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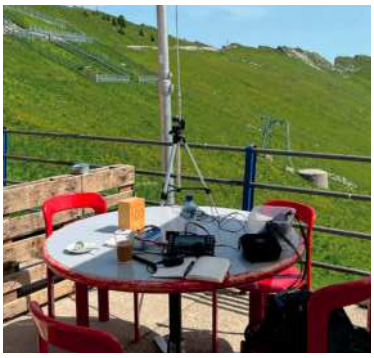
Our editor reviews some headphones for the shack



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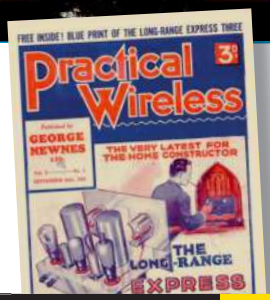

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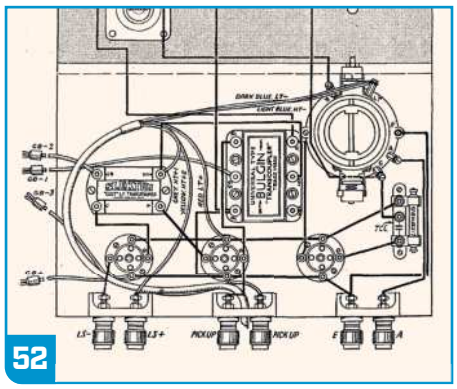

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Keylines

Welcome to the ultimate 90th anniversary *PW*! The magazine started with the September 1932 issue and has been published continuously since. As well as a two-page wrap-up of *PW at 90*, I have also included a reproduction of one of the articles from that first issue. I hope this will be the start of an interesting regular feature in future, as we continue to look back at some of the excellent articles that have been published in these pages over the years. And in response my earlier request, we have two fascinating anecdotes about how *PW* has featured in the lives of a couple of our readers in years gone by. One, by **Steve Hartley G0FUW**, was worth publishing as a short article, the other, from **Geoff Voller G3JUL** (who used to be the man behind the Science Museum station GB2SM) appears in the *Letters* pages.

Welcome back Joe

We also feature three short articles this month by **Joe Chester M1MWD**. Joe used to write our popular *Notes from a Small Station* feature so it's a great pleasure to have him back and I hope that, once again, you enjoy his inimitable style of writing.

PCR Receiver

Our *Valve & Vintage* slot this month features the PCR receiver. This is one I remember well. When in the 6th form at school (I have no idea what that would be called these days! Year 11 perhaps?), my friend and I started a school radio club. He was by no means an aspiring radio amateur, but a broadcast listener, inspired, as were so many of us in those days, by the plethora of pirate radio stations that had appeared on both Medium Wave and the various Short Wave broadcast bands. And he was lucky enough to have acquired an AR88 receiver – I was deeply envious. But our funds for the school club didn't extend to such luxury so we managed to buy a PCR3 from the local surplus store (most towns had one in those days), enabling us to spend our school lunchtimes scanning the bands. Happy days!

VE3XN

Another memory was jogged by **Steve Telenius-Lowe PJ4DX's** mention in this month *HF Highlights* column of **Gary VE3XN**. I believe Gary is retired now but he worked for many years as a schoolteacher at Listowel High School in Ontario, Canada. In the early 80s he brought a group of students over for a trip around the UK, including a visit to Cambridge, where I was living at the time. It was the weekend of the CQ

WPX SSB Contest and Gary managed a few hours of operation from my shack. But what makes the occasion memorable was that he and the group travelled back to Canada later that weekend and Gary managed a few hours of operation from his home shack before the contest ended. This must be a pretty much unique situation where an operator manages two contest entries, from two continents, in the same event!

Recent Happenings

As well as VHF Field Day, July saw a number of regular rallies back in operation (including the Reading club's McMichael Rally at which I was a regular attendee and helper in my 30+ years living in the area). Fortunately, the weather cooperated (albeit rather on the hot side at times!), so hopefully a good time was had by all. The bands, though, were largely going through their summer doldrums and even 6m was quite disappointing after a great Es season during most of May and June.

This Month's Magazine

As well as those pieces already mentioned we have not one but three reviews this time, all quite different. For those more interested in operating, there's a piece about starting on SSTV and the announcement of our September 70MHz contest – one for the diary. And for constructors, there's a project to build an Arduino-based antenna switch. Enjoy.

GB90PW

Finally, I am pleased to say we have been issued with the GB90PW callsign for use during September to celebrate the magazine's 90th birthday. I hope to work out a schedule for its operation so that we can make it available on a regular basis during the month for those of you wanting to work this very special event station.

Don Field G3XTT
Editor, *Practical Wireless* Magazine

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

Limited Time – 90th Birthday Offer

Six issues for just £19.32

In honour of our 90th birthday we are rolling back to 1932, the year we launched. Celebrate this huge milestone with us and receive six issues of Practical Wireless for just £19.32*, a saving of almost £14.

The front cover of the first issue of Practical Wireless from September 1932

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This fantastic offer is also available when subscribing to our digital edition, saving you both money and physical space (allowing for more shack essentials, surely!). For just £19.99 for six issues, read on any device, a week before the shop on-sale day, wherever you may be. Visit **www.pktmags.com/pw90birthday**

*This offer is only available on direct debit until 15th October 2022. After your first six issues, you will pay just £24.99 which still offers a fantastic saving of almost £8 every six months. For international customers, please visit www.radioenthusiast.co.uk for our latest subscription offers.

Newsdesk

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

New from Moonraker

Moonraker's AMPRO mobile antenna range is well established throughout the UK and the world offering low cost, high quality single band HF mobile solutions. They have now added cut-down versions of the 20/40/80m models. These new HF Mini Mobile Whip Antennas are designed to let you mount an HF antenna with just a small magnetic mount. No need to drill holes or make special hard mounts on your car to get on HF. Put on a simple magnet mount or boot-lip mount and you are ready to go HF mobile. In stock now from just £19.95. Search for AMPRO on the Moonraker website.

The Xiegu G106 is a 5W 80-10m portable QRP model with SDR circuit structure, which uses 16bit-CODEC sampling and can deliver superior performance. The transceiver has SSB/CW/AM modes and extra WFM (88~108MHz) receiving function, allowing you to listen to local FM broadcasts while communicating. Equipped with a CW digital filter with three bandwidths, it can help you connect to more radio stations. With the external DE-19 digital adapter (optional), it can be easily connected to the computer for FT8 communication.

As an entry-level portable SDR transceiver, G106 is ideal for playing CW and FT8 at a very reasonable price, from Moonraker at just £349.95.

www.moonrakeronline.com

UPDATED RBN WEBSITE: The Reverse Beacon Network launched their updated website on 16 June:

A full explanation of the new features is available under 'About > Guide to the New Site'. The Reverse Beacon Network is a network of stations listening to the bands and reporting what stations they hear, when and how well. You can see band openings in near-real time on an animated map.

The database of past spots allows you to instantly find out what stations, from a given country or zone, have been heard, at what times and on what frequencies. You can see when you have been spotted, who spotted you, and how loud you were. And now, for the first time, you can compare your signal with those of your friends and competitors, in near real time or historically. If you wonder how your signal stacked up during last weekend's contests, the Signal Comparison Tool will give you real, quantitative data. Tell it what stations you want to compare, based on signals heard by a given reverse beacon on a certain band at a certain time, and there you'll have it.

https://reversebeacon.net/main.php

NEAT RECEIVER: This one costs just £70 and may be just what you need to monitor the bands as well as listening to the FM broadcast band on your travels:

www.youtube.com/watch?v=3ZIphm82zBM

SHEFFORD AND DISTRICT AMATEUR RADIO SOCIETY: Shefford and District Amateur Radio Society held a bumper summer auction of radio equipment and good quality junk in June to complete their annual programme, prior to the holiday closure. Although post Covid attendance had not yet returned to normal levels, the evening proved to be great social and financial success and the Treasurer Owen G0PHY was to be seen with a happy grin as he totted up the welcome dividend to his club coffers!

Auctioneers Don G4LOO and David G8UOD worked hard to clear tables laden with tempting 'goodies', much of which sold at bargain prices. A very nice communications receiver went for a song and an attractive selection of test equipment, including two 'scopes, a GDO and a pristine Heathkit signal generator, soon found new homes.

SADARS will reconvene for weekly meetings at 8pm on 8 September at the Community Hall, 54-56 High Street, Shefford SG17 5AX. A full programme of lectures, events and contest activities is planned and visitors and prospective new members will be most welcome. For information contact the Hon. Secretary David Lloyd G8UOD on 01234 742757 or go to their website for an overview of amateur radio at SADARS:

sadars.co.uk

DIRECT TO FULL: The RSGB report that they are pleased to announce the publication of the new Direct to Full examination syllabus. Enrolments for the Direct to Full examinations will open in January 2023, six months after the publication of the new syllabus. The examination is specifically aimed at aspiring amateurs who are already competent in related technical subjects. However, it will be open to all, and Foundation and Intermediate amateurs are free to enrol for the Direct to Full examination or continue along the three-tier route as they wish. More information about the changes and the full syllabus can be found at:

rsgb.org/direct-to-full

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

BITTERN DX GROUP: Please note that the monthly Bittern DX Group meetings have resumed, from 25 August at the Erpingham Eagle Public House 19:00 for 19:30 start. Club news and general chit-chat.+ Zoom if possible for those who can't attend in person. (from Peter Stainton G6ZRV Chairman Bittern DX Group, Phone 07884583765)

CWOPS NEWS: (from W1UU, CWops Vice President) CWops has grown! Over the past 10 years we have grown to over 2500 members, with worldwide membership increasing substantially! Our CW Academy has world-wide acclaim! Our Ambassador program needs to be revisited for new ways to promote our activities and extend outreach. Many of us would like to meet prospective members at traditional forums:
Hamfests: Dayton, Ohio, Japan: JARL, Germany: European meetings centred at Firedrichshafen, Local Radio clubs: Slide show and presentation
New forums are being created because COVID-19 prevents the traditional way of meeting prospective members. These new forums include the use of online tools such as Zoom.
CWops has created a Forum Investigation Committee (FIC) that searches and investigates new forums to present CWops activities. The Ambassadors, located in worldwide areas, are then asked to make direct contact with those forums and provide information to our CWops Ambassador program manager. The Ambassador program manager is CWops Vice President, Peter Butler W1UU, who will be advising the Board of Directors to further develop CWops on a worldwide basis.
The newly appointed CWops Ambassador for North West Europe is Duncan Fisken G3WZD.
Meanwhile, get ready for one of the most time flexible and fun CW contests of the year. The CW Open contest is managed by the CWops club with Trophies and Plaques sponsored by ICOM America. The CW Open contest comprises three individual sessions, each four hours long. These sessions are all on 3 September, and spread across a 24 hour period so as to level the propagation playing field globally. Here is the schedule for the three sessions:
Session 1: 00:00 – 03:59 UTC
Session 2: 12:00 – 15:59 UTC
Session 3: 20:00 – 23:59 UTC
For a complete description and rules go to:
cwops.org/cwops-tests/cw-open

4U1ITU: 4U1ITU, the amateur radio station of the International Telecommunications Union, is marking 60 years of operation as part of the United Nations specialised agency for communication. Its first QSO in June of 1962 was with DL4VK in Germany and that contact marked the start of a busy 24 hours in which more than 1,300 contacts worldwide were logged. The station has since logged more than a million contacts in CW, SSB and digital modes, including its first use of the weak signal mode software WSJT, which bounced signals off the moon. That activation was made by Nobel laureate Joe Taylor K1JT, the software's creator, and was logged on the occasion of the station's golden anniversary. In recent years 4U1ITU has logged contacts with astronauts aboard the International Space Station and participated in the ARISS program with students in Switzerland. However, the building in which 4U1ITU is housed is due for redevelopment so it may well be that 4U1ITU becomes inactive for the next four years or so.

TEN AMATEUR RADIO CUBESATS DEPLOYED FROM ISS: On 21 July 2022, during a spacewalk by Samantha Cristoforetti IZ0UDF and Oleg Artemyev, ten amateur radio CubeSats were deployed from the International Space Station.
The SWSU series satellites were developed at the Research Institute of Space Instrumentation (part of Roscosmos) and radio-electronic systems of southwestern State University (SWSU). The main developer of the SWSU series satellites is Egor Shilenkov UB3WCL, Candidate of Technical Sciences, Director of the Center for Space Instrumentation, Advanced Research and Development of Southwestern State University.
The mission of the SWSU series satellites is to create a peer-to-peer information network. Within the network, retransmission and parallel transmission to the ground monitoring point are organised.
Study of the Earth's magnetic field. measurement of the noise of the radio broadcast in outer space. transmission of photos (SSTV) and voice messages (AUDIO) to radio amateurs around the world. For each satellite, a personal phrase will be selected, which is translated into eight different languages.
SOURCE R4UAB:
https://tinyurl.com/2z9frvwx
https://twitter.com/R4UAB

QSO Today Virtual Ham Expo

The next QSO Today Virtual Ham Expo, a full featured virtual amateur radio convention, is 17/18 September 2022. The online event includes speakers and presentations, fully interactive video lounges where participants can meet each other and chat, and an exhibit hall full of vendors and organisations.
While the Ham Expo was originally created in August 2020 as an alternative to cancelled in-person amateur radio conventions due to the COVID-19 pandemic, it has evolved into a regularly-held event for amateur radio learning through peer submitted presentations on nearly every amateur radio subject, lively discussion, and interaction.
The Expo uses virtual event technology using platforms produced by vFairs and Kumospace. *"The Kumospace lounges were a fantastic edition to the Expo last March and were full of hams and conversation during the entire Expo weekend"*, said **Eric Guth 4Z1UG**, the founder of the QSO Today Virtual Ham Expo. Kumospace is a video chat platform for hosting and participating in immersive virtual events.
Guth said there are new enhancements that will make the lounges even more enjoyable for attendees. Kumospace and vFairs are now supported by apps for Apple and Android.
Expo personnel still recommend a fast internet connection and big screens for the best user experience.
New for this Ham Expo is a Poster Gallery Hall that includes a product showcase and interactive projects submitted by amateurs. The product showcase is as a way for vendors who may or may not have a booth to demonstrate individual products through videos, white papers and slides. Each showcase is fully interactive through text chat and supports opportunities for vendors to follow-up with interested visitors. The Poster Gallery will also include an opportunity for individuals to submit papers, projects, and articles to be enjoyed by Expo delegates. Accepted gallery submission will include a free ticket to the expo.
The $10 ticket for the Expo was due to go on sale in August. Anyone can attend the Expo from anywhere in the world, over the internet.
For more information go to:
qsotodayhamexpo.com

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PW at 90 Years

We wrap up the story of PW, as we celebrate the magazine's actual 90th birthday.

Don Field G3XTT
practicalwireless@warnersgroup.co.uk

We come now to the most recent decade of *PW's* distinguished existence, which came to an end with last month's issue. This issue is the first of the magazine's tenth decade.

The ninth decade starts with **Rob Mannion G3XFD** still at the helm but I took over the editor's chair with the December 2013 issue, **Fig. 1**. The decade therefore is one with which I am most familiar but it will also be the most familiar to the majority of our readers, although I know some go back a very long way with the magazine! The ownership of *PW* has also changed a number of times over the years, most recently when *PW* was acquired by Warners in the autumn of 2017. This proved to be the opportunity for several members of the previous team to take a well-earned retirement although **Tex Swann G1TEX** is still available to me from time to time for drawings, while **Steve Hunt** still helps with some of the advertisements. It's encouraging, of course, that Warners saw enough of a future for *PW* (and sister magazine *RadioUser*) that they were prepared to buy the title. And, as many of you will be aware, they have the resources to have made an online version available, greatly increasing the potential, especially overseas where postage is so expensive nowadays. The appearance has changed since Warners acquired the magazine, too, but then the format has changed quite regularly over the years to reflect changing times. Of course, the readership has also declined drastically over the years. Rumour has it that in its heyday in the late 40s and early 50s, it had a circulation of over 100,000.

Remarkable given that there certainly weren't that many radio amateurs in the country, but there was a massive hunger for information about radio and TV generally, with many folk engaged in home construction, training to be technicians, training as seagoing radio officers and suchlike. As **Mike Richards G4WNC** notes in his column this month, not only did *PW* have a significant number of staff, but it also boasted a well-equipped laboratory for design work and testing. Sadly, in such respects, we are now a shadow of our former self. Reader numbers are substantially lower, reflecting not only an aging amateur radio population but also the ready availability of much information via the internet and fewer people tinkering with electronics. But the good news is that modern publishing software allows the magazine to be produced with a much smaller staff and with the demise of many other magazines addressing the amateur radio market, it's great that there is still one title available in bookstores and

newsagents that caters for what is still, clearly, a need. As I have explained in these pages before, it's now me doing the editing and **Mike Edwards** of Warners doing the page make-up both for *PW* and *RadioUser* (and quite a lot else besides!). But, as **Tim Kirby GW4VXE** mentions in his VHF column this month, and as will be clear from previous *PW at 90* features, the magazine didn't focus that much on amateur radio in the early days – more on broadcast radio. Amateur radio was catered for in other publications and particularly in *Short Wave Magazine (SWM),* especially when that magazine was edited by the formidable figure of **Austin Forsyth G6FO**, who pulled no punches in his editorials.

Sadly, *SWM* is no more but the title was acquired by one of the previous owners of *PW* so we can accurately claim the magazine as part of our heritage. And nowadays *PW* is focused exclusively on the amateur radio world, albeit with a fairly broad understanding of what that encompasses (for example, last month's look at some classic test equipment).

During my time at the helm I've tried to achieve a good mix of reviews, technical articles, amateur radio history, general interest and educational articles, all of course focused on the amateur radio hobby as mentioned above, with *RadioUser* covering other aspects of hobby radio. While this mix of topics may not be the case in a single issue, hopefully it's a balance that pans out across a year's issues.

And although we no longer produce give-aways such as the blueprints, data cards and the like of old, we do post supplementary material on the internet and continue to run two VHF contests a year, aimed at both newcomers and old-hands alike.

I won't dwell on the articles that have appeared in recent years as most readers will be familiar with them. I have enjoyed writing a number myself – from equipment reviews (it's always nice to be one of the first to get my hands on an interesting radio or piece of ancillary equipment) to travelogues (sadly diminished since the advent of COVID but I hope to be travelling again soon and reporting on amateur radio in other parts of the world).

FG Rayer G3OGR

The story of **FG Rayer G3OGR**, **Fig. 2**, has been told a number of times, for example in the December 2007 75th anniversary supplement of *PW*. But it deserves retelling, at least in brief because he had such an impact on the magazine, often being featured several times in an issue (although usually under aliases, apparently because the then editor didn't want to be seen to be over reliant on a single author). I admit to being confused when I first came across him in my teenage years, thinking his callsign must be G 30 GR, not having a knowledge of callsign structure at the time. But I soon learned!

Frank Rayer obtained his amateur radio licence in July 1960 but was already a prolific author, not only of science fiction (both books and magazine articles) but of non-fiction including for county magazines and daily newspapers in Worcestershire and also, it seems, for the *Readers Digest*. Indeed, unlike current *PW* authors, who write in their spare time, Frank Rayer made his living out of writing and was truly prolific in his output.

In *PW*, he wrote, it seems, as **RF Graham**, **Frank Rayer** and **FG Rayer G3OGR**. When RF Graham first appears in *PW* in the mid -1950s, he seems to be G3OGR's transistor personality, while G3OGR concerns himself almost exclusively with tried and tested valve circuits. So, for example, in the July 1957 issue of *PW*, the second part of *An Amateur Communications Type Receiver* (using good old octal valves) by F G Rayer, and *A Diode and 3 Transistor Portable* (using 0070/71/72 transistors) by Capt. R F Graham are published. The attachment of F G Rayer to his callsign doesn't occur until *PW*

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

Fig. 1: Cover of the December 2013 issue, the first under Don's editorship.
Fig. 2: FG Rayer G3OGR.

August 1964, with the publication of *End Fed Aerials* by F G Rayer G3OGR.

