth on the opening day of the war to counter any chance of a surprise naval attack from Germany's Deutschland class pocket battleships. The battleship was used on convoy work and joined HMS *Hood* in patrols to try to hunt down *Scharnhorst* and *Gneisenau*. Patrolling off Iceland highlighted defects in the design of *Dunkerque* and she had to drop to 10 knots to avoid damage due to her limited freeboard and light construction. On 11 December 1939, like many other French battleships, *Dunkerque* carried part of France's gold reserve to Canada and escorted troop ships back again. In the Spring of 1940 *Dunkerque* moved to the port of Mers-el-Kébir and she was here when France surrendered.



▲ Side profile of Strasbourg

When the British fired on the French fleet, *Dunkerque* was tied up facing the wrong way so could not bring her guns to bear. The crew quickly loosed the anchor and manoeuvred to try to fire on HMS *Hood*. Although *Dunkerque* fired off several salvos, none hit the target. *Hood* was more accurate and the French battleship was hit by four 15in shells. These shells damaged the ship's rudder and the final shell destroyed one of her boilers and took out electrical power so her crew were forced to beach the ship to prevent her sinking. Most of the crew were evacuated and repairs began with the intention of allowing the ship to limp home to Toulon. On learning of this the British launched aircraft armed with torpedoes that caused further, extensive damage and the ship would have been lost by a hit to the magazine had her Captain not had the foresight to flood it at the first sign of British aircraft. After further emergency repairs the ship crawled back to Toulon for more permanent repairs.

When the Germans and Italians decided to seize the Vichy France ships, her crew opened the dock gates and tried to flood and sink the ship. By the time the Italians reached the battleship she was declared a complete loss and the Axis began to scrap her in situ but it was not until 1958 that the final remains of *Dunkerque* were sold for scrap.

STRASBOURG

The second ship of the Dunkerque class, *Strasbourg* was similar but not identical to her sister ship. It was decided to increase the armour thickness of the ship during construction and so she boasted an extra 58mm of armour on her belt and an extra 12mm of armour thickness on her decks. The combination of these increased her displacement by an extra 1,200 tons. *Strasbourg* was laid down in 1934 and launched two years later. She entered service with the French navy in 1938 and joined *Dunkerque* in April 1939 as the 1st Battle Squadron. *Strasbourg* received two identification tripes on her funnel in comparison to *Dunkerque*'s one to allow the two vessels to be quickly told apart. At the outbreak of war *Strasbourg* completed her duties in tandem with *Dunkerque* until October 1939 when she joined HMS *Hermes* and a pair of destroyers to patrol the central Atlantic. Although the patrol was mostly uneventful, *Strasbourg* did

▼ *The twin turrets of Strasbourg seen from the bow*

▲ *The sleek bulk of Strasbourg when newly commissioned*

SPECIFICATIONS

Dunkerque

Class: Dunkerque
Displacement: 26,500 tonnes
Length: 214.5m (703ft 9in)
Beam: 31.08m (102ft)
Draft: 8.7m (28ft 6.5in)
Speed: 29.5 knots
Range: 14,537km (9,033 miles)
Crew: 1381-1431 men
Armament: 8 x 330mm guns • 16 x 130mm guns • 8 x 37mm AA guns • 32 x 13.2mm AA MGs
Armour: Deck – 11.5cm (4.5in), Waterline belt – 22.5cm (8.86in)

SPECIFICATIONS

Strasbourg

Class: Dunkerque
Displacement: 27.700 tonnes
Length: 214.5m (703ft 9in)
Beam: 31.08m (102ft)
Draft: 8.7m (28ft 6.5in)
Speed: 29.5 knots
Range: 13,888km (8,630 miles)
Crew: 1381-1431 men
Armament: 8 x 330mm guns • 16 x 130mm guns • 8 x 37mm AA guns • 32 x 13.2mm AA machineguns
Armour: Deck – 12.7cm (5in), Waterline belt – 28.3cm (11.14in)

successfully capture the German merchant ship *Santa Fè* on 25 October.

Strasbourg was ordered to Mers-el-Kébir in April of 1940 following an abortive operation to Norway to defend that nation against the Germans. *Strasbourg* returned to the Mediterranean to undertake patrols against Italian shipping following Mussolini's declaration of war against the Allies. Following France's surrender, *Strasbourg* was one of the many battleships in Mers-el-Kébir when the British issued their ultimatum. *Strasbourg* was moored with her stern facing the sea so she had to slip her moorings and she headed for open waters along with four destroyers. Although damaged by some near misses, *Strasbourg* managed to clear the harbour and elude the British. Debris had entered her boiler room, slowing *Strasbourg* to no more than 20 knots and leaving her with black smoke belching out. On realising their quarry was escaping, the British launched a series of carrier aircraft attacks, all of which missed and *Strasbourg* managed to reach the safety of Toulon. *Strasbourg* became the flagship of the Vichy French navy and underwent repairs and refit in 1942 including the fitting of radar.

In November 1942 the Germans moved to seize the remaining French fleet in Toulon but to prevent this the crew of the *Strasbourg* sabotaged and scuttled the ship. Any equipment that might have been of use to the Germans such as rangefinders and radios were smashed with sledgehammers and the boilers were lit, with the water feeds cut off to cause them to explode. The ship's seacocks were opened to flood the ship and scuttling charges were detonated to prevent her being easily refloated. The Italians refloated the ship anyway but decided to scrap her due to her poor condition.

Following the Italian surrender, the ship returned to Vichy hands and moored in the Bay of Lazaret where she was sunk by gunfire from the USS *Nevada* during Operation *Dragoon*. Refloated once more she was used as a testbed for underwater explosions before being scrapped in 1955. ■

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