Rayer also wrote at various times for *SWM*, *Radio Constructor*, *Practical Electronics* and *Practical Television* as well as, perhaps, other electronics magazines. He also worked closely with Berbard Babani Publishing, well-known for their range of technical publications.

As a fiction writer, some of his works appeared under the pseudonym **George Longdon** (reflecting the place of his birth, see below).

Born at Longdon, Worcestershire in June 1921, Frank was the second son of **Harry Rayer**, a farmer, and **Florence Shepherd**. Rayer began his science writing after suffering a heart attack at a young age. During the Second World War he and his brother were exempt as farm operators. He had a bout of rheumatic fever and later joined the Home Guard. He married teacher **Tessa Elizabeth Piatt** in 1957 and had two children, **William** (formerly **G8PWR**) and **Quintin**. He taught himself Esperanto and professional writing skills. He died on 11 July 1981 at Upton-upon-Severn, Worcestershire following complications of diabetes.

Of course, Frank Rayer wasn't the only author to have kept *PW* in the forefront of amateur radio publishing. We have been fortunate in attracting many excellent authors over the years, some on a one-off basis while others have returned again and again to inform and entertain. I count around 170 authors in my time as editor, quite remarkable.

2

F J Camm

The other great figure in the history of PW was, of course, **F J (Frederick James) Camm. B**orn in Windsor in 1895 he was the second of 12 children, the eldest being **Sydney Camm**, designer of several aircraft, including the Hurricane fighter. His career as a technical author led to him joing George Newnes publishing and to his creation and stewardship of the 'Practical' series of magazines. These included *Practical Engineering* (published weekly from January 1940), *Practical Home Money Maker* (published monthly from October 1957), *Practical Householder* (February 1957 to 1970), *Practical Mechanics* (1933 to 1963), *Practical Motorist* (1934 to 1997) and *Practical Television* (1934 to 1938 and 1950 to 2008). He also wrote or edited over 100 technical books. He must have been quite the workaholic!

This month we feature one of the articles from the very first issue of *PW*. The author (and presumably designer of the circuit) is F J Camm himself and it is quite clear that in preparing to launch the magazine, he had done a vast amount of groundwork and put a lot of thought into how the magazine would move forward. Indeed, in those early days it was published weekly, quite astonishing!

Camm died of bronchial pneumona in 1959 at the age of 64.

RSGB 100 this Year

Finally, while we celebrate our 90th birthday, it's been pointed out to me that in November 1922 the Wireless Society of London changed its name to the Radio Society of Great Britain, so that name sees its centenary this year. And, of course, we look forward to our own centenary in ten years' time. Meanwhile, as another piece of nostalgia, see the extract below from the June 1946 issue of PW, announcing the first post-war Amateur Radio Examination. **PW**

G.P.O. Amateur Transmitting Licence

APPLICANTS for a licence to establish an amateur wireless station who have not previously held a licence to install wireless transmitting apparatus will be required to furnish evidence of British nationality and proof that their technical knowledge and operating ability reaches a certain minimum standard. The proof normally required will be a "pass".

(a) in a test, conducted by the Post Office, in sending and receiving morse signals at the rate of 12 words a minute, and

(b) in the City and Guilds of London Institute's "Radio Amateurs' Examination."

Exemptions from one or both of these examinations will be allowed where applicants can produce proof of equivalent or better qualifications. A leaflet will shortly be obtainable from the Engineer-in-Chief (W5/5) G.P.O. London, E.C.1 setting out particulars of such exemptions. These particulars will include a list of grades in the Forces, service in which will be regarded as qualifying for exemption.

The first City and Guilds of London Institute's "Radio Amateurs' Examination" will be held on 8th May, 1946, between the hours of 7 p.m. and 10 p.m. at Technical Institutes throughout the country; the last day of entering for the examination was the 31st March, 1946. The fee for the examination is 10/-, in addition to which the examination centre may make a small charge for accommodation. Intending candidates who may experience difficulty in finding a suitable examination centre should write to the Superintendent, City and Guilds of London Institute, Department of Technology, 31, Brechin Road, London, S.W.7, who will also supply particulars of the "Radio Amateurs' Examination" on demand. Examinations will be held annually in the future, or more frequently if there is sufficient demand for them ; it is possible that a further examination may be held before the end of the present year.

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RADIO ENTHUSIAST BOOKSHOP

The Magic Bands

Building on Don's earlier books the *6 Metre Handbook* and *Six and Four*, *The Magic Bands* adds lots lots of material on data modes operation, which has grown enormously in popularity in recent years with the advent of FT8. There is detail of the many new radios that have appeared in recent years with 6m and, increasingly, 4m capabilities. Readers will find two new antenna designs from Justin Johnson, G0KSC, of InnovAntennas especially produced for this book. There is detail of software too, not just for data modes but for remote operation, tracking of achievements and much else. There is even material highlighting the achievements of several of the leading operators on the 6m band.

The 6m band is now almost universally available across the amateur radio world, while in recent years 4m access has been granted to many more countries, often on a permanent basis. So why miss out on the 'Magic bands'? The Magic Bands is recommended for anyone who wants to try these bands out and is a comprehensive guide for those who are already hooked on these fascinating pieces of spectrum.

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Austrian Audio PG16 Pro Gaming Headset

The editor takes a look at some headphones that might serve in the shack as well as being useful elsewhere in the home and office.

Headphones are an absolute essential in my shack. I invariably wear them while operating, not just to avoid disturbing other members of the family but they keep out extraneous noise and I'm convinced they also help me to pull out those weak callers during a contest, for example. And it's useful from time to time to be able to listen to the main receiver of my IC-7610 on one ear while monitoring the second receiver on the other ear.

My experience of headphones has been mixed, to say the least. I have, for example, spent considerable sums on two different Heil headsets, only to have both of them disintegrate on me. Hopefully not an experience shared by all Heil users. I've also owned two sets of Bose QC15 noise cancelling headphones. Again, expensive, but the noise cancelling is superb. However, one pair recently broke – I had discovered that there is one notable weak point in their construction. And I hear that the latest Bose headphones that use Bluetooth have delays (latency), which can affect Morse reception. So, in recent years I have resorted to using cheaper headphones, including the excellent bhi HP-1 ones I reviewed in the July 2019 issue of *PW*. I held onto the review pair and bought a second pair second-hand in order to have back up, should they be needed.

You can imagine then, that I was interested recently to be offered a rather different headset to review. This is the PG16 Pro Gaming Headset from Austrian Audio, now available here in the UK. A gaming headset? Well, yes. But potentially more than that insofar as this appears to be a well-made headset, with built-in microphone, at a mid-range price. But how would it perform in amateur radio service?

Before answering that, and by way of background, Austrian Audio was an upshot of AKG moving its operations out of Vienna. Several former AKG employees came together to form Austrian Audio, and the result is a young(ish) company with an experienced team.

In Use

Anyway, back to the question as to how they perform. The answer is that they are pretty good. I have used them for several contests now – they are comfortable to wear, the sound quality is excellent and they appear to be well made. Although not noise-cancelling, because they are over-ear they do a good job of keeping out extraneous noise (including the fan noise from my transceiver and linear amplifier). What more to say! They have a built-in microphone (that can be rotated out of the way when not in use, which also mutes the microphone), not necessary for CW operations of course. But, even for me (primarily a CW operator), they have the added benefit that they work well in use with the PC for Zoom calls and similar. For this purpose, the main connector is a four-way 3.5mm one as used on modern PCs, your smartphone and many other devices. They also come with a Y-adaptor, **Fig. 1**, to split out microphone and headphones. The features and specification appear in the sidebar. To use the microphone with your rig, you will need a suitable adaptor to suit the 3.5mm plug on the headset – available for most transceivers. The 1.4m cable plugs into the headset so can easily be detached. The headset also comes with a handy carrying bag.

Incidentally, it's probably worth a mention that I wear glasses but the headset sat comfortably over them.

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PG16 Specification

- Metal hinge for maximum durability
- Soft memory foam earpads to keep you comfortable during the longest sessions
- Foldable construction for easy storage, uncommon in this price range
- Detachable 1.4 m cable included
- High quality/price ratio—they're especially good value
- Multi-Platform: Compatible with PC, Mac®, PS4™, PS5™, Xbox™ (controllers with TRRS socket)
- Teamspeak certified
- Pro Gaming Headset
- Frequency range: 12Hz – 24kHz
- Drivers: 44 mm High-Excursion
- Sensitivity: 113dBspl/V
- Impedance: 25Ω
- Input Power: 150mW
- Microphone boom: with Mute function
- Microphone directional characteristic: omnidirectional
- Cable (detachable): 1.4m
- Connector: 3.5mm (1/8in) TRRS
- Adapter (included): 3.5mm (1/8in) TRRS to 2x 3.5mm (1/8in) TRS
- Dimensions: 205 x 180 x 80mm
- Weight (without cable): 265g
- High-quality pro sound for discerning gamers
- Featuring an immersive and outstanding precise sound - achieved by the highly acclaimed Austrian Audio High Excursion technology. Outstanding passive noise cancellation for uninterrupted focus. Earpads made out of special slow retention memory foam for the greatest comfort during long listening sessions.

PG16 features:

- Our proprietary High Excursion Technology, for high resolution sound
- Spatial Sound Card 7.1. surround sound software from New Audio Technology included
- Soft memory foam earpads to keep you comfortable during the longest sessions
- High-end omnidirectional microphone with "Tilt-To-Mute"-functionality
- Metal hinge for maximum durability
- Foldable construction for easy storage, uncommon in this price range
- Detachable 1.4 m cable included (Optional replacement different length cables available)
- Multi-Platform: Compatible with PC, Mac®, PS4™, PS5™, Xbox™ (controllers with TRRS socket)
- TeamSpeak™ certified

An alternative is the PB17 headset, **Fig. 2**, aimed at business users. Very similar but black in colour and with a USB connector rather than the Y-cable. Sonically, both models are identical.

Conclusions

I liked this headset and despite being sold as a 'gaming' headset I suspect it could well find a place in amateur radio shacks, given that it is comfortable to wear, works well and can fulfil other uses around the house (I am listening to Spotify on my smartphone through the PG16 while writing this, in order not to disturb my wife). Price-wise, they fall nicely between the cheap communications-quality headphones that many of us use but are significantly cheaper than the premium headphones aimed at the amateur radio market (and cheaper than most 'quality' music and gaming headphonsets). A good compromise perhaps?

The Austrian Audio PG16 sells for £129.00, while the PB17 sells for £119.00. They are distributed exclusively in the UK and ROI by Sound Technology. Further details from the following:

https://tinyurl.com/4jz3h53c
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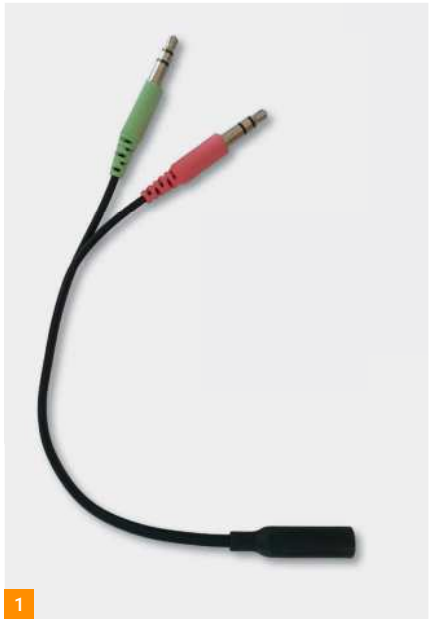

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Fig. 1: Included Y-cable.
Fig. 2: The all-black PB17 'business' headset.

Radio News

HF PROPAGATION PROJECT GOING FORWARD: A US project that makes use of sensors on satellites in very low Earth orbit is looking for proposals that will help develop a better way to predict HF propagation in the ionosphere in real-time. The program is known as Ouija (wee-Jah) and is being undertaken by the Defense Advanced Research Project Agency, or DARPA, which is part of the United States military. The agency wants to monitor the ionosphere locally and continuously and believes that it will achieve its stated goal. The program focuses on the section of the ionosphere that is between 125 miles and 185 miles in altitude. In announcing the project this past spring, DARPA said a more predictable environment for communications will be an aid for military communication, which includes among its obstacles solar flares and the 11-year solar cycle.

144/430MHZ BANDS TO BE USED FOR PMR DURING 2024 OLYMPICS: (from *Southgate Amateur Radio News*) France's National Frequency Agency ANFR has announced that the 144 and 430MHz bands will be used for PMR voice comms, 1240MHz for PMSE and 2.3GHz for video links during the 2024 Olympic and Paralympic Games. A translation of the ANFR announcement says:

France will host the Olympic and Paralympic Games in Paris in 2024. The National Frequency Agency is in charge of drawing up the frequency plan and allocating frequencies for the Games. To this end, it worked with all the assignees to assess the amount of spectrum needed for the organisation and global dissemination of the Games. In this context, bands not primarily devoted to PMR, PMSE audio and video uses and to score and time management have been identified, as in previous editions of the summer JOP, in order to meet the consequent need for spectral resources.

ARCEP, assignee of the band 144 – 146MHz has thus authorised that it can be used by the official broadcaster of the Games and its service providers, among other stakeholders. The band will thus accommodate the PMR voice service (walkie-talkie) in simplex pipes of 6.25 and 12.5kHz, up to 1W. In addition, the frequencies of the band 430 – 440MHz will also be used to accommodate the PMR voice (walkie-talkie) service in simplex pipe of 6.25 and 12.5kHz, up to 1W.

The band 1240 – 1260MHz, open to amateur service on a secondary basis, will accommodate PMSE Audio equipment with a power of less than or equal to 50mW and a pipeline of less than or equal to 200kHz.

Finally, in the bands between 2300 – 2483.5MHz, part of which is also open to amateur service on a secondary basis, mobile video links up to 10W for a maximum channel of 20MHz will be deployed. The frequencies will be made available to the Organising Committee of the Paris 2024 Olympic Games during the period from one month before the Opening Ceremony of the Olympic Games to one week after the Closing Ceremony of the Paralympic Games, from 26 June to 15 September 2024. In order for them to be usable in good conditions, it seems essential to us that in the vicinity of the sites, their use by radio amateurs is moderated during this period. We rely on all members of the amateur radio community to do this.

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The Xiegu GNR1 Digital Audio Noise Filter

Daimon Tilley G4USI checks out a newly launched accessory from Xiegu.

Daimon Tilley G4USI
practicalwireless@warnersgroup.co.uk

Pleased to see another new product from Xiegu, **Alan** at Sinotel kindly agreed to the loan of this device to review.

The blurb states that the filter is designed to be used in the external audio chain of a transceiver or receiver to effectively reduce background noise, improve signal-to-noise ratio (SNR) and improve the ability to resolve signals.

Description

Arriving well packaged, the filter itself is housed in a sturdy metal case, which is black and looks very professional. Dimensions are 159 x 44 x 143mm. On the front are a power switch, audio input level control, a noise reduction control, controls for Low and High Cut and an output control. Also on the front panel is a 3.5mm headphone jack, a power LED and an LED to indicate clipping, which can then be rectified using the line input control. However, even with the maximum setting of this control and a decent volume from the transceiver or receiver, it never clipped for me.

On the rear panel is a 12V coaxial power input, a 3.5mm Line In socket, a High/Low Line In impedance switch, and two speaker outputs, giving a choice of phono or 3.5mm jack.

Also included in the box is a lengthy 3.5mm double-ended stereo cable and a 12V wall-wart power supply with the correct plug for the device. Disappointingly, like the X6100 transceiver, this plug is a Euro plug and will need to be used with a three-pin adapter, which is not supplied. For this reason, I used my shack 13.8V supply. The manual states a supply of 12V with a tolerance of plus or minus 15%. There is a highlighted warning not to use it under-voltage, although I am not clear why.

In practice I found that the Line In could be taken from either the external loudspeaker or headphone socket of the rig it is coupled with. The manual sounds a note of caution at this point, noting that all 3.5mm sockets must be used with a stereo, and not mono connector, to prevent internal damage.

The specifications claim that the noise reduction can achieve more that 22dB of reduction and the Low Cut range is 5Hz-1280Hz, with High Cut ranging from 500Hz- 5615Hz. These ranges should allow use with AM broadcast stations, through to SSB and CW signals. Output from the unit can be sent to either to a speaker with impedance between 4 – 16Ω, or to headphones in the impedance range 16 – 64Ω.

Testing

I decided to test the device with my Kenwood R1000 receiver and my recently acquired Elecraft K2 transceiver. In the case of the R1000, the filtering is quite wide, making AM and SSB reception comfortable but CW reception on a busy band very difficult – the filters are just too wide and this is where I started. Connecting the GNR1 to the external speaker output of the receiver I began with the Noise Reduction. This was seriously impressive. There was a large amount of band noise on a couple of the evening tests and the GNR1 progressively killed it stone dead! Just a small initial tweak of the control made a big difference, but then the effect could be improved right through the range. Signals that were surrounded by noise were suddenly isolated and clear with the noise just falling away. Understandably, and as pointed out in the manual, there was a need to increase the unit's audio output as a result, but this worked well.

Moving to the CW portion of the bands, and with the R1000 only tuning in 1kHz steps as well as having wide filters, CW reception has always been tough. Using the Low and High Cut controls together seemed to work well and allowed quite reasonable isolation of what were otherwise conflicting signals. I think this would have been easier if the receiver tuning resolution was better, but we work with what we have and the GNR1 did help a lot. It didn't make the R1000 the perfect CW receiver, but it definitely made it much more usable. On SSB I struggled to see much benefit from the Hi and Low Cut filters on the R1000 if I am honest.

I then moved to the K2. The CW filtering on the K2 is excellent, going down as low as 100Hz, so I saw no benefit in testing this. The K2 also has quite effective noise reduction but I was keen to see what the GNR1 could bring to the party. I played around comparing the NR on both devices. While the K2's noise reduction is quite effective, it is either on or off, not variable, and it does produce some quite hollow artefact sounds, which can be a little annoying at times. Switching in the GNR1 was just as impressive an improvement as it was on the R1000. The noise merely fell away by degrees as I adjusted the control, compensating for the slight loss of audio by increasing the Line Out control. It was much more effective than the K2 on its own.

Listening on SSB on the K2, the NR was again more effective than that of the rig, but again I found the Low and High Cut to be of very limited use compared to the selectable rig filters. I then decided to see if the NR worked with RFI noise. I am lucky to live very rurally on a smallholding with no near neighbours and therefore a low noise-floor. However, I do possess a cheap Chinese Switched-Mode Bench Power Supply, which has its uses but is a hideous RFI generator! Switching it on while listening to the K2 on 40 or 80m gives me S9

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of noise. The GNR1 handles it well, and made the difference between a comfortable and a difficult copy of medium strength stations.

When using the GNR1 Noise Reduction during transmit, I did find that immediately after finishing your transmission the noise on receive does increase before fading away to the reduced level very shortly afterwards, but this did not cause me a problem.

So, in essence, I found the Noise Reduction to be first class, and the Low and High Cut filtering effective on receivers (or transceivers) with wide CW filtering. On SSB, however, I struggled to identify any real benefits.

My only real wish is that the controls for filtering were slightly different. To make use of them I found you were constantly having to fiddle with both slope controls all the time, to eke out your desired signal and this was a little cumbersome for me personally. I cannot help but draw a comparison to my old Datong FL3 audio filter, which I use with my Heathkit HW9. The Datong does not have any Noise Reduction, but I do rate its ability as a CW filter very highly. It has a slightly different control setup which I prefer – namely there is a single control for bandwidth and then a separate control to shift the centre frequency of your passband. If the GNR1 had these controls, I do think it would be easier to use in the way I would want to use it. If I were to keep it, I would want to add a bigger series resistor to the power LED, which is somewhat blinding of a late evening, but this is being very picky!

Retailing from Sinotel at £190 it could be a fabulous addition to your shack, particularly if, like me, you are a fan of older equipment, where it could really enhance your operating experience. **PW**

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Joe Chester M1WD
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A Mini-DXpedition to Switzerland

Joe Chester M1MWD tries his hand at operating from a mountain before heading to Friedrichshafen.

Height is everything. Or so I was told. And I understand why this is true. For example, a 2m Yagi beam will deliver more if it's 1000 feet up a mountain (assuming a clear take-off - – don't go hiding in a forest!). But what about on HF, I hear you ask? Yes, there too. But let's get this conversation under control.

An HF dipole antenna will work its best if it's a half wavelength above ground. Higher? Lower? Yes, strange things happen in both cases. So, you can't keep pushing up those support poles endlessly and if you drop the dipole down to ground level, then you really have a very strange antenna (Beverage fans know this, which is why the Beverage in the Ground is a popular choice as a receive antenna).

Back at Ground Level

OK. I'm just back at ground level myself, after a one-hour train ride. It took an hour to go up earlier this morning too. Where? Roches de Nayes. It's an Alp. 6000 feet, or 2000 metres in new money. Or rather, a collection of them. And train buffs will know that the train is driven along by a central cog wheel.

And why, you are asking? It's been over 30 years since I last backpacked a radio station up a hill. So, this morning, I dragged my KX3 and a battery onto that train, and up we went. Ears pop regularly, as the train grinds its way upwards. It sounds ridiculously like a 747 taking off every time the driver pushes the throttle forward. And it's fast too. On departure we immediately entered a tunnel, and came out 200 feet up, over Montreux, looking out over Lac Lemain, in Switzerland.

The train is packed with tourists, and a few high-altitude locals with supermarket bags. The KX3 is on the floor, but my foot is protecting it from the feet of the other passengers. It takes an hour because the track twists this way and then back, to climb this particular Alp. It has the character of a model train, narrow gauge and a bit rickety. But every time we turn through a curve, another breath-taking vista opens up.

At the top, there is a stunning view over half of the country. And a restaurant. I had obtained permission in advance to use one of their tables, near the edge, for the station. Set up only took a few minutes. Antenna? The AX1, of course, with its 40m extension coil and two pre-cut counterpoises. Now, this antenna seems to have a love hate relationship with radio operators in general. It's small and light, so highly suitable for portable work. It's basically a bit like a base-loaded car antenna. I did a review of it here in *PW* way back (October 2019), in which I also pushed it through the modelling software. So, it does work. Better or worse kind of depends on your experience with it. Mine has been good.

I'm set up, and now comes the whole point. I will admit up front that it was a failure, but it was a long shot, and I know why it failed. I am heard regularly on the National Radio Centre (NRC) net weekday mornings, from 1030 local, and run the net from the NRC when I am there. It's a friendly place to call by or to have a chat, everyone is welcome. We have used 3.727MHz as the regular net frequency since his eminence (!) **Nigel G4RWI** started the net at the beginning of the first Covid lockdown, over two years ago. We have a group of volunteers to run it now, and it can be fun.

However, recently, there have been complaints about the lack of cooperation from the gods of propagation. Not to gild the lily here, but it's been dreadful. So, a plan was hatched. Why not move to 40m where, we assumed, that inter-G propagation would inevitably be better? 7.130MHz was chosen, plus or minus for the QRN. It hasn't been a 100% success, so we drop back to 80m sometimes. It all depends. On the propagation. On conditions, as we say.

My Modest Effort

By arrangement (I sent an email to the group) my plan is to light up 7.130MHz, and try to work the Net from 6000 feet up an Alp, around 600 miles or so away from the NRC. And there they are. **John GQ4FZA** is in the chair, calling CQ and QRZ. **Keith**, **Ed** and **Roger** are there too. However, I only know this because I am listening on the Hack Green SDR. 40m propagation this morning was dire. I heard a couple of strong Italian stations earlier, but they

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didn't answer when I replied to their calls. The netdenizens were reporting 59 signals between themselves, but struggled to work a local M7. I got a text from the aforementioned Nigel, asking if I was trying to call in, but as I was hearing nothing from anyone direct, I didn't bother to call.

So, a failure. Proving that even height does not have the power to overcome the vagaries of propagation. But, as I'm set up, I quickly retune to 20m, and while I won't claim that it was wall to wall, I did manage a few QSOs. The best were ON, SP and OK. I did hear a G6, from the south coast, working T77LA, but I couldn't work him.

And before you jump up and tell me to get a better antenna, I can tell you that everyone is suffering from the poor conditions of late. I saw this in an email on the WAB list on the same day from **David G0FVH**: *"Just a normal busy Friday morning here yesterday, nothing heard/worked on the radio. Out from 1030-1330, back in the shack around 1400, and nothing, the first blank log day for a while!"*. There are lots of emails like this, from all over, and comments on air too. But I had fun with my mini DXpedition, and that's what it's all about. Tomorrow, I head for Friedrichshafen; more on this elsewhere (see page 26). **PW**

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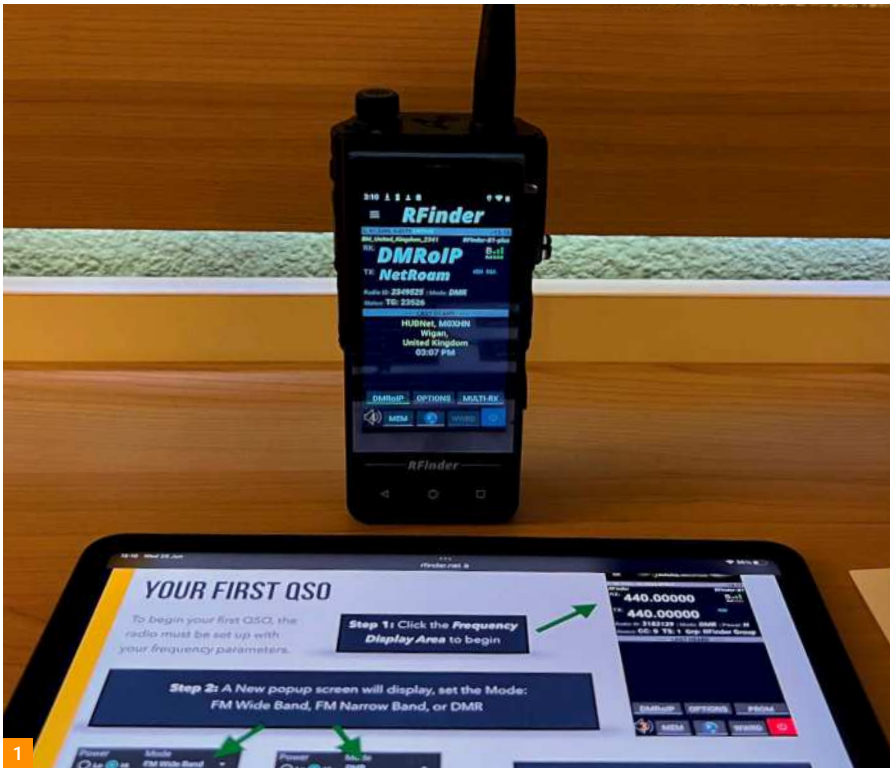

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The RFinder B1

Joe Chester gets excited by the RFinder B1, to the extent that he actually buys one!

So, I pull around a corner, and I hear what was a very strange conversation. A Scotsman is trying to teach an American to speak English like a Scotsman. *"Only use o's and u's"*, he says. *"So, I koop a hord of abordun ongus cuttle"*, which the American repeats back very convincingly, even more so when they start on some less savoury language. Although what on earth started this conversation, I have no idea. I decided to risk life and limb, so I interrupted. *"Is that it"*, I managed, my eyes popping open. The 'it' is a whole new ballgame, as the Americans say. Now don't run away in search of the DX page, hear me out.

It's a radio, a V/UHF handheld one, 4 watts out. It's built like a brick, and waterproof to IP67. What sets it apart on first sight is the full-size screen. Like on a smartphone. Oops, I shouldn't have said that right away. Because it is. Yes, it's also a smartphone. But I'm getting ahead. The Scotsman is **Graham 2M0IGV**, and the Americans, for there are two of them, are **Bob W2CYK** and his buddy **Joe**, straight out of college. Graham is waving one around in his hand, so I make a grab for it, and ask him to show me what it can do. *"It's six years old, and still works a dream"*, he says. Bob says that it's gone through six generations since the first version, which Graham is rather proud of. One push, enter a few numbers, and voice emanates from the thing. Big beams all around. Like any kid handling a piece of advanced technology, this looks like magic, so I reach out to check that Graham doesn't also have a pair of pigeons, and a magic wand up his sleeve!

The next trick is down to Bob. *"Look at the display"*, he says. *"That repeater wasn't there yesterday, it was set up here last night, for the show"*, as he presses an icon on the screen and toggles the PTT. And back comes a voice in reply. OK, time for a bit of an explanation I think.

So, What's it About?

I'm at the Friedrichshafen show, towards the end of my second day there. I missed Bob and Joe the previous day, as their stand is basically a wall with three posters behind two chairs and a table. An international crowd has now gathered, and the conversation is buzzing. *"How did you get the frequencies and tone information for the repeater"*, someone asks, in perfectly broken English. *"That's the magic"*, says Graham. You see Bob has a database. It contains all the frequencies and access tones for every repeater in the world. And it's updated from primary sources every night. You've no doubt heard of it. It's called the RFINDER WW Database. Bob has been selling subscriptions to access this database for some years now. Then he got the idea to manufacture a V/UHF handheld that would take the information in this database and automatically set up the frequencies in the radio. But rather than start with an actual existing radio and try to modify its operating system (an impossible task), he got the notion of programming a fairly obvious and easily available operating system – Android, on a smartphone. Brilliant! But it gets even better.

What Bob did was to manufacture his own smartphones, and during manufacture to put an RF chip in them! Now, using software he and his team wrote, when the thing is powered up, you just select the repeater you want to operate, push an icon on the screen, and then the PTT, and away you go. And it works very, very well. But I promised you more. As it's basically a computer, it can be programmed so that it can send and receive DMR signals as well, over the Brandmeister network of servers.

Now, you will recall the piece I did on digital radio some time back. I bought a cheap digital/analogue handheld, the Retevis RT3S, and got it working. But to do this, I needed to download software from the manufacturer's site, and create and modify the radio's settings – the codeplug. You have to understand that these digital radios use standards developed by ETSI for commercial users. We amateur operators have to be able to do as the suppliers of these radios do for their commercial customers. And there are those who understand the processes involved very well, and who are very helpful to the rest of us to get the right codeplug into these sets. Then, there are the rest of us.

The Joys of RFinder

But RFINDER has made all this effort rather redundant. Because the radio has access to the RFINDER DMR database too. This means that after setting up, and logging into the Brandmeister system, there are no more codeplugs needed. Ever. And I proved this in a hotel room in Dijon, 250 miles south of Paris, two days after I picked up my RFINDER radio. I powered it up, connected to WiFi (who ever heard of a V/UHF analogue radio needing a WiFi connection? But let's carry on), checked for updates, signed into Google (it's an Android phone after all!), and entered my DMR ID and Brandmeister password. It powers up connected to the RFINDER Talk Group, so I pressed the TG icon, and a numeric screen appeared. I entered 23276, the UK Hubnet Talk Group, and pressed the set icon. A few minutes later I heard QSOs on-going on Hubnet. When these were finished,

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Fig. 1: Your first QSO. Fig. 2: My local repater. Fig. 3: Just push and set. Fig. 4: List view. Fig. 5: Map view.

I pushed the PTT and sent my callsign. I was answered by **Garry MM6ZGS** in Airdrie. His audio stream to me was perfect, but he said that there were losses on my signal to him. This is a well-known problem with IP transport; it's called packet loss, and it's something we all live with, even using our mobile phones *("sorry, could you repeat that, you're breaking up?"*).

But ten minutes later I heard **Jan PA0MVP/M** calling for a radio check. I answered him, and we had a nice conversation, with no disruption from packet loss. So, straight out of the box, after entering a few pieces of personal data, the RFinder B1 is making and receiving DMR calls, no codeplug needed!! And how cool is that, I can't help but ask? And there's more!

One of the interesting features uses Google maps – yes, it's a smartphone! In RF mode, the handset uses the onboard GPS chip to find its location, and then interrogates the database for repeaters within 50 miles or so, and displays them on a map, or in a list if you prefer. Press the one you want to use, then SET, press the PTT and you get access to that repeater. And, at the risk of repetition, the database is updated daily. In fact, if you think about this (and I'm borrowing someone else's line here), the RFINDER B1 is actually a new radio every day, reprogrammed with the current frequencies, and access tones for every repeater in the world. Plus, all the currently active DMR Talk Groups.

What's in it?

Someone said something interesting at the end of my afternoon with Bob and Joe and Graham. Radio amateurs are not satisfied with using a piece of technology, but want to know in detail how the thing works. And how to hack it. Such as whether there might be other ways to upload the repeater database information? And what RF chip is it using? Or whether it could do D-STAR or Fusion. Honestly? *"But surely not all of us"*, I said. I could see the frustration on Bob's face, because these questions and more were routinely being asked. It's as if this level of performance just wasn't good enough, and we want to see the magician saw the assistant in half as well.

There are more than enough easily accessed tools on this radio to keep even the most technically minded of us busy and happy for quite a while. For example, it's a smartphone, so has a SIM card slot. Insert a cheap data SIM, and you don't even need WiFi access anymore. How's that for the ultimate in handheld radios? So, you're up a mountain peak, RFINDER B1 in hand. Light up all the repeaters around you, and get on DMR as well! *"Hello yes, I'm standing on top of* (insert your favourite hill), *looking at the lake in the valley below, It's a balmy –20° degrees and the snow is a brilliant white"*. And using DMR over IP, or through any one of the repeaters the RFINDER can see and which has a digital gateway attached, and you are literally telling the world where you are and what you are doing.

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The Technical Stuff

OK, you want the sawing in half trick. You want more technical stuff. It's a 2m/70cm handheld transceiver. Is it better or worse than any others currently on the market? Its operating range is quite wide: 136 to 174MHz, and 400 to 490MHz. Well for ease of programming, it's clearly better. Any repeater anywhere in the world at the push of a button. Audio is clean, 2 watts out through the onboard speaker, and my audio was reported similarly. There is a speaker/mic option, which uses a strange looking set of contacts on the side, but I can't see any way to add an earphone or a lapel mic. Oh, wait a minute, it's an Android smartphone, with Bluetooth! I'm off to the shops tomorrow for a Bluetooth earpiece/mic. I can't see why that won't work (see the note at the end of this piece). Is 4 watts RF output enough? Well, if it isn't, you can always add an amplifier. But isn't that the same for other handies, some with less output power than the RFINDER B1? Some reviewers have lamented the inability to scan through a list of repeaters to find activity. Yeah, that's true, but a feature to scan memories is in work, and will come with a future software update. And there is a promiscuous mode on the DMR side that listens to every TG, so that partly compensates I suppose. Memories? Bob says that there is an almost infinite set of memories, which can be organised into Zones or whatever else you want to call them. A UK one, a France one, a USA one maybe, or a Local and Not Local Zone? Who cares what you call them as long as you know what they are. And since I mentioned software updates, then I suppose this makes the RFINDER B1 an SDR as well!

The 5in screen display is a good as on any

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smartphone, but you are recommended to put a screen protector on it. I was given a free one, just for annoying Bob all afternoon! A nice to have, I think, is the little stub antenna Graham had on his. It just looks neater, and doesn't seem to matter for local repeater access. High on my shopping list is the relevant adapter to PL259, so that I can attach it to my rail-mounted 2m/70cm whip in the car. Batteries? I'm glad you asked. When last did you see a smartphone with exchangeable externally mounted batteries? If you run out of power chatting to the world up that hill, just swap in a spare. There are options such as slim and big here, but any two should be enough. They say it should run all day with even the smallest of the battery options. It comes with a drop-in charger, so while you're having fun with it with on one battery, the spare can be recharging in the charger. Or, and this is a new option on the RFINDER B1+ model (which is the one I have), just plug in a USB-C connection to recharge it. I haven't checked if it will run with the USB-C plugged in, with no battery attached, but I think I heard someone say it would (again, note at the end). The only other thing to note is that the volume control on the top; it clicks into each setting, so it won't accidentally get turned up or, worse, down.

And finally, when you are tired using it as I have described, recall that it's a smartphone. So, download Zello, or any of the other 'network radio' apps doing the rounds. The RFINDER B1 has a second PTT switch, below the RF one, which can be assigned to these Apps.

Other Matters

You should note that a subscription to the RFINDER WW database is required if you want daily updates from the RFINDER website (about $12 a year, or two cups of coffee!). Mine came with a 30-day free trial. Warranty is one year. But Bob is (if he will forgive me for revealing this) so committed to his brainchild, that I have read reports of him coming up on WhatsApp at unearthly hours to help iron out issues for his customers. And Graham's earlier model still looked pristine after six years, despite being in regular use while herding Aberdeen Angus cattle around the place.

Oh yes, it's not exactly inexpensive, currently at $1100 or so. But it's a lot of technology for that price – smartphone plus V/UHF handheld, plus no codeplugs too! Is it a convincing idea? Definitely! Does it do everything it says it will do straight out of the box? Yes (after initialisation with some essential user data). Would I recommend it? Certainly, especially if like me, programming codeplugs is the closest thing to having teeth drilled without Novocaine. In fact, the way it does DMR is a bit more intuitive than playing with codeplugs. You are basically logging into the Brandmeister set of IP servers across the world, as you would with any computer network.

Now this will raise a philosophical question in the minds of many amateur radio operators. If you think about what I just said, then this device could and does enable worldwide QSOs without the intervention of amateur radio RF anywhere along the path between the operators. Of course, if you access the DMR system through a repeater, then this last does not apply, since your access to that repeater requires RF, for which you need to be a licensed amateur operator. An interesting speculation indeed.

And under the same heading (philosophy), then let me say that there are multiple ways to get on DMR. Some of these approaches use an Android smartphone, or a computer and some software. However, these solutions don't include a V/UHF handheld radio option. So, if you add up the cost of getting set up on DMR and on V/UHF, then this will increase the total cost. Then there is the programming issue, be it entering repeater frequencies and tone access codes manually, or programming codeplugs. As in all walks of life, you can DIY a solution, or you can buy one ready and set to go.

But back to the RFINDER B1+. Any questions? OK hold that thought, Bob will be at Newark! I've told him that there are thousands of amateurs over here who hate codeplugs, and to bring supplies of his no-codeplug radio with him. The ten he had available in Friedrichshafen went in a day. I just about got the last one (and drove down across Switzerland to Milan to pick it up!). Oh, did I mention the belt clip? And the cameras (front and back)? And Bluetooth? Oh, of course, it's a smartphone, so you can use it as a phone too! Regrets? Yeah, that Friedrichshafen came near the end of my six-week Grand Tour of Europe's finest (Belgium, France, Switzerland, Austria, Germany, Italy, even Liechtenstein, this one for the first time!). Look at what my logbook would have had in it if I'd had the RFINDER B1+ with me throughout – all those initial country code prefixes in front of my callsign! Not to mention the fun of operating from some very exotic locations. My thanks to Bob, Joe and Graham for a very entertaining afternoon.

Notes

Yes, it did work with no battery and plugged into a USB-C power source, and I put a SIM card into it and took it out for a walk away from WiFi and it worked (4G or even 3G is fine). Less encouraging, the cheap Bluetooth headset didn't work, further research needed, which allows me to mention the active Facebook forum for the radio, wherein all manner of issues and ideas are discussed. Bob has frequently said that all users of RFINDER are basically part of the development team. Quote: *"If someone comes up with a good idea, and if that makes sense and is doable, it will be added to the work list for a future update"*. **PW**

Radio News

YOUR QSL CARD MEMORIES: Print historian Bob Richardson kindly sent in this advertisement from a 1930s issue of *PW*, together with a request for readers' photos and reminiscences of using Adana printing presses (or any other letterpress machines) to print their QSL cards in days gone by.
This year Adana celebrates its centenary and as well as appearing in *PW*'s Letters pages, it is hoped that anything sent in would also appear in the British Printing Society's *Small Printer* magazine (of which our designer, Mike Edwards is the editor) later this year when they plan to devote an issue to these once ubiquitous machines. Please send any correspondence to the editor of *PW*.

URESAT-1 UPDATE: (From *Southgate Amateur Radio News*) CubeSat URESAT-1 is a project of Spain's national amateur radio society URE and a blog about the satellite is available giving technical and status information. A translation of the URE post reads:
URESAT-1 is already a reality! It will be the first satellite of the Union of Spanish Radio Amateurs (URE).
In this project, URE and AMSAT EA are making a great effort that will give us greater technological visibility, a modern association and at the forefront of telecommunications for use and enjoyment of its partners and all amateur radio in general. URE, together with a great team of technicians and engineers, is hoping to launch the URESAT-1 satellite into space on a Space X Falcon 9 in January 2023. For more information, including many technical details, URE has also created a WordPress blog where the status of the project will be reported, including details of the functionalities and techniques:
https://uresat.ure.es

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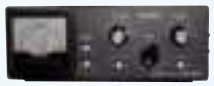

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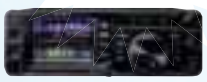

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1

Antennas Down!

Steve Telenius-Lowe PJ4DX returns home to find his antennas down, but has a full postbag as usual despite the summer downturn in band conditions.

Welcome to the September *HF Highlights*. There is typically a downturn in HF propagation during the summer months, particularly July and August, leading to this period sometimes being known as the 'summer doldrums'. This seems to be the case most years, no matter what the state of the solar flux or sunspot number. The good news is that by September propagation is usually improving again and, with the continued overall upward trend in solar activity, see **Table 1**, conditions on all the HF bands should be pretty good this autumn.

During this month the solar flux (SFI) peaked at 153 on 10 and 11 July and the sunspot number (SN) peaked as high as 152 on 18 June before falling to more normal levels again.

Black Beam Down!

My wife and I returned to Bonaire after a visit to the UK in May-June to find that while we had been away our Spiderbeam aluminium push-up mast, with the Spiderbeam 5-band beam on top, had toppled over, **Fig. 1**. The reason was immediately obvious: one of the iron guy stakes that had been hammered into the ground nearly nine years ago had completely rusted through and had snapped off at ground level.

With the beam now on its side it was easy to see the effect of almost nine years of exposure to the tropical sun on the black fibreglass spreaders of the beam. They had been bleached almost pure white on the top side that was exposed to the sun, whereas the underside of the beam was still black. As the UV damage could cause the fibreglass to split this seemed a good opportunity to do a complete renovation of the beam. For the present we are therefore restricted to using dipoles and wire ground plane antennas although I hope it won't be too long before the PJ4DX/PJ4EVA station is once again back at full strength.

PW's 90th Anniversary

Volume 1 Number 1 of *Practical Wireless* was dated September 24th, 1932. In those days UK amateur radio licences were being issued in the G2, G5 and G6 series, followed by two letters (the G3, G4 and G8 two-letter calls came along later in the 1930s). There were also G2 three-letter callsigns being issued, which were so-called 'Artificial Aerial' licences. These allowed the holder to build a transmitter but only to test it into a dummy load, although it was apparently quite impressive how far some of those dummy loads could radiate!

Early issues of *PW* did not really cater for the transmitting amateur, however. In those early days the term 'amateur' referred mainly to those who built receivers in order to listen to the long wave and medium wave broadcast stations that were starting to proliferate in the UK and around Europe. *PW* carried numerous advertisements for broadcast radio kits, 'condensers' (variable capacitors), valves and valve holders, coil formers and the like. **Fig. 2** shows an advert from the very first *PW* for a rather peculiar device called the 'FILT Percolative Earth', which cost the grand sum of two shillings and sixpence (or 12½p in the new money). According to the blurb, you *"Simply bury the copper receptacle containing the wonderful FILT chemical, which at once begins to spread through the earth, attracting moisture and making a PERMANENT highly conductive area to the depth of several feet. FILT keeps moist and highly conductive. It spreads like a tentacle, earthing your set perfectly and giving you every ounce of power, range and purity, no matter what set you use."* I do wonder, though, if it actually worked?

By 1932 transmitting amateurs had already been working DX for a decade on HF, those bands *"below 200 metres"* that were originally considered to be useless for long-distance communications. The first reception of transatlantic amateur signals took place as far back as December 1921 (see the April 2022 *HF Highlights*) and less than three years later world-wide amateur DX became a reality when **Cecil Goyder 2SZ** at Mill Hill School made a two-way contact with **Frank Bell 4AA** on the South Island of New Zealand. By the time that *PW* was first published working DX on HF was becoming almost commonplace and transmitting amateurs were already starting to count the number of countries they had contacted. In 1935 American amateur **Clinton B DeSoto W1CBD** wrote an article in the ARRL magazine *QST* entitled *'How to Count Countries Worked, A New DX Scoring System'* which led to the ARRL establishing the 'DX Century Club' (DXCC) – and the rest, as they say, is history.

Readers' News

"A disappointing start to June and the first airing of my GQ3JNB call" reports **Victor Brand G3JNB**. *"Propagation was almost non-existent due to solar activity. Early morning, the RBN showed no reports of my signals from anywhere at all! Later in the day, local EUs appeared and an EA9 obliged for my first QSO, the second being on 2m in the Shefford club's net. Not quite what we had in mind! Next morning, nothing. At teatime, the Cluster showed many stations on 6m but I noticed **XV1X** Vietnam was spot-*

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Fig. 1: I came back from a visit to UK to find my mast and Spiderbeam antenna had fallen over.
Fig. 2: Advert from PW Volume 1, Number 1, 90 years ago this month. Fig. 3: The ZQ2GI / ZQ2JK 10m Backpack at Spur Battery, Gibraltar.
Fig. 4: Roger G1VTK and Steve G7AHP operating the Riviera Amateur Radio Club;s special event station for Armed Forces Day. Fig. 5: The Friedrichshafen 'Messe', home of the biggest amateur radio get-together in Europe. Fig. 6: Well-known (and very active) Canadian operator Garry Hammond VE3XN in his Listowel, Ontario, shack.

ted on 17m. ***Eddy*** *was very weak and working a pile-up on split from his farm near Hanoi. I was astounded when he heard my 'NB' and responded, although he was initially confused by the 'Q'. My RST 499 but what a welcome change!*

"It all went quiet again until 2130UTC when it happened again! I could just hear ***ZP5KO*** *in Asunción, Paraguay, on 20m simplex. It was utter chaos! A keen CW operator,* ***Roa*** *finally caught my 'GQ', swung his rooftop beam and up came his signal to give me my contact. Next day..zilch. But on Saturday 4th at 0740UTC, I could just hear* ***Moz VK3CWB*** *on 20m 10,000 miles away in Victoria. He struggled but we made it. My report in the end 529! Better on the 6th when E2WRTC Thailand on 20m caught my initial evening call but he too had to check the GQ prefix.*

"FY5KE French Guiana was the only audible 10m CW signal on 10m mid-afternoon on the 11th. Weak but just workable and we made it. Having a 'tea-break' in the wee small hours, I just slipped into the shack for quick listen on 40m (as you do) and, apart from a few EUs chatting, I just sat listening to ***Rich KC3MIO*** *running QRP CW from Pennsylvania and* ***Gerald VE2ACP*** *in Quebec both absorbed in a splendid 'rag-chew', totally free of QRM, QRN or QSB. Compared to the hurly-burly of the DXing channels it was such a pleasure to hear.*

"Was the 'GQ' prefix successful? Yes, although most DX contacts seemed to do a 'double take' and needed a repeat to get it right."

Kevin Hewitt ZB2GI also took advantage of the special 'Q' prefix, saying: *"I operated as ZQ2GI on HF throughout June, to celebrate the Platinum Jubilee of Her Majesty Queen Elizabeth II, marking 70 years of loyal service. This month I operated at the Top of the Rock, from the club station and my home station."* Kevin added that he also operated from Spur Battery, **Fig. 3**, with **John ZB2JK**, where they used a 10m backpack containing a 'Superstar 3900' CB transceiver modified for 10m to a quarter-wave centre-loaded mobile whip, a coiled counterpoise wire and a 7Ah SLA battery.

Neil Clarke G0CAS submitted his usual 28MHz beacon report for the month of June: *"From the very start of June Sporadic E activity increased significantly from the previous month, with a large number of European beacons heard. The best day was the 11th when 36 beacons were logged...*

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Beacon activity remained high till the 27th except on the 13th and 14th when only eight and seven beacons were logged respectively. However, the 14th was the only day when beacons in North America were heard. The last three days of the month the number of beacons logged declined significantly. For example, only five were heard on the 29th. During the evening of the 6th a seldom-heard beacon was logged: LA6TEN 28282, which is located in KP59AQ in northern Norway, well above the Arctic Circle. The beacon is only running 10W to a ground plane. ED4YAK was heard on 27 days of the month making it the most heard beacon in June, followed closely by IZ8RZA 28240 on 26 days. No inter-G or very short skip beacons were heard from SW England." Neil added that on the 28200 world-wide beacon network, where 18 beacons share the frequency and transmit for 10 seconds in turn, equating to a three-minute cycle, 4X6TU was heard on 21 days, LU4AA on 16 days, VK6RBP was logged on the 12th and 19th and RR9O just once, also on the 12th. *"PY4MAB 28270 continues to be a good indicator for propagation to South America and was heard on 18 days."*

Steph Foster G4XKH of the Riviera Amateur Radio Club in Torbay sent in a photo (**Fig. 4**) of the group's activity for Armed Forces Day on 27 June.

Etienne Vrebos OS8D had what he described as *"A poor month of radio activities. I didn't really take time to 'talk' this month, being busy with a lot of other important things... I don't believe I sent you once before such poor results, please apologies."* In fact, Etienne says he made 125 QSOs during the month, but mainly with European stations. Those DX stations he worked are shown in 'Around the Bands' below.

Reg Williams G0OOF admits that *"It has been a little while since sending a report. Busy times during the summer such as keeping the garden together and some breaks away. I do manage,*

	Jul '22	Jan '22	Jul '21	Difference
SFI:	153	99	72	(+81)
SN:	113	38	24	(+89)

Table 1: Solar Flux Index and Sunspot Numbers on 11th of the month: this month, six months ago and one year ago. The final column shows the difference between now and the same time last year.

though, most days to get on the radio early in the mornings and late in the evening, usually in FT8 mode. I find DX on various bands is really good, especially in the mornings. One instance was 18.100MHz FT8 when I was surprised that the band was open to Hawaii at 0730, where I worked two stations within minutes of each other. A couple of propagation guides I used did not show a suitable path for that band to that part of the world at that time. Using WSJT-X FT8/FT4 it is easy to check very quickly what bands are open, due to the activity that may be seen. 14MHz and 21MHz have been open very late into the evening on some days throughout the month, especially to North and South America, which suits me fine for more grids and counties. There are friends who live in Tennessee so I set a personal challenge to work all 95 counties on FT8. To date the count is at 35 from when I started about two years ago. Just to work the stations will be enough without requiring confirmation. I did try to work the 3D2RRR [Rotuma Island – ***Ed****] DXpedition during the month, but with no success: I found it hard to follow them and understand their strategy. Generally, some nice stations were worked during the month on FT8. Still not many stations worked using SSB, but hopefully that will change with improving conditions."*

PW's VHF columnist, **Tim Kirby GW4VXE**, wrote: *"With 50MHz being so busy over the last few weeks, HF operation here has been fairly minimal.*

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I've had the HF rig running, mostly on 40m, while other things are happening. I've enjoyed working a good number of portable stations, mostly on CW, many of them taking part in the WWFF programme (which I don't know very much about). It was also fun working K2H on 10m CW the other afternoon, in what I assume was a multi-hop Es opening. Earlier on in the month, it was enjoyable making some QSOs with the GB70E station at Windsor Great Park, with happy memories of my participation in the GB50 station at Windsor Castle, 20 years ago. I was also really pleased to find GB70W on air and heard GB70U, although did not manage to make a QSO."

Owen Williams G0PHY reported that *"Most DX activity this month involved operating in the RAC Canada contest on 1 July and trying to work a few of the 13 Colonies special event stations around 4 July, with a few tasty titbits thrown in for good measure. A very early start in the Canada contest had stations from Saskatchewan, Manitoba and Alberta in the log. Conditions in this year's contest were much better than last year with more contacts although I was disappointed not to hear any stations from British Columbia. I had contacts with both 8R1AK/P and 7Q5RU on 14MHz. These were interesting contacts as both took place 24 hours after hearing them working big pile-ups, yet when I worked them they were both not busy at all. Sometimes it pays to be patient. Although not DX, I had a QSO with PH9HB/AM in a Boeing 737 over the Bay of Biscay and a QSO with Z62FD operating remotely from his laptop from Friedrichshafen while at the HAM RADIO exhibition* (**Fig. 5**)."

The HAM RADIO exhibition at Friedrichshafen in southern Germany took place this year from 24 to 26 June after being cancelled due to coronavirus in 2020 and 2021 (although 2021 was held as a 'virtual event'). Next year's dates have already been announced as 23 to 25 June 2023 – put a note in your diary now!

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Around the Bands

Kevin ZQ2GI/ZB2GI: 7MHz FT8: CT3MD, GQ0KPH/70, N1UL/2. **10MHz FT8:** 4Z5JO, AB1HL, K8TE, KN4NOK, PY7ZZ, W7PC. **14MHz SSB:** AA4BC, JE8AGX, JY4CH, K4ZLE, KB2KOP, KE3LB, N1RYH, N2NVH, N6AR, N8XX, ND7J, PP5RP, PY2MH, PY6HD, PY7BC, VA2ZE, VX1BB, WP4KP. **14MHz FT8:** AB1HL, CT3HU, HK3J, K0AP, KA9WAR, KD2T, N0FW, N1UL/3, PY7ZZ, V31DL, VA3FF, W2PJ, W3PT, ZR6CV. **18MHz FT8:** AB1HL, CT3IQ, JR3IIR, K2TY, K4EM, KC7V, N3VA, PY5XT, VE3EYS, W9AI, YV4BCD. **21MHz SSB:** 6Y5HM, AA1VX, AD3I, FJ/K2LIQ, K2RSK, K3EWZ, K5UR, KN4IRM, KP4PUA, PY5PLL, VE3TV, VX9RK, WR4N. **21MHz FT8:** 9K2YD, AD8RL, AI4FR, HI3CMQ, HJ3SUA, JS2IWW, KA3MFN, KB2ELA, KP4HF, N1UL, V31DL, VA3WLD, W9YSX. **24MHz SSB:** MQ0GOR. **24MHz FT8:** AB1HL, HC1BI, HK3W, K2TQC, K4CMS, K9KMD, PU2OIP, PU4PAF, WS5W, YB1RUS, YV4BCD. **28MHz SSB:** GQ1OVK, MQ0IQD. **28MHz FT8:** 6Y5HN, A41ZZ, BH8OCW, CX1VH, CX5ABM, HK3W, HS0ZOQ, LU8EX, LW4EAZ, PR7JL, PU2TRH, PU4JLV, PY5EG, VU2PTT, YB9OBQ, YC9LAG, YG9PBV, YV5DRN, ZP6LMR.

Etienne OS8D: 14MHz SSB: 4L4KR/P, UK8OCU, VU2CPL. **21MHz SSB:** VP8GGM, YC2DBW.

Reg G0OOF 10MHz FT8: 4X1UF, 6Y5HN, K8TLC, PU2TWZ, ZS6OB. **14MHz FT8:** 3X1A, BD3MN, VP2EIH, WB6UNG. **18MHz FT8:** 9K2OW, NH6JC, K2GT, VP2EIH. **21MHz FT8:** 9K2BM, OD5ZZ, KP2B, TF3VS, YD2ULK.

Owen G0PHY: 14MHz SSB: 7Q5RU, 8R1AK/P, K2L, K2F, K2D, K2E, K2K, KP2BH, KD0S, VA2RAC, VE3XN (**Fig. 6**), VE4YH, VE5CPU, VA6DJ, VE9FI, ZY8AM (DXpedtion to Amazon Rainforest).

Signing Off

Thanks to all contributors. Please send all input for this column to teleniuslowe@gmail.com by the 11th of each month. Photographs of your shack, antennas, or other activity would be particularly welcome. For the November issue the deadline is 11 September. 73, Steve PJ4DX. **PW**

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Friedrichshafen, Another Perspective

To supplement last month's report on the Ham Radio event in Friedrichshafen, we have a very personal take from our much-missed Small Station columnist **Joe Chester M1MWD.**

Who among you has not been to Friedrichshafen? This is not a trick question. At least in the sense that there is probably a sensible answer. So let me ask again, but in a slightly different manner. Who's been to Friedrichshafen for a family holiday, then slipped off to catch an early morning ferry? *"Be back by lunchtime"*, sort of thing, and *"no, I've left the credit card on the table for you"*. Yep, heard it all recently in the vast halls of amateur airwaves. Some of it may even be true. But, for those daunted by the trip (this year anyway) let me give you the highlights, and the odd lowlight as well, just for company.

It's big. And that multi-use facility they have over there is first class. And the economic benefits to the region are incalculable. My friend **Vincent** was pacing the seafront one evening, raging at the dying light, and the rain shower which had kept people away from his restaurant that evening. When he calmed down (a few whiskeys later, thanks Vincent!), he spoke to his senior staff, in tones of dire dread, *"We will just have to work twice as hard tomorrow night to make up"*, he said. Literally, the loss of a few nights during an event up in Messe is live or die for these good people. And don't mention losing a whole event, or the last two years.

So, have you been to Friedrichshafen? And if not, why not? These are good people, and they depend on you for their livelihood. And is the show worth the effort? Definitely. And the place is a tourist paradise too. So, into the diary. You are going next year, whatever happens.

Radio Stuff

Radio stuff? Where do I start? All the big names have huge stands, well all except one (more on this later). And there is a huge bring and buy. And stands for amateur radio clubs from far and wide. And a buildathon, and the RSGB's bookshop, and the ARRL, and DARC, and ITU. So, if you want to get something off your chest, there are loads of people to talk with. As a particular, I had a long chat with the ITU folk about the xDSL interference problem. Not that there was much daylight afterwards, but I had the chance to vent a bit of frustration at how it all works (or doesn't in this case).

And in case no one else mentions it, there were chairs everywhere, for the old, the tired, the meeting, the chat, for lunch. But then it's big, that hall, maybe four times that of Newark? So, to the details.

My (I wish!) K4 sat proud on the Elecraft stand, manned by their German distributors. Lovely. But not for me at the minute. Icom's stand was huge, with examples of the whole product range powered up and working. I played around a bit, but my heart wasn't really in it, after I left the K4 alone. One slight negative was that no one thought to bring a few brochures in English. Tut tut, Mr Icom. There was no stand from Yaesu. I was told that the decision to go ahead with the show came late, and they had no staff available. Tut tut again!

The biggest stand was DARC (the German national Society) or rather stands, as there were 12 stands altogether, manned by very enthusiastic if understandably nationally focused volunteers. The most exotic? For me, it had to be the large stand from the Amateur Radio Society of Qatar (I'm not going to try to write that in their language!). But it generated a bit of conversation in the group around me. The question? Who had worked the King. You know who I mean. Hilarious!

The 'most fun' award had to go to **Ivan 9A2ZI**. He was using a PC running RemoteHam to operate a remote station in Croatia, calling 9A22YOTA. He was achieving what I suspect was very near the maximum SSB QSO rate achievable by a single operator for hour after hour. If there was a contest, then surely he would have won it! However, given that this was an amateur radio event, I thought that there should be more stations actually on-air showing what amateur radio was all about. Maybe there were a few /P in the camper van park, but it always seems a shame at these large-scale events that we don't make an effort to get a few more stations on air (maybe Newark please note?).

But back to Ivan, Or rather his friend **Marija, 9A6PAX**. As I was watching the QSOs mounting up (he was working a UK station at the time), my attention was drawn to the large stand from the Croatian YOTA group. Marija is the Assistant to the Secretary of the Croatian Amateur Radio Association. What a title! I joked *"so you run the Association"*, to discover that it wasn't quite a joke. She's a historian, by profession, so the next question was obvious. She puts it this way, as nearly as I can decipher my notes; she is very interested in opportunities for young people, and looking around found a radio club in Zagreb. So, she got the idea to ask them to help train young people to pass the radio exam. A year later, 40 students had qualified, one of them Ivan. And somehow this got her a job with the Association, promoting STEM activities. I'm not going to tell the story of the job interview, ask her about it when you meet her (and you will!), but it was hilarious! I know STEM is big in the UK and Ireland too, but I do wonder if the RSGB would be interested in this approach, ie a dedicated STEM/YOTA 'assistant'?

And speaking of club stands, the whole of one end of the great hall seemed to be occupied by DX club stands. What exactly do DX clubs get from an

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Photo 1: The Qatar Radio Society stand.
Photo 2: The crowd in the club area.
Photo 3: Ivan operating remotely.
Photo 4: New loop antenna from Ciro Mazzoni – not for /P! Photo 5: The QSL wall.

event like this? I asked one volunteer, and he told me the story of Bouvet Island, and the $400k which a Californian DX club had donated to this expedition. So, these guys were basically recruiting members to help front up the cost of DXpeditions. I wish I had known this, for I could have asked them to pay the train fare for my recent ascent of the Roches de Nayes! (see story on page 14)

OtherStuff

What else? I am not going to talk about **Bob Greenberg W2CYK**. He cost me an entire afternoon, and a few dollars too! There is a whole piece about him somewhere else! (see page 16) A shout out to the BARC, The Ballooning Amateur Radio Club from Ireland! Well done guys! I sent a few minutes slavering at the Hiberling station, but not for me, even in my dreams. A new loop antenna caught my attention, quite weird looking thing, from Ciro Mazzoni, but hardly /P! And a whole stand given over to Yagis, for every band imaginable. Oh yes, that homebrew satellite tracking setup from HB9ARK. That would work out portable. Hmmm! Did I mention contesters? The World Amateur Radio Contesting Association wasn't attracting much interest– which says all I want to say about contesting (sorry guys!).

The usual bring and buy/sell, or flea market. Yeah lots of boxes of bits, but I left the construction business after my crystal set and never looked back. Someone said, over a coffee in the atrium, that there didn't seem to be as many Russian operators selling stuff as in previous years. Pass. But the most frequently heard comment was that the whole event didn't seem as busy as in previous times. My favourite image is of the QSL Wall. Dare we hope that the two young people standing there are actually future radio amateurs? I do hope so (with thanks to mam and dad for their help with the photograph).

Personally, there is one major gripe but it's the same at all these industry fairs. A huge effort by the whole amateur radio community to engineer a setting where we all end up talking to each other. And why is that a negative? The UK has fewer than 100,000 radio amateurs (I am reliably informed), out of a population of 60 million plus. We really must do more, much, much more to interest others in joining us, and having a bit of fun. And we also must do more to 'entertain' the family members who make these trips with us. Which brings me back to my intro. You see this is exactly what Friedrichshaven does, it's a holiday playground for families, while the amateur radio operator is off chatting with his mates. QED.

With special thanks to the President, and the General Manager of the RSGB for the chat, and to **Mark** for personal encouragement, and to Mark's darling wife for the endless cups of tea she made me over the few days. How's that for a bit of name dropping!

And yes Marija, I will be coming to Croatia, as promised! **PW**

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Moving Home and a Fresh Start with Amateur Radio (Pt II)

Richard White G6NFE continues his odyssey to get back on the air after a house move.

For those who read Part 1, I left the brand new amateur radio installation with the ESD protection consisting of Diamond and Array Solutions surge suppressors, mounted in a waterproof box on the outside of the house. It was the end of March, rain and storms had stopped play and it wasn't really the environment for building out the antenna mast, rotator, cabling and additional ESD protection. It's now coming up to the middle of May and things have progressed (in most areas!).

I'm a big fan of testing systems stage-by-stage so there are no nasty surprises at the end when components are hooked up and you discover things don't work quite as planned. Been there, done that; not happening anymore if I can avoid it.

So, before I went any further, I really needed to know if the Baby Loop had survived the trip in the removals lorry from Kent to Shropshire. I had gone to great lengths to explain to the moving crew that this giant contraption under the tarpaulin was actually extremely delicate so could they help by not crushing or dropping it? To their credit, they were true to their word and the Baby Loop appeared unscathed once unwrapped. First hurdle over with. Second hurdle: Would it still tune up?

With my shiny, horrible 'radio thing' sitting on its test stand (thank you Lidl for that bicycle test stand I bought on a whim five years ago; indispensable, but has never seen a bicycle in its life!) it was time for the moment of truth, **Photo 1**.

Creating the Stealth Station

Some coax and three-core mains cable was run across the garden and through the conservatory and very carefully 'temporarily hidden' behind the sofas. My theory is that the less radio equipment seen in the house, the happier the partner! With a carefully negotiated test slot agreed for use of the dining room table, the Yaesu FT-450 was connected to a power supply and the Baby Loop remote control box. Finally, I hooked up my Monitor Sensors SWR/PWR meter and an RF choke for good measure. It would be interesting to see if the indicated SWR on the Baby Loop controller matched that shown on the Monitor Sensors instrument.

With fingers crossed power was applied and the Baby Loop tuned up on the 40m band with an SWR of 1.7 according to its own controller**.** Further testing gave an SWR of 1.1 on 20m, **Photo 2**, then an SWR of 1.2 was seen again on 40m, **Photo 3.** Interestingly in most cases, the Baby Loop controller showed a higher SWR than the Monitor Sensors device. All of these tests were with the loop on its test stand with the top at approximately 2.5m AGL. So far, so good. Then strange things started happening with odd, unrepeatable results occurring at random. Eventually I traced this to a poor connection on one end of the RF choke and with the choke taken out of circuit things became more consistent. That said, although the situation had improved, I was still seeing occasional odd, non-consistent results when toggling back and forth between the bands. At this stage I couldn't get to the bottom of this and found that powering down the loop controller and re-powering it stabilised things. Some research seems to suggest I haven't been the first person to come across this with the Baby Loop.

More Testing

Over the next few days further testing showed that the loop tuning had settled into a pretty reliable state albeit with the occasional, inexplicable (at the time) wobble.

At this point I was aware of the minimum and maximum height above ground markings on the Baby Loop, but thought it was probably more important that it was not adjacent to any metal or buildings. It turned out that Ciro-Mazzoni have put this label on the antenna for a good reason – more about this later!

Happy that I was mostly getting consistent tuning results I took the time to listen around and was astounded one afternoon to hear an operator in Bogota talking to another radio amateur in Indonesia. The copy was absolutely 59 both ways and easily copied for a long time. This is the type of QSO I never heard at the old QTH using a long wire antenna or the MFJ-1788. An improvement in sunspot activity, the capability of the Baby Loop, the new QTH, or all these things? Probably all three I decided.

OK, now for the next steps. Baby Loop integrity seemed largely intact; time now for a quick rotator test. Yaesu's instructions for the G450 rotator are clear and it worked first time when tested. No problems here.

With two boxes ticked, I could now think about fitting the Baby Loop, rotator, RF choke and cable to the mast. With an alarming disregard for health and safety, my first attempt at building out the

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Photo 1: The loop on its stand. Photo 2: 20m SWR. Photo 3: New 40m SWR. Photo 4: How not to do it! Photos 5 and 6: Carefully laid between two workbenches. Photo 7: The loop in position. Photo 8: Switching relay in controller box.

mast involved two council wheelie bins, some rope, a Black & Decker workmate and a plant pot! See **Photo 4**, how not to do it. It was quickly obvious that due to the weight of the Baby Loop this was a recipe for disaster and this plan was abandoned.

Finally, inspiration came and I decided to build the mast up with it supported horizontally between two work benches, taking extreme care not to damage the loop, **Photos 5** and **6**.

It's funny how ideas sometimes come in bursts and this build was no exception. As I fitted the rotator a couple of thoughts crossed my mind. First thought; is that mounting pole going to overstress the bearings of the rotator when the wind gets up? I thought it might, so it was cut back by 25cm. This clearly isn't very scientific, but I was happier after trimming it. Only time will tell here.

The second idea concerned earthing the main aluminium mounting mast and at the same time providing a really good earth to drain away static charges from the loop itself. In Part 1, I already mentioned not having total faith in the horizontal copper water pipe I had fitted, so I thought that as I was going to install a very long earth rod next to the mast, I might as well make best use of it. Back to Array Solutions and this time a surge arrestor, the Array Solutions AS-303 was fitted into a waterproof box along with the rotator and tuning control connectors.

Lastly, a common-mode choke was fitted at the antenna feedpoint, all cables were protected in flexible conduit and joints were waterproofed. As it turned out, this was the relatively easy part!

In my mind, I had visualised a really easy way of mounting the whole built-out mast onto the ground socket. It would be a breeze; with four strong adults, heavy duty nylon rope and a pair of steps, what could possibly go wrong?

Well, once again the power of visualisation hadn't fully prepared me for the reality of moving a very top heavy, 4m+ long assembly upright. Between us we did it. Just. We were on the very limits of what is possible, I think, but eventually the mast dropped into the ground socket with a reassuring 'thunk'. After aligning the Baby Loop to a 'parked' position facing north, the jointing sleeve bolts were tightened up and all electrical connections were made, **Photo 7**.

All Change – Take a Deep Breath

And here is where things changed. Remember what I said earlier about the mostly consistent SWR and tuning results when the Baby Loop was on its test stand? Well, checking the tuning with the Baby Loop in its final position showed that the SWR had changed and not for the better.

The point is, nothing I read anywhere, said the loop had to be a maximum distance above ground level although the label on the loop does show a maximum height of 2.5m AGL. My baby Loop is 3.4m AGL. What I couldn't find written anywhere is why 2.5m maximum height, is recommended. There is information about minimum height and information about the effect of nearby metal structures and other structures. Other texts and articles about vertical loop antennas seem to imply that, in fact, they should be at such a height that they clear nearby obstructions for best coverage, with additional height offering no advantages. This makes sense and in my case that is exactly what I did.

Strangely, I didn't experience these problems with my MFJ-1788 when it was mounted horizontally at roof apex height at the old house. In this position it was actually within a metre or so of the concrete roof tiles and it had no detuning issues.

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There must be something very particular about the way a vertical magnetic loop antenna couples to the ground beneath it. My Baby Loop is in the clear, above fence panels and is less than 1m higher than the attached label recommends. Can it really be that picky about another 0.9m above ground?

The time had come to take a deep breath, stay calm and review everything I had observed so far, everything I had noted that affected SWR performance, then start some serious research on Baby Loop installation.

At the back of my mind I had memories of a July 2019 *RadCom* review of the Ciro-Mazzoni Baby Loop antenna by **Adrian Ryan 5B4AIY/G3VJN**. Something interesting Adrian discovered was that the Baby Loop controller required a completely flat feedline when measured with a TDR network analyser. In essence, the controller in the shack does not want to see any 'discontinuities' in the coaxial feedline. Adrian discovered that connecting two lengths of coax together with an SO-239 joiner had done just this!

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The net result of these discontinuities was that reliable tuning of the antenna became inconsistent. This was exactly what I was seeing earlier and my suspicions were now piqued.

Adrian concluded that the Baby Loop required one continuous run of coaxial cable, but was this going to be incompatible with my ESD protection, the RF choke and the coax patch panel I intended to fit in the new shack? The first thing to try was replacing the cheap RG-58 test cable (with BNC to PL-259 adapters), with a decent length of RG-213 with good quality PL-259 plugs. This might reduce some of the tuning and SWR inconsistency I was now seeing.

The following expression sums up exactly where I was at this moment:

(going) *down the rabbit hole Used for referring to a situation that is strange, confusing, or illogical and often hard to escape from [1]*

Changing the coaxial cable out from the iffy RG-58 really helped and I was starting to see an improvement in tuning results. Then odd things started happening again; the Baby Loop controller would show an SWR of 1.4 but the FT-450 and the Monitor Sensors instrument would indicate an SWR of 4.5, with the associated loud complaints from the rig. What on earth was going on?

My immediate thought was the switching relay in the controller, **Photo 8**, but looking at RS components, a suitable replacement was £86 for a box of 20. That wasn't going to happen.

However, examining the relay wiring showed really good build quality and excellent soldering, with nothing externally obvious that could cause the problem. Electrically it appeared fine when checked with the DMM too.

This got me thinking though. I thought it left three possibilities; either (a) the relay, although appearing sealed, might have dirty contacts that were causing intermittent high SWR, (b) the coax cable from the transceiver was faulty or (c) the SO-239 sockets were dirty.

Changing out the coaxial jumper from the transceiver to the controller made no difference. Dirty SO-239s possibly? Cleaning the insides of the SO-239s proved that yes, they were positively filthy. For good measure I also cleaned the threads too.

The moment of truth. Could it be as simple as filthy RF connectors? I reconnected the Baby Loop controller and hooray, the problem went away. It

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is entirely possible that the dirty connectors were masking relay problems, but for now I have a reliable Baby Loop with reliable tuning. If it turns out in future a new relay is required, then I'll just have to change it.

For anyone who is thinking carefully about operating on HF and trying to reduce the visual impact of antennas, I would definitely recommend the Baby Loop providing you consider the points I have noted. This is a precision piece of engineering and requires some thought and care when installing.

Lessons Learned

Looking back on things now, there are a few lessons here I think:

Adrian Ryan 5B4AIY/G3VJN is definitely right about coaxial feedline continuity with the Baby Loop. The fewer connections, the better.

The Baby Loop controller seems to be extremely sensitive to dirty/contaminated RF connectors.

Moving the Baby Loop just 0.9m above the recommended maximum height above ground appears to increase SWR.

With the benefit of hindsight, I would not have fitted the separate RF choke at the antenna feedpoint under the loop. Instead, I'd have used clip-on ferrite beads on the feedline coax and reduced the connector count by two.

I won't now be terminating the feedline on the shack patch panel. It will go straight into the Baby Loop controller.

On a happy note, I celebrated success with a solid QSO with LZ2KV while heavy rain engulfed the Baby Loop. During this time the antenna behaved perfectly, with a low SWR and a strong 59 received signal at my end. It looks as if I am out of the rabbit hole for the time being!

Part 3 will cover off finally getting the cables into the shack area, re-installing the radio equipment currently in storage and then re-testing. If time and money allow, I'd also like to look at installing a 2m and 70cm Halo antenna for SSB capability, then reinstate my HyEndfed long wire antenna for 10/20/40. **PW**

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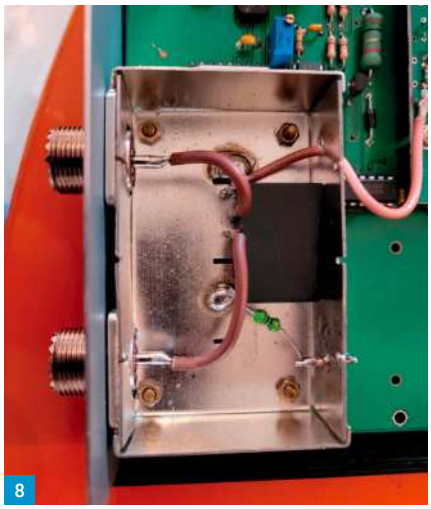

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Recommended Reading

Recommended reading for those interested in Magnetic Loop antennas:

- July 2019 *RadCom* review of the Ciro-Mazzoni Baby Loop antenna by Adrian Ryan 5B4AIY/G3VJN.
- June 2017 *RadCom* article: 'Safety distances for Magnetic Loop antennas', Dr Peter DeNeef, AE7PD.
- 'An overview of the underestimated Magnetic Loop HF antenna' written by Leigh Turner VK5KLT. Latest version, October 2015. This is an excellent paper that makes for interesting reading and dispels some of the prejudices surrounding HF Magnetic Loop performance.

Citations

- [1] From the MacMillan dictionary at: **www.macmillandictionary.com**

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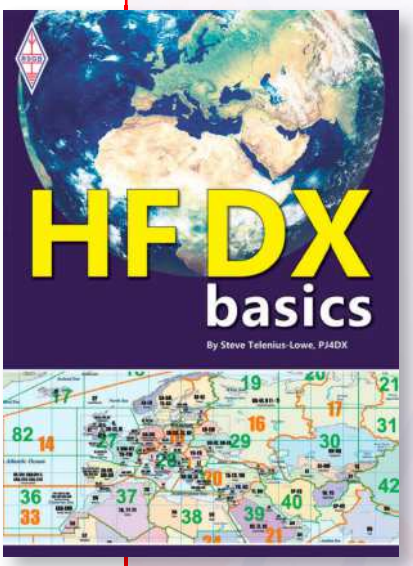
Happy 90th Birthday to PRACTICAL WIRELESS

HF DX Basics

By Steve Telenius-Lowe, PJ4DX

Will sunspot cycle 25 be one of the strongest on record?



One thing that is certain is that when propagation improves, contacting far flung parts of the world (DX) on the High Frequency bands (HF) becomes easier and much more of a pleasure. It remains one of the enduring fascinations of amateur radio.

HF DX Basics provides a practical guide to making the most of this endlessly fascinating area of operation. Many are put off by the challenges of DX operation but well-known author and DXer Steve Telenius-Lowe, PJ4DX dispels the myths about huge antennas and high power in an easy-to-understand way. Based on Steve's previous book *HF SSB DX Basics* this book provides a guide to what DX is all about and you are led through to the opportunities the HF bands provide and much more. *HF DX Basics* has been revised to bring it fully up-to-date and much new material about FT8 operating as well as details of operating in the 1.8, 5, 10 and 50MHz bands has been added.

As you would expect you will find a practical guide to what antennas make good choices in your location, choosing your transceiver including what the myriad of buttons on a modern transceiver do. There is a guide to the HF bands you can operate, their propagation characteristics and what to expect from them. Steve also provides practical advice on how to avoid pitfalls when operating on the bands and much more including handling pile-ups, split working, QRP operation, QSLs and even being DX yourself. So, give HF DXing a try and allow the DX 'bug' to bite!

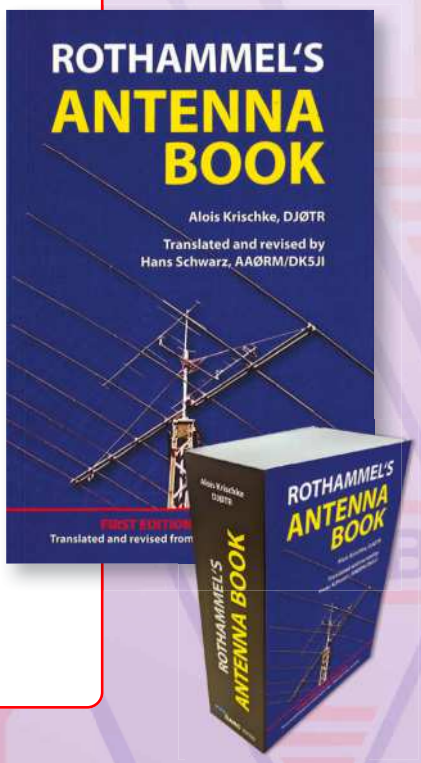
Also available amazon kindle

Size: 174 x 240mm, 144 pages ISBN: 9781 9139 9522 5
Non Member: £11.99, RSGB Member: £9.99

Rothammel's Antenna Book

By Karl Rothammel, DM2ABK and Alois Krischke, DJ0TR

The Best Amateur Radio Antenna book - ever?



There are many Germans who would say that this book is the 'Antenna Bible' that surpasses all other antenna books. Now translated into English after numerous German language editions this is a truly comprehensive book covering in 1600 pages the theory and building of antennas.

Rothammel's Antenna Book was first published in the fifties and has developed into a comprehensive reference book for practical use. Designed to be a comprehensible read, theory is deliberately simplified, but you will find masses of detail on building, such that readers without any special technical training are able to reproduce the described antennas. In over 40 chapters readers will find 100s of pages of antenna designs from the simple dipoles, broadband antennas, magnetic loops, arrays, verticals, directional HF beams and many, many more. The author lists 22 broad categories for antennas and then breaks this into chapters of types of antenna designs with all described in terms of their best use and real-world applications. Transmission lines, Matching, Baluns, EMC, EMFE, Testing and measurements are not forgotten and are also covered. This book is simply a comprehensive guide to amateur radio antennas and beyond. With over 1600 pictures and 268 tables *Rothammel's Antenna Book*, is also lavishly illustrated.

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Non Member: £52.99, RSGB Member: £44.99

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Tim Kirby GW4VXE
Longworthtim@gmail.com

A Look Back

On our 90th anniversary, **Tim Kirby GW4VXE** looks back at VHF coverage in the magazine and how things have changed.

It's good to be writing this column every month, but particularly so in this *PW* 90th anniversary issue. **Don G3XTT** asked me to try and reflect on the changes in operation over the 90 years of *PW*. So, this month, rather than the usual mix, I've tried to reflect the changing world of VHF/UHF through the 90 years that *PW* has been published.

I'm sure many of you will be aware of the wonderful historical archive of radio magazines at: **http://worldradiohistory.com**

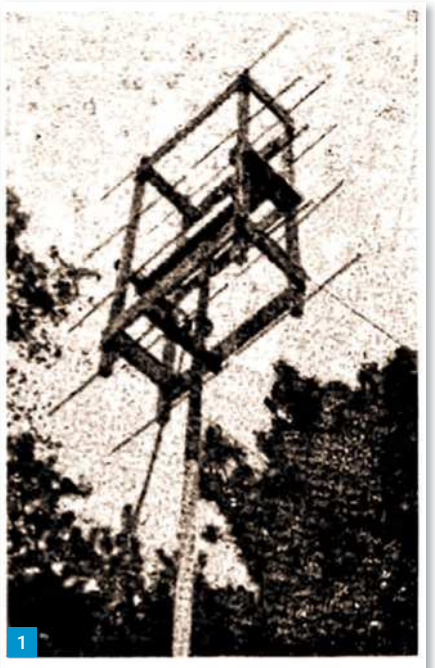
This includes many vintage *PW* issues. I started looking through and to my surprise, I found very little coverage of VHF/UHF in the early issues. There was some mention of VHF FM listening, some doubt as to whether stereophonic reception would catch on (it's a gimmick, surely) but until the early 1980s, there was very little regular VHF coverage in the magazine. **Ron Ham** was the first writer I remember on VHF matters, then **Norman Fitch, G3FPK** and **Dave Butler G4ASR** followed by myself. It's an age thing, but the 1980s seems like yesterday, so I really wanted to go back further to try and reflect the changes on the VHF/UHF bands.

To do this, I had to go back to *Short Wave Magazine (SWM)*. Pre-war, there is relatively little VHF coverage, although I did find some notes on the Five Metre band in September 1939 that 'On 4 August, at 1729 BST G6YL heard what she had to enter in the log as 'W5?PB or W4?PB' as the signal came and went in a few seconds on her 1-v-1, QSB being R5-0'. The report goes onto say that 17 August was a good day for **Miss Dunn**, as she received a number of European commercial harmonics and that it was clear that amateur working would have been possible.

Post-WWII

From the end of World War II, *Short Wave Magazine* had excellent coverage of VHF/UHF matters. Immediately post war, the majority of VHF coverage was given over to the Five Metre band (56MHz). It's clear that there was very considerable intra-UK operation on 'Five' with many reports. The May 1946 issue of *SWM* contains a 'Five Metre' column which commences with news that *'G5BY/G6CW establish 233 mile inter-G record, G5MQ/G6VX/G6YQ receive over 184 mile path'*. The initial operation on Five was primarily on CW, but this report in 1946 is delighted to report that many of these contacts were on phone (this was AM, of course!).

The opening words of the September 1948 column of the *'VHF Bands'* column in *SWM* record *'by the time these notes reach you, the first contacts on 145mc will doubtless have been made and a fresh field for Amateur Radio achievement will have been opened'*. It is fascinating to read the VHF columns through the months and years of the late 1940s and early 1950s, reading of the early activity on 2m. The Five Metre band was withdrawn from amateur use at the end of March 1949 and it's clear that amateurs were very sad to have lost the band.



G2WS has a neat 16-element beam, cut for 436 mc, at his /A location at Crowborough, Sussex, and is obtaining good 70 cm. contacts at very satisfying distances

However, things were progressing higher up the spectrum and by September 1949, *SWM* was reporting that there was a new DX record on 2m, with G3BLP in Surrey having worked GM3OL in Dumfries over a path of 296 miles. The same issue reports that contacts were starting to be made on the 70cm band, with G2FKZ/P having worked G3BEX/P over a distance of 38 miles. Even higher up the bands, G8RS from Reading is mentioned as being active on 10,000mc (10GHz!) with a 14 inch dish and a 725A/B klystron.

I spoke with **Roger Ward GW5NF**, whose father, **Leon Ward G5NF** was very active from Farnham in Hampshire on the VHF bands. On 2m in the early days from around 1948, Leon used a modified SCR522 transmitter and on receive, a German Telefunken receiver, with a converter. Leon started off with a home-made 4-element beam on a wooden pole but progressed to a 16-element (two groups of eight elements) collinear array mounted on a wooden frame. Roger says it weighed a ton to push it up! There was also a slot-fed Yagi for 2m and when Leon finally used a commercial Yagi, it was an 8-element Jaybeam. Roger remembers the majority of contacts being on CW and that the AM that was used was of quite variable quality – carbon microphones not always providing the greatest quality. Leon had a nightly sked with F8MX in Cherbourg on 2m for many years, which was generally successful, and Roger remembers his father working F8MX on 70cm also. In the early days, in the late 1940s, the majority of 2m contacts were between UK stations. Roger remembers the great 'fogs' of that period providing some excellent openings and also that there was great interest in working UK counties. When Rutland first came on the air, there was huge excitement! Later, in the early 1960s, we think 1962, Leon was delighted to make the first 2m QSO between G and Italy and was awarded the Marconi Medal by the Italian society, ARI.

In June 1955, the *SWM* VHF Bands column opens with something that surprised me, a report that GW8SU in Porthcawl had reported hearing W1AW on 145.6MHz! There's discussion about how it might occur and it says *'further details of this extremely interesting and important matter are awaited'*. My guess, I don't know about yours, is that it was a case of IF breakthrough from the short-wave bands where the W1AW signal was very strong. However, the same issue reports that on May 16 G3CGQ (Luton) and G5RZ (Leighton Buzzard) had conducted a series of tests on the 25cm (1250mc) band over their 10½ mile path. This is reported as being the first time in amateur radio history that point-to-point communication had been achieved over any reasonable distance on the 25cm band using amateur designed and built equipment. On 2m, G5MR at Hythe in Kent clearly had a pipeline into France and had worked a number of French stations, including F8ME (Plerin) at a distance of 245 miles – the report continues to say that it's G5MR's ambition to work a G station!

Prior to World War II, as noted before, amateurs had operated at 56MHz. After the war, they were moved to 58.5 – 60MHz, which allocation was withdrawn in 1949. However, in 1956, the 70MHz band was allocated to UK amateurs. Scanning the VHF columns, there's very little mention of 70MHz until I got to August 1960, where it is reported that **Don Hayter G3JHM** (a call many VHF-minded readers may remember) had worked FA9VN in France. The report concludes that G3JHM has also worked G2JF and G3FEX on 70mc. *'There are about half a dozen other stations known to be on, or potentially available, including G3EHY and G5YV'*, it says. G3MPS reports that he is going QRO on 2m with a 4X150A in the PA and that a new 70cm transmitter is in the offing, with the planned output being around 40W. This is still all AM and CW, remember.

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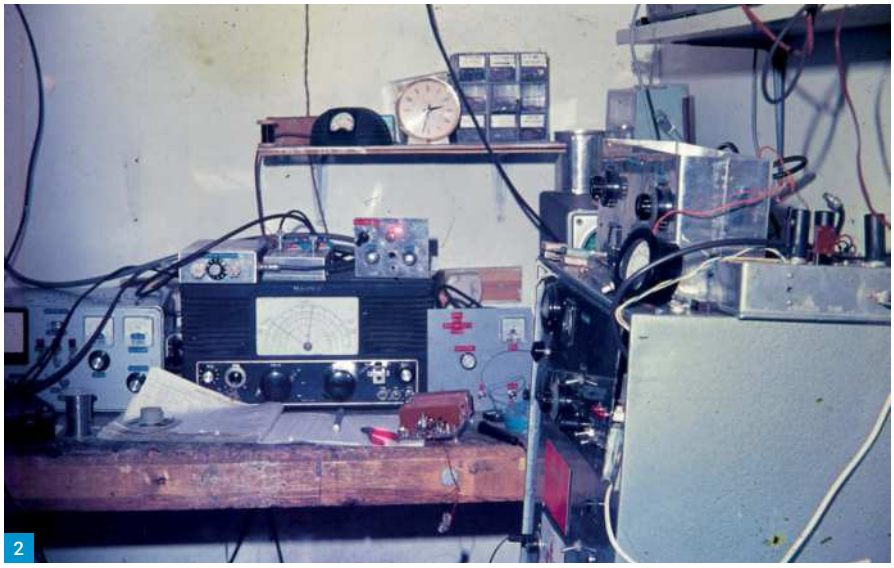
Photo 1: From Short Wave Magazine 1949, G2WS had a large array for the 70cm band.
Photo 2: The shack of John G8CQX around 1971. There is a 2m VFO-driven transmitter to the left, a 70cm tripler PA top right on top of a crystal-controlled 2m driver, Eddystone 640 tunable IF and to right of that a 23cm tripler with a 2C39 in a box cavity. Photo 3: Bury Radio Club in 1972 with Steve G4AQB operating and Alban G8NVW and an SWL logging.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There's a mention of meteor scatter, with G3JHM (running 600W!) looking for DX stations at distances of 475 – 1200 miles during the Perseids.

The 60s and 70s

September 1965 brings news of Oscar-III, not a satellite, but a transponder attached to a balloon launched in the Netherlands. The plan was for the balloon to rise to around 30km when it would burst and parachute the gear back to the ground. The transponder was operational on 2m and could be heard clearly in the UK. **Tom G3BA** reported contacts with G6CW, PA0LBF and DL3SP. What is particularly interesting in this report is that the 'new mode', SSB is mentioned and in somewhat disparaging terms! It is clear that AM and CW were still very much preferred. Meteor scatter is clearly progressing and there's a report of **Johnny G3CCH** working UA1DZ on 28 July, I am assuming on CW. There's also mention of Sporadic E QSOs on 2m between Sweden, Spain and Italy. **Peter, G3LTF** reports working KP4BPZ on 70cm EME using CW, with KP4BPZ (perhaps using the Arecibo dish) who was easily copied on SSB. In the same issue there is discussion of two-way amateur TV with those transmitting TV requiring a separate licence and callsign in the form of G6ABC/T. In Manchester, 4m AM activity is reported as 'pretty high' with most people using either Pye Reporters or B44s, modified, with quarter wave verticals.

By 1970, SSB operation seems to be becoming more common on 2m, although some AM activity is still highlighted. John Hawes G8CQX who was first licensed in 1969 once told me in the 1980s that he remembered how SSB had been decried by some amateurs as the 'end of amateur radio'. As a young G6 hearing that, I found it incredibly funny and impossible to comprehend. Back in 1970 though, and there's a huge amount of coverage of amateur television, which had clearly become very popular. There's also an interesting report of VE2AIO in Montreal receiving the TF3VHF beacon on 70MHz and there's speculation that a 70/50MHz cross-band contact should be possible between the UK and Canada – at the time, of course, UK amateurs could not transmit on 50MHz, but could transmit on 70MHz.

Fast forward to October 1975 now and the first thing I notice is an advert for a commercially built 2m power amplifier (180W input for 10W drive) made by Belcom, for £165. Microwave Modules are advertising a 1296MHz to 144 (or 28MHz) receive converter for £29.90. There's a 1296MHz varactor tripler, capable of 14W and available for £31.30. The VHF bands column has more of an emphasis on VHF/UHF contesting, which is clearly becoming more of a portable activity with equipment becoming smaller and easier to transport. The outgoing SWM VHF columnist, G3DAH, is still clearly unhappy about SSB taking over the bands. FM, on the other hand seems to be seen as a good thing, although the columnist feels that the availability of FM 'black boxes' has 'reduced the urge to experiment with original designs and concepts'. The introduction of repeaters is mentioned, alongside words such as 'acrimony and abuse'. Incidentally, this issue announces the next VHF columnist, Norman Fitch G3FPK, who will in due course, take over the reins of the VHF column in our very own Practical Wireless.

The 1980s

Five years on, in April 1980, there's an advert for a rig that I know many readers will recall and still be using, the Icom IC-251, priced at £479. The Icom portables, 2m FM (IC-215), 2m SSB (IC-202) and 70cm SSB (IC-402) are all advertised – classic and popular rigs, even now. There's also an advert for another classic 2m transceiver, the Yaesu FT-225RD. Both the IC-251 and FT-225RD would see Mutek produce front end boards to improve the rigs' performance. MuTek, a company run by **Chris Bartram G4DGU**, would build an astonishing reputation for good performance and design of VHF/UHF products. You could buy a Microwave Modules 2m/23cm transverter for £139 and a 100W linear amplifier for 2m priced at £124. The *SWM* VHF column, now in the hands of Norman G3FPK, reports that permission has been granted to run a 50MHz beacon in Anglesey, outside of TV hours. Plans for the launch of a satellite, AO-9, are discussed. There is plenty of VHF/UHF news across the bands, with SSB the dominant mode now, although there's some CW. UK counties are still chased on an annual basis, creating plenty of day-to-day activity. It's clear that the influx from CB, still illegal in the UK, is starting to happen, with comments about pirates and people becoming disillusioned with 2m.

In September 1985, there are reports of a two-way QSO between the **Blackwood and District ARS club GW6GW** and astronaut **Tony England W0ORE** on the Space Shuttle *Challenger*. There was SSTV activity from the shuttle too. Satellites mentioned include the Russian RS satellites, RS-5, RS-7 and RS-8, which were mode A transponders, with 2m up and 10m down. If you had a class B licence, which were not permitted to operate on HF, you could still use these satellites as you were transmitting on 2m. Six metre operation had started in the UK, but by permit only, with initially 40 permits allocated and then the number of permits extended to 100 and operation taking place outside TV hours. Some multi-hop Es openings were noted and a number of permit holders such as **Brian Bower G3COJ** and **Angus Mackenzie G3OSS** made QSOs into the USA. 4m, 2m, 70cm and even 23cm are all busy, with summer expeditions to rare locator squares being quite common. Talking of locator squares, the 'old' system was still in use, IO91 was still known as ZL square for example. The problem with the old system was that it only covered a fairly small area of the planet, so calculating distances on a worldwide basis was impossible. Nevertheless, the switch was not without controversy. I remember being quite opposed to it at the time! Class B licensees were not yet allowed to use CW on the air, even if they knew it! This was relaxed sometime in the late 1980s, I think, but I cannot remember exactly when, although I remember staying up late one night to work **Colin**, then **G6ZPN**, now **G0CUZ** on CW for the first time.

The 1990s

By 1990, good quality VHF reporting had been included in *Practical Wireless* for some time, and was

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now in the hands of David Butler, G4ASR. The 6m band is now available to all UK licensees both Class A and Class B, as is 4m. 6m is providing plenty of DX, both Sporadic E and contacts further afield into South America and Africa by F2 (those were the days!). The DX is being worked on CW and SSB. Summertime expeditions to rare squares are still popular, although with the advent of 6m operation, some groups are starting to go further afield to take advantage of Sporadic E propagation. Meteor scatter operation is still using high speed CW (or SSB!) and modified cassette recorders to slow the high speed CW down to 'normal' speeds. Computer logging is starting to be available. If you wanted to contribute to Dave G4ASR's VHF column, you would still most likely be writing him a letter, although you could have sent him a message via packet radio, which was extremely popular,

Five years later, the internet is available for many correspondents and now radio amateurs can exchange information readily and quickly. DX Clusters, which had grown in popularity since the late 1980s, were starting to be linked using the internet rather than via packet radio links. The Atlantic remained a challenge for 2m enthusiasts with expeditions being mounted from time to time to see if signals could be exchanged. White noise, largely, was the only reply.

The New Millennium

In 2003, UK licensing changed, when the Morse code requirement to operate on HF was dropped, enabling those that had Class B licences to operate on HF for the first time with up to 400W. Some of those Class B licensees started to spend more time on HF rather than on VHF/UHF. The new Foundation and Novice licence classes, introduced from 2001 could go on HF straight away, so there was no captive audience for the VHF/UHF bands.

Nevertheless, VHF/UHF operation continued to thrive, perhaps less for chatting, although club nets remain popular on 2m and repeaters, in particular. DXing changed shape, thanks mainly to the work of **Joe Taylor K1JT**, author of the WSJT and WSJT-X suite of software. I first started using the JT65A mode on 6m in 2014 and it immediately revolutionised what could be worked with a small station, such as 100W and a vertical. Although JT65A was very sensitive, QSOs took a long time, so the next major evolution was FT8, which was almost four times faster than JT65A but retained a good amount of sensitivity. The digital DX modes from K1JT also revolutionised moonbounce communications, putting a few contacts within the reach of most people who would like to try it, rather than a select few.

Digital operation is not everyone's cup of tea, of course. However, for the generations who grew up playing computer games, working in IT rather than electronics and preferring to send text messages rather than talk on the phone, it fits perfectly!

As well as the digital DX modes, digital operation came to the voice modes too. D-STAR, primarily supported by Icom, became available around 2004. The Digital Mobile Radio system (DMR) as used commercially by Motorola started to gain some following in amateur circles a few years later. For a while, I think we all wondered whether there would be a 'fight for supremacy' between the two systems but of course it didn't work like that and the two systems started to develop in parallel, followed fairly quickly by Yaesu's System Fusion, which gained many followers, thanks in part to some good marketing of their repeaters by Yaesu.

Software Defined Radio has made huge inroads to the hobby, bringing some amazing technical advantages in both receiver performance and useability. The performance that can be achieved from a simple RTL-SDR would have been unthinkable a few years ago, let alone what can be done with the more expensive devices. For the transmit chain, SDR brings some great possibilities, with devices such as the ADALM Pluto and LimeSDR enabling straightforward experimentation on the microwave (and other) bands. Mainstream manufacturers are incorporating SDR concepts into their radios in both traditional transceivers with a front panel as well as those that can be controlled from a computer.

'Where will it end?', people sometimes ask me. I don't know, but only know that when the hobby stops changing and evolving, then we will be in trouble. Join me in raising a glass to the last 90 years of VHF/UHF in *Practical Wireless*, and all of those who have been involved. Most importantly, let's look to the future and how the magazine will inform, inspire and encourage the evolution of the hobby.

The column will return to normal next month with the usual band reports. This month, the band reports will be in the form of a 'web extra' which you can find on the magazine's website as a news item: **www.radioenthusiast.co.uk**

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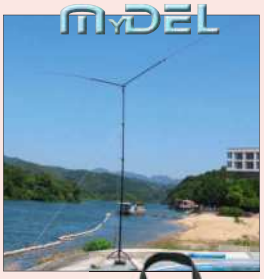

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See MLandS.tv for our full video review of this antenna.

See: HamRadio.co.uk/JPC

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Mike Richards G4WNC
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1

Looking Back and Forwards

Mike Richards G4WNC looks back on his time with PW but also has news of the latest addition to the Raspberry Pi stable.

In this 90th birthday issue I'll be reflecting on my time with the magazine, but I also have some more FT8 comparisons and we have a new Pi Pico to play with.

90th Birthday Reflections

My experience with *PW* began at the age of 10 when I started building valve communications receivers with my father. At that time, we had a couple of good component shops in Bournemouth and my father and I would often go window shopping on a Sunday evening to see the latest components, tuning systems, etc. Tuning mechanisms were always a bit of an art form and comprised complex arrangements of pulleys and cords to move a linear dial as the multi-gang tuning capacitor rotated. The holy grail of tuning systems was the Eddystone dial, but these always seemed to be out of our price range. *PW* was always a good source of affordable designs, so we looked forward to every issue and I remember the excitement of visiting the newsagent to pick up our copy.

My early interest in radio with *PW* served me well and helped me get an apprenticeship with Post Office Telephones (BT today). This set me up with a hugely varied career as I moved around different engineering specialisms and into management. When I met my wife, **Elaine G4LFM**, in the mid-80s, I was reintroduced to *PW* from the publishing side. At that time Elaine worked for IPC magazines in Poole and *PW* was one of their magazines. However, at the beginning of 1986, the editorial team bought *PW* from IPC and started PW Publishing. At about the same time they also bought what was to be their sister magazine, *Short Wave Magazine*. I was soon roped in to write their new *Decode* column. This was great fun because the *PW* team had a dedicated test lab with lots of high-quality test equipment that I could play with.

Later that year, **Ron Ham**, the author of the long-running *PW* RTTY column, decided to hang up his pen and concentrate on propagation matters. He very kindly offered the RTTY column to me, so I found myself with two different columns to write every month! That's when I discovered there's a huge difference between writing the occasional review and producing interesting material every month! My first RTTY column was published in the August 1987 *PW*. At that time RTTY was the dominant data mode but packet radio and AMTOR were gaining momentum. Once onboard with *PW*, I soon started writing reviews and the first for *PW* was the Siskin 220TNC packet radio terminal, **Fig. 1**, that brought affordable packet radio to UK amateurs.

When I started with the RTTY column computers were a relatively new addition to the shack. However, the early designs still required a terminal unit to decode the RTTY tones into a DC signal that could be sent to an RS232 port on the computer. The revolution that triggered the huge range of data modes we now enjoy was the arrival of the SoundBlaster sound card in 1989. The soundcard meant we could feed the audio RTTY signal from the rig straight into the computer where the filtering and decoding could be done entirely in software. Likewise, the transmit RTTY signal could be generated in software. The soundcard was a death knell for the noisy teleprinter and it quickly disappeared from amateur radio. It's interesting that computer-generated RTTY still manages to survive today, mainly because it can synchronise on a single character, thus enabling the quick exchanges that are ideal for contesting. Over time, the *PW* RTTY column morphed into *Bits & Bytes* and I left *PW* for a while. However, I returned later with the *Data Modes* column, which is where I've been for the last 145 issues!

There have been so many changes over this period but freedom to create entirely new data modes in software has spawned a huge range of ingenious systems with the current WSJT-X suite representing the pinnacle of that development. However, we seem to be stuck in a loop of chasing contacts not communications, i.e. we don't talk to each other anymore! FT8's popularity is a stark reminder of that. I know there are small pockets of amateurs that are returning to the conversational modes, and I'm hoping this is the start of a trend. **Peter Martinez G3PLX** has been the master of conversational data modes with PSK31 and its siblings, being excellent examples of a well-designed conversational data mode. I also have a soft spot for Peter's earlier work, AMTOR. This locks two stations together and produces a very effective HF chat link.

FT8 Decoder Comparisons

Last month I provided a performance comparison between operating FT8 with WSJT-X and three of its popular clones. In the meantime, **Joe Taylor K1JT** and his team have developed a new version of WSJT-X (v2.6.0) that promises improvements to FT8 decoding. At the time of writing version 2.6.0 is in release candidate (RC) stage. That means the software is on general release for testing only and there may be changes and bug fixes before the final version is released. Following last month's tests, it was clear that JTDX was the program to beat as it always produced the most decodes from any given test signal. Because of that,

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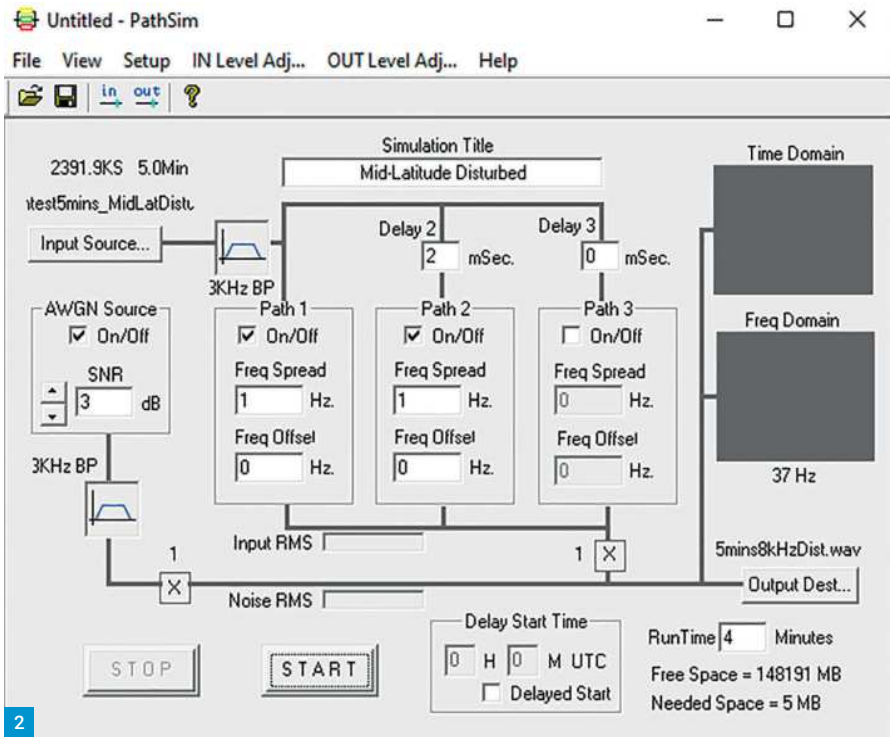
this month, I'm only comparing the new WSJT-X with JTDX. By way of a reminder, my test method is to use a VAC (Virtual Audio Cable) to send an identical audio signal to each program. WSJT-X and JTDX each store their decoded messages in a text file. Before the test, I erase both text files and after the test, I count the number of messages captured by each program. This method provides a simple indication of which program produces the most decodes. I also operate both programs using their default settings.

For the first test, I used a five-minute recording of the 7MHz band during the recent ARRL Data Modes contest. At the end of the test, I imported the 'ALL' text files into Microsoft Excel. Here I cleaned up the formatting to end up with two columns of received messages. These were alphabetically sorted as I've found that helps when trying to spot the differences. In this test, JTDX decoded 474 messages while WSJT-X produced 462 messages. This is a huge improvement from WSJT-X v2.5.4, which was about 30% down on JTDX in last month's tests. Further study of the received messages reveals that seven of the JTDX messages were marked with an asterisk, which indicates they originated from the hint decoders. These decoders use database information to suggest a likely callsign when part of the message is damaged. I've decided to exclude these as I'm trying to compare only the decoding performance. The corrected result shows 462 messages for WSJT-X and 467 for JTDX, that's a difference of just five messages, or about 1%. As the testing method is not perfect, the decoding performance can be considered identical. The next test was to use the single FT8 cycle audio recording to compare the two decoders. The results were very nearly identical at 30 messages for WSJT-X and 31 for JTDX. From the results so far, it is clear that there is very little difference in the decoding ability of JTDX and WSJT-X v2.6.0 using test signals from the ARRL Data Modes contest. The drawback with that test is that most of the signal levels were very high, so it was more a test of how well the two programs could unpick signals that are layered on top of one other. I also wanted to see how they would fare when propagation conditions get difficult. For convenience, I decided to start with my existing test signals but use **Moe Wheatley AE4JY's** excellent HF path simulator software to degrade the signal in a controlled way. If you want to replicate some of these tests, you can find Moe's software here: **www.moetronix.com/ae4jy/pathsim.htm**

I've shown the main screen of PathSim in **Fig. 2**. You can see that there are basically three signal paths that have adjustable delays and frequency spreads that can be configured to mimic HF propagation conditions. There is also a white noise generator that's used to set the desired signal-to-noise ratio. PathSim also includes a useful range of predefined simulation settings



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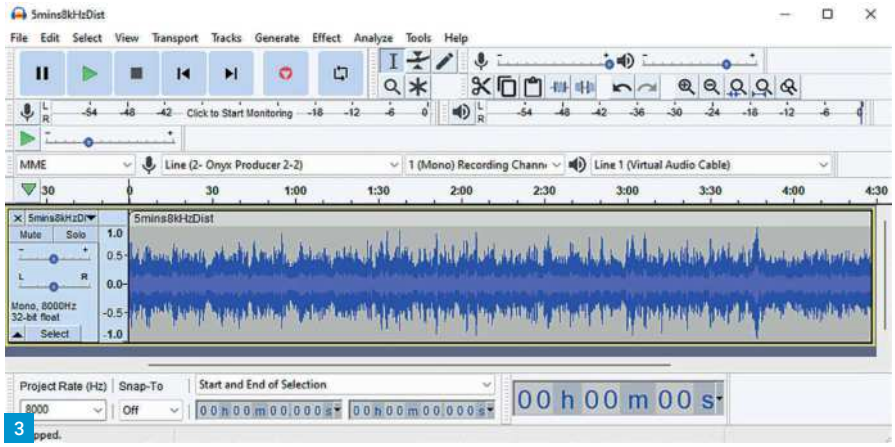

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that mimic international standards for HF link testing. Overall, it's an amazingly powerful simulation tool that Moe has kindly shared with us all at no cost. PathSim can take its input and direct its output either to a soundcard or a wav file. One limitation is that PathSim can only handle 16-bit WAV files with an 8kHz sample rate. Converting files for this format is easily done using Audacity, **Fig. 3**, as follows:

Load the source file into Audacity
Go to the bottom left of the main screen and set the Project Rate to 8000Hz.
Select File – Export
Choose Export as WAV
In the panel that opens, choose the file name and set the encoding to Signed 16-bit PCM
Press Save

To provide a stiffer test, I used the Mid-latitude Disturbed pre-set and degraded the signal-to-noise ratio to 3dB. This produced a badly degraded signal and I've provided a copy on my website for those who want to experiment further or replicate my tests. The test signal is a five-minute sample. I used the same test setup as last month, i.e. Audacity plays the file to the VAC where it is passed to the FT8 software. As some of the signals would be marginal, I ran the test signal three times and averaged the number of decoded messages.

As a further refinement, I eliminated the JTDX decodes that were flagged by the hint decoders. The result was 256 messages received by JTDX and 243 messages by WSJT-X v2.6.0 RC1. In all the tests JTDX always did slightly better than WSJT-X but the difference was at most 5%. Of course, WSJT-X 2.6.0 may be further improved by the time we get to the public release, so I'll repeat the comparison and report the results here.

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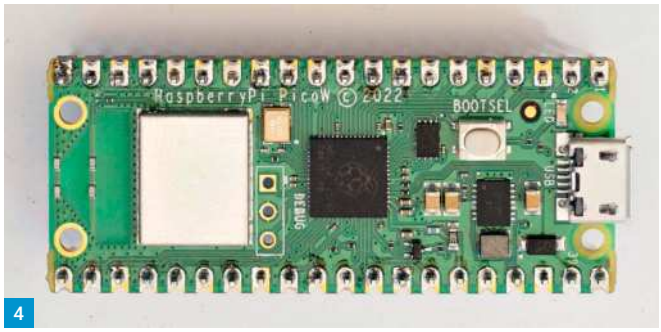

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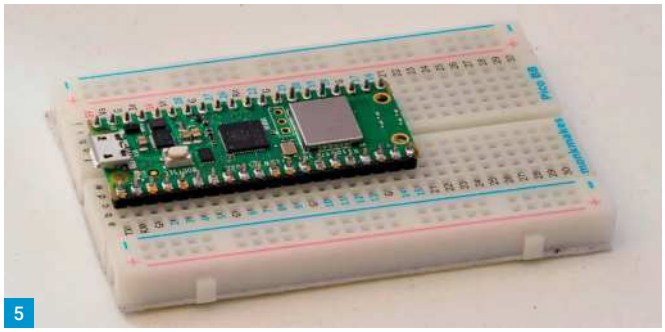
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RaspberryPiPicoW

We have a new Raspberry Pi in the form of the Pico W, **Fig. 4**. As you can no doubt guess from the name, the new version adds Wi-Fi to its already impressive list of capabilities.

The Pico has seen a boom in sales during the current chip shortage because the Pi team had the foresight to advance order millions and set up an order pipeline for tens of millions more. The ready availability has resulted in commercial and industrial microcontroller users switching to RP2040-based designs.

The Raspberry Pi Pico is a very powerful and versatile microcontroller board featuring their in-house designed RP2040 microcontroller that uses a dual-core, 133MHz Arm Cortex-M0+ processor with 256kB of SRAM and a unique programmable I/O system. The new Pico W uses the same form factor as the original Pico but adds an Infineon CYW43439 wireless chip. The wireless chip and associated electronics are protected under a metal shield, and it uses a PCB-based slot antenna.

The wireless chip also supports Bluetooth Classic and LE, but this is not currently enabled. However, the Pi team have hinted that this may be released later. Programming the Pico W can be drag and drop over USB using C or MicroPython and ready-built code libraries are available now.

For those wanting to make use of the Pico W, the Pi team has created an excellent application note titled *"Connecting to the Internet with Raspberry Pi Pico W"*. This 27-page guide can be downloaded from the Pi site at: **https://tinyurl.com/2twc3dj9**

For ready-made code examples try: **https://github.com/pi3g/pico-w**

Fig. 1: Siskin TNC220 – my first PW review. Fig. 2: Moe Whatley's excellent PathSim. Fig. 3: Audacity configured ready to export an 8kHz WAV file. Fig. 4: The new Raspberry Pi Pico W. Fig. 5: The Pico W mounted on the MonkMakes breadboard.

If you're looking for a simple breadboard, the MonkMakes Pico BB works well and includes some of the Pico pin markings, **Fig. 5**. This is available from several Pi main dealers.

The new Pico-W adds tremendous versatility to the range and makes it a very attractive choice for telemetry and remote-control applications.

As with previous releases, the Pi team have worked wonders with the price. The Pico W costs just £5.99 and there is plenty of stock. **PW**

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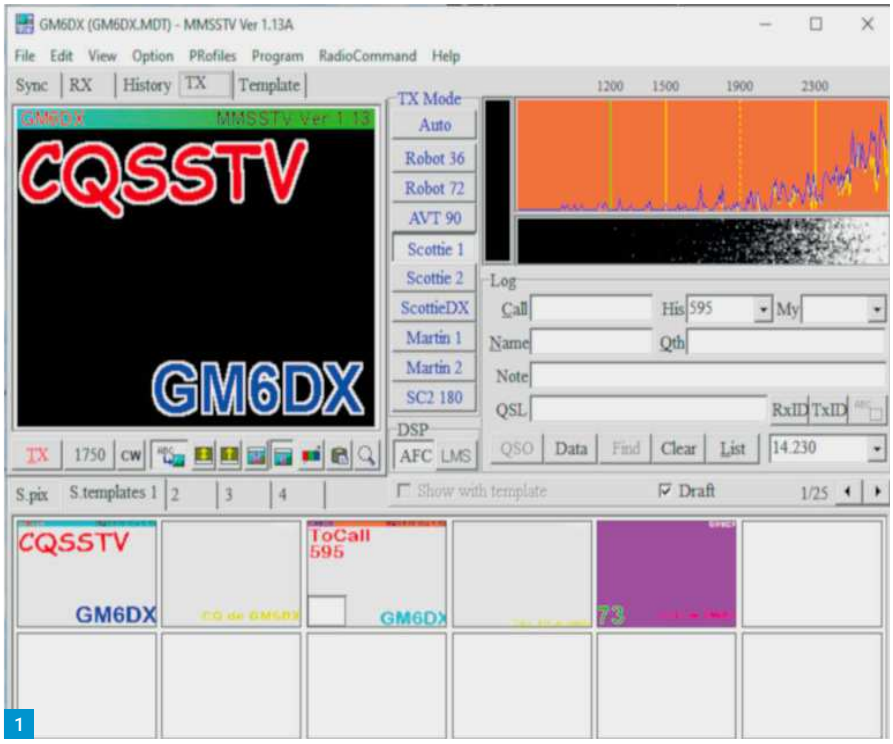
Billy McFarland GM6DX
gm6dx@outlook.com



SSTV

Billy GM6DX says "It's not as hard as you think".

I am a great believer that amateur radio operators should try and use as many bands and modes as possible. One mode which has not lost mystique since its development in the late 1950s is Slow Scan Television (SSTV). How can you send a picture across the world using a transceiver and personal computer? How does it all work? I aim to cover the basics to get you started. SSTV signals are traditionally about 3kHz wide with the transmission time to send a picture varying from about 8 seconds (black and white image) to a few minutes, depending on the modulation type. As you can imagine, it could be difficult to have a QSO using SSTV if transmissions were all over the band, so like many data modes SSTV can be found at particular parts of the bands. A simple search online will tell you a list of frequencies but a few common ones are 14.230MHz (USB), 7.171MHz (LSB) and even on 50.680MHz (FM) for the VHF operators out there.

Let's get Started

Firstly, you will need a transceiver and the ability to modulate it using a PC sound card. Most modern transceivers will have a built-in sound card that offers connection to a PC using a USB-B connection, usually CAT control is also offered. If your transceiver does not have a built-in sound card or CAT control such as the Yaesu FT-857, for example, then you will require some form of interface, such as those produced by Rigexpert, Rigblaster or Tigertronics. You can also homebrew an interface but the construction of this would need to be covered another day. If you already utilise data modes such as FT8, FT4, RTTY or PSK, then the principles are the same and you are set up. If you are new to data modes, then you must ensure that you read the manual for the transceiver on AFSK or FSK keying. There are various ways of modulating the transceiver from the PC, but most modern rigs have a DATA setting that activates the rear USB-B connection for CAT and Sound modulation. In simple terms the CAT control puts the rig into TX and RX (like the PTT on a hand microphone) and also allows frequency control. The sound card for data modes replaces your ears and mouth as used in SSB. The sound card Mic connection listens (ears) and the sound card Speaker connection sends the modulated audio (mouth). Once you have the physical connections in place it's then time to get started on the software.

Visit the hamsoft website (URL below) and download the latest version of MMSSTV (note the latest version is 1.13A developed in 2010). Make sure it is MMSSTV that you download as there is a YONIQ-MMSSTV version. This version is in Spanish but looks and works physically the same. Once downloaded, simply install on your personal computer and run the software. You should have a display similar to that shown in **Fig. 1**. If you don't, simply click from the top, *VIEW > DESIGN > STANDARD*. On the program you will see the picture window to the left (RX and TX pictures) followed by a few common modulation types such as Scottie 2, or Martin 1, in the centre. Then to the right of these you will see the scope of the received signal and a short log below that. At the very bottom you will see various boxes, which is where you add the images that you want to send.

https://hamsoft.ca/pages/mmsstv.php

Software Setup

You need to set up the software as follows:

OPTION > SETUP MMSSTV> RX TAB. Now make sure all options are selected as in **Fig. 2**. Next click on the TX tab. If you have come out of that screen, simply select OPTION > SETUP MMSSTV> TX TAB. In this tab you will see a space for your callsign. Insert a callsign that you will be using for all images and templates. I recommend that you use a CW ID (sends CW callsign at end of SSTV transmission) and also select the Encode FSKID. You will see a PTT port where you select the COM PORT number, which puts your rig into PTT. If, like me, you want to use a different program for logging and manually turn the VFO on the rig to the correct frequency, then the settings displayed on **Fig. 3** are sufficient. However, if you want MMSSTV to control frequency for logging then click the 'Radio Command' tab under the PTT port and fill out the COMM PORT, STOP RATES BAUD rate etc. for CAT control. One final setting is to select which sound card to use, so again OPTION > SETUP MMSSTV> MISC TAB. In the soundcard box select the sound card you are using. Put JPEG quality to 100% and then you can change the colours of the scope and Waterfall. You can see this in **Fig. 4**. This covers the basic setup of the transceiver and software. If you want to use MMSSTV for logging, be sure to go to OPTION>SETUP LOGGING and complete the tabs.

The Process

Before we can start to transmit we need to sort out the pictures and templates that overlay the images. On the main screen ensure you are on the S.PIX TAB. This can be seen just above the blank white squares, the red circles in **Fig. 5** show these areas. On one of these white squares, RIGHT CLICK > LOAD FROM FILE. Now select the image you want to use for transmission from your PC folder. An image editor will appear as seen in **Fig. 6** where you will need to crop or edit the selected photos for

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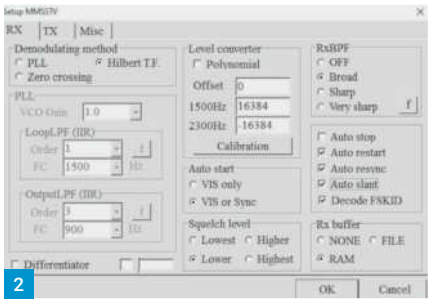
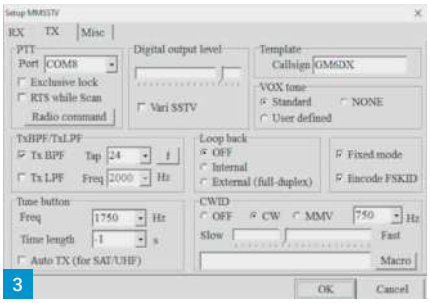
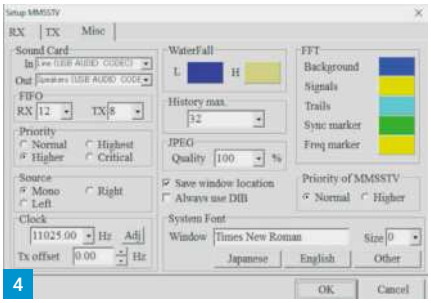
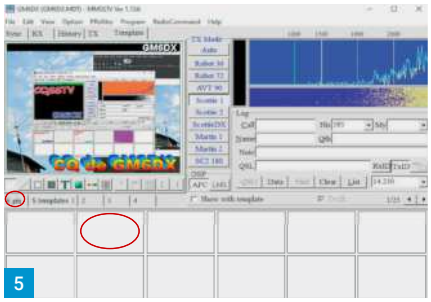
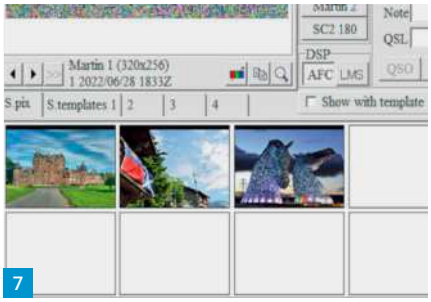










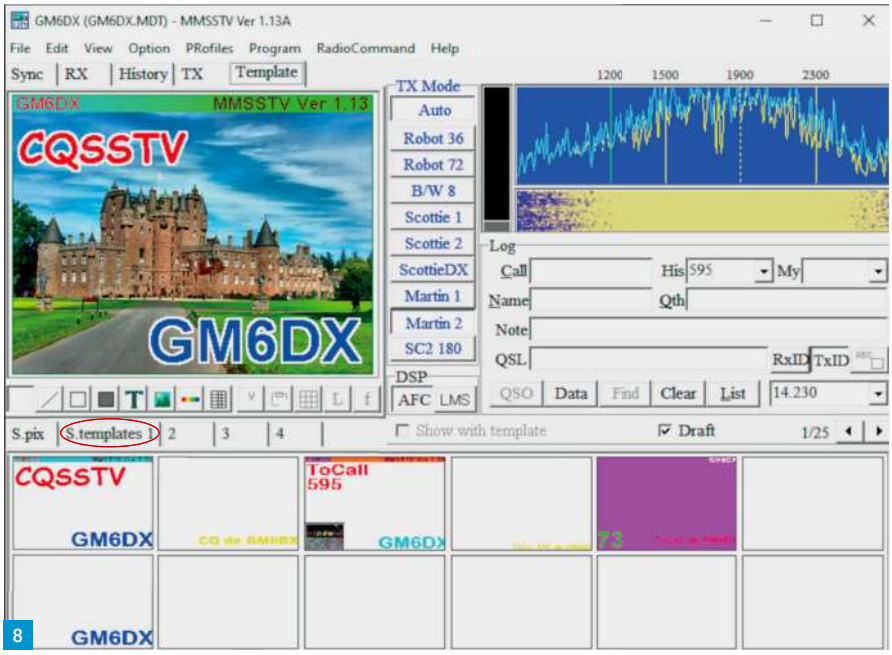


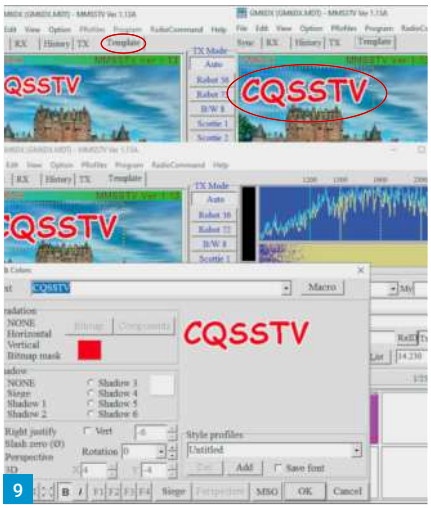
Fig. 1: The program display on startup.
Fig. 2: The receive setup screen.
Fig. 3: The transmit setup screen.
Fig. 4: The MISC setup screen, for other options.
Fig. 5: Selecting the S.pix tab.
Fig. 6: Using the image editor to select a picture, or part of one. Fig. 7: The S.pix tab partially populated with images. Fig. 8: Using an image as part of the template. Fig. 9: Changing the template using the editor facility.
Fig. 10: Selecting a transmission mode.
Fig. 11: Entering the callsign and report from the station worked. Fig. 12: Receiving the closing image from the station worked. Fig. 13: Received images vary in quality according to conditions.

use on air. Repeat this process until you have a few in the S.PIX TAB as seen in **Fig. 7**. Please be mindful of the type of images you have selected so as to ensure you are not breaching licence conditions or content regulations. In the S.PIX TAB double-click on the first image you want to send then select the S.TEMPLATES 1 TAB. In this tab you can see various pre-formed templates, which when you double-click on the relevant template, it will place this as an overlay of the picture as seen in **Fig. 8**. If you want to edit any part of the template such as font, colour or position, then select the TEMPLATE tab just above the picture window, double-click on the part of the template you want to edit and the editor window will appear. You can then change anything within the window editor. All this can be seen in **Fig. 9**.

The QSO

Having a QSO in SSTV is the same as any other mode. You have a CQ call, a report and a 73 final, a beginning, a middle and an end. Double-click the picture you want from the S.PIX TAB. Then select a CQ template from the S.TEMPLATES 1 TAB by double-clicking on it. Then above the picture window you will see a few other tabs, SYNC, RX, HISTORY, TX and TEMPLATES. Click on the TX TAB, select a mode such as Scottie 2, then click on the TX button at the bottom left of the picture window.

These are highlighted in **Fig. 10**. Your transceiver will transmit the SSTV signal. Once transmitted you then wait for a reply. The software should jump to the RX TAB when it starts to decode an SSTV signal. If not, select the RX TAB. Note that people may reply to you using a different modulation such as Martin 1. However, if you have AUTO selected, you will reply and decode in their mode. Once the other station's image has been received, then we select the exchange



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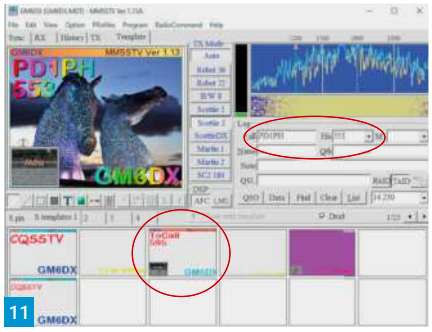

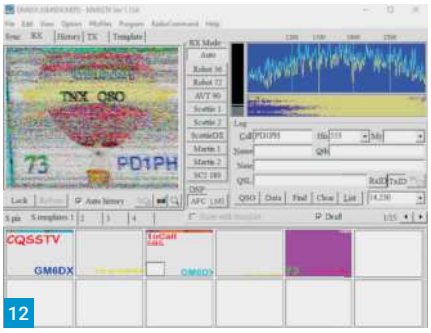

template. Although you are not using MMSSTV software as a log you need to enter the station's callsign and signal report in the log boxes as seen in **Fig. 11**, the template takes and uses this information. If you do not have a station's callsign in there, it will send a transmission with blank information. We then wait for the station's final image, as seen in **Fig. 12,** before replying with our final picture. This process is then repeated for each QSO.

To summarise; select the images from the S.PIX tab that you want to send. Select the templates from the S.TEMPLATES tab that you want to use, whether CQ, exchange or 73. Be sure to use the TX and RX tabs above the picture windows to switch between transmit and receive picture windows. Like every method of transmission, if conditions are rubbish, then the picture quality that you receive will likely be rubbish and it certainly isn't HD quality (see **Fig. 13** for some images I have received), nonetheless this mode is challenging but very enjoyable. If you would like to see a video showing from install to QSO, then you can watch my video at:

shorturl.at/cfvCI

For more help using MMSSTV then visit here for the manual:

shorturl.at/csIOZ

As always, if anyone has any questions, please email me at **gm6dx@outlook.com.**

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Colin Redwood G6MXL
practicalwireless@warnersgroup.co.uk

The Fourteenth Practical Wireless 70MHz Contest

Colin Redwood G6MXL invites readers to participate in the Practical Wireless 70MHz Contest.

The 13th Annual *Practical Wireless* 70MHz Contest takes place on Sunday 25 September 2022 from 1300 to 1600UTC.

The contest is split into two sections. The low-power section with a power output limit of 10W enables Foundation Licence holders to compete on an equal basis with other low power stations. The high-power section allows stations to run up to the full power permitted by their licence.

You may operate from a fixed location or portable subject to complying with the spirit and letter of prevailing government regulations and guidelines.

For those new to the 4m band, the *PW* 70MHz contest is a great introduction to the friendly nature of contesting found on the band.

Equipment

The choice of equipment at 70MHz (4m) continues to improve.

For SSB and CW operation, Yaesu's FTdx10, Kenwood's TS-890, along with Icom's IC-7100 and IC-7300 transceivers all offer the 4m band in addition to the traditional HF and 6m bands.

Less well known is the Noble NR-4SC, a dedicated 4m SSB/CW (but not FM) transceiver. The UK version of the older Yaesu FT-847 also covers 4m and can often be found second-hand.

Transverters are still used by some 4m operators and are available from a number of sources. Most use an intermediate frequency (IF) of either 28MHz or 144MHz, taking the 28MHz output from a transceiver and mixing with a local oscillator to give 70MHz for transmit and vice versa on receive. Transverters usually require drive levels much lower than the full output power of most HF and VHF transceivers, sometimes as little as a few milliwatts. You may need an attenuator unless your main transceiver has a low-power output to suit your transverter.

A number of FM transceivers for 4m are available from several manufacturers including Anytone, MyDEL and Wouxon.

Antennas

Many stations will perhaps be using nothing more than a simple dipole or quarter-wave vertical. Stations with Yagi antennas are likely to have fewer than six elements. A number of suppliers now offer commercial 4m Yagis and Moxons.

Vertically polarised antennas are generally used for FM and AM operation. For SSB and CW, most stations use horizontally polarised antennas. For those who like building antennas, there are a number of designs for the 4m band on the *PW Antenna Collection Archive Disc*.

Operating

I'd suggest spending some time on FM and AM in addition to SSB and CW. If you are unfamiliar with the 4m band, you could be surprised at just how many stations are using these modes.

In recent years there has been increasing activity from the Continent in addition to activity from almost all parts of the British Isles, including a number of EI stations. It is easy to miss out on contacts simply by not rotating directional antennas in all directions. Don't forget that slow QSB (fading) is a common occurrence on the 4m band, so you may miss a station altogether if you don't rotate a directional antenna a number of times during the contest. The QSB can cause stations to disappear for a minute or two and then re-appear.

Entries

Don't forget to submit your entry after the contest. Although electronic entries via email are preferred and make the task of the adjudicator much easier, legible paper entries continue to be welcome. The email address for logs is

entries@pwcontest.org.uk

Do make a note in your diary now. The 14th *Practical Wireless* 70MHz Contest takes place on **Sunday 25 September 2022**. If you plan to use batteries, don't forget to charge them a day or two before. Remember to put a reminder in your diary to submit your entry to be received by **Tuesday 11 October**. Let's hope for some good weather and propagation on the day so that we can all have a really enjoyable time.

The 14th Practical Wireless 70MHz Contest Rules

www.pwcontest.org.uk

The 2022 Rules

1. General: The contest is open to all licensed radio amateurs, fixed stations or portable, using SSB, CW, AM or FM in the 4m (70MHz) band. Entries may be from individuals or from groups, clubs and similar organisations, provided that all operation is in accordance with the spirit and letter of prevailing government coronavirus regulations and guidelines. The duration will be from 1300 to 1600UTC on 25 September 2022.

All stations must operate within the terms of their licence and only transmit within the 4m licensed allocation. Stations using transverters are reminded to be careful not to transmit out of band.

Subject to licence conditions, split frequency operation is permitted for the purpose of working stations in countries with different 4m allocations. Cross-band contacts where either station is not operating between 69.0 and 71.0MHz will not count for points.

Entrants must observe the bandplan for their country and keep clear of normal calling frequencies such as 70.200MHz. Entrants must avoid using any frequency that is obviously in use for non-contest purposes. **The 4m band is not an exclusive amateur band in many countries. Contest stations must allow all other users (including non-amateur users) of the band to carry out their activities without hindrance.**

The station must use the same callsign throughout the contest and may not change its location. Entrants not operating as a fixed station must use the /P callsign suffix.

2. Contacts: Contacts will consist of the exchange of the following minimum information:

(i) callsigns of both stations (**including any /P suffix**)
(ii) signal report, standard RS(T) system
(iii) serial number: a 3-digit number incremented by one for each contact and starting at 001 for the first contact
(iv) locator (i.e. full 6-character IARU Universal Location for the location of the station).

Information must be sent to and received from each station individually and contacts may not be established with more than one station at a time. Simultaneous transmission on more than one frequency is not permitted.

If a non-competing station is worked and is unable to send his full universal locator, his 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

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at least one contact with a station in the square.

Contacts via repeaters or satellites or using any digital voice modes (including D-STAR, Fusion and DMR) and data modes or machine generated modes, such as FT4, FT8, JT65, PSK31 and RTTY, are not permitted. The use of the DXCluster, ON4KST chat or similar is limited to setting up contacts and not for requesting or passing reports, serial numbers or locators, which must only be exchanged on the 70MHz band.

3. Power: In the low-power section, the output power of the **transmitter** or **transverter** final stage must not exceed 10W PEP. If the equipment in use is capable of a higher power, the power shall be reduced and measured by satisfactory means. Stations cannot rely on feeder loss to meet the 10W power limit. In the open section, stations may use whatever power they are permitted to use by their licence conditions.

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 in which contacts were made (a square here is the area defined by the first four characters of the universal locator).

Example: 52 stations worked in IO81, IO90, IO91, IO92 and JO01 squares; final score = 52 × 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 logs submitted by email).

5. The Log: Logs must contain the following information for each contact:

(i) time (**UTC – NOT BST**)
(ii) callsign of the station worked (**including any /P suffix**)
(iii) report sent
(iv) serial number sent
(v) report received
(vi) serial number received
(vii) locator received (or location).

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 are 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 eight 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. The preferred method of submitting this is by the use of the online facility on the website. Alternatively, the information may be written in the email message to which the log file is attached. For entries sent by post, it should be written on a separate sheet of A4-sized paper.

The information required for every entry is:

(i) 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
(ii) callsign used during the contest **including any /P suffix** (e.g. G6MXL/P)
(iii) name and address for correspondence
(iv) location of the station during the contest
(v) full 6-character locator as sent during the contest
(vi) 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
(vii) a full description of the equipment used, including transmitted PEP output power
(viii) if you are entering the low-power section and the transmitting equipment (including any transverter employed) is capable of more than 10W PEP output, a description of the methods used (a) to **reduce** and (b) **measure** the output power
(ix) antenna used and the approximate station height in metres above sea level (ASL)
(x) if you receive or send a report of poor-quality signals (e.g. wide/splattering), full details of the complaint, including time, callsign, nature of complaint and actions taken **during** the contest to investigate and resolve
(xi) 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 & Other Information

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 11 October 2022. Late entries will be disallowed.

Any other general comments about the station, the contest and conditions during it are welcome. Photographs relating to the operation may also be sent by email. They may be used for publication in *Practical Wireless* or on the contest website.

You will be asked, with your entry, to agree to the holding and processing of your log 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. In particular observe any restrictions on access. Always leave the site clean and tidy, removing all litter. Observe the Country Code.

8. Poor Signals: Make sure that your transmitting equipment is properly adjusted and is not radiating a broad or poor-quality signal, e.g. by over-driving, excessive speech compression or low voltage supply. On the other hand, be aware that your receiver may experience problems due to the numerous strong signals it will have to handle and that this may lead you to believe that another station is radiating a poor signal. Before reaching this conclusion, try heavy attenuation at the received input.

The use of a high-gain RF preamplifier is likely to worsen strong-signal problems so if you do use one, 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 70MHz 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 (e.g. wide/splattering), 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 the complete 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. **PW**

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- Frequency entry: 1KHz resolution
- Measurement for 25, 50, 75, 100, 150, 200, 300, 450 and 600-Ohms systems
- SWR measurement range: 1-100 in numerical mode / 1-10 in chart mode
- R&X range 0…2000, -2000…2000
- Dimensions: 230mm x 100mm x 55mm
- Weight:650g
- Operating temperature: 0-40 C (32-104 F)

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- Frequency entry: 1KHz resolution
- Measurement for 25, 50, 75, 100, 150, 200, 300, 450 and 600-Ohms systems
- SWR measurement range: 1-100 in numerical mode / 1-10 in chart mode
- R&X range 0…2000, -2000…2000
- Dimensions: 230mm x 100mm x 55mm
- Weight:650g
- Operating temperature: 0-40 C (32-104 F)

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AA-650 Zoom Analyser

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- Frequency: 0.1 to 650MHz
- Frequency entry: 1KHz resulotion
- Measurement for: 25, 50, 75, 100, 150, 200, 300, 450 and 600Ω systems
- SWR measurement range: 1-100 in numerical mode / 1-10 in chart mode
- R&X range: 0… 2000, -2000… 2000
- Dimensions: 230mm x 100mm x 55mm
- Weight:650g
- Operating temperature: 0-40 C (32-104 F)

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SPECIFICATION
- Frequency: 0.1 to 230MHz
- Frequency entry: 1KHz resolution
- Measurement for: 25, 50, 75 and 100-Ohm systems
- SWR measurement range: 1-100 in numerical mode / 1-10 in chart mode
- R&X range: 0…10000, - 10000…10000 in numerical mode /0…1000, -1000…1000 in chart mode
- Dimensions: 82mm x182mmx32mm
- Weight:236g
- Operating temperature: 0-40 C (32-104 F)

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AA-55 Zoom Analyser

This analyser is designed for measuring SWR (standing wave ratio), return loss, cable loss, as well as other parameters of cable and antenna systems in the range of 60kHz to 55MHz A built-in ZOOM capability makes graphical measurements especially effective.

SPECIFICATION
- Frequency: 0.06 to 55MHz
- Frequency entry: 1KHz resolution
- Measurement for: 25/50/75/100/150/200 /300/450/600 ohm
- SWR measurement range: 1-100 in numerical mode / 1-10 in chart mode
- R&X range: 0…10000, - 10000…10000 in numerical mode /0…1000, -1000…1000 in chart mode
- Dimensions: 103mm x207mmx37mm
- Weight:310g (without batteries)
- Operating temperature: 0-40 C (32-104 F)

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AA-35 Zoom Analyser

This analyser is designed for measuring SWR (standing wave ratio), return loss, cable loss, as well as other parameters of cable and antenna systems in the range of 60kHz to 35MHz A built-in ZOOM capability makes graphical measurements especially effective.

SPECIFICATION
- Frequency: 0.06 to 35MHz
- Frequency entry: 1KHz resolution
- Measurement for: 25, 50, 75 and 100-Ohm systems
- SWR measurement range: 1-100 in numerical mode / 1-10 in chart mode
- R & X range: 0…10000, - 10000…10000 in numerical mode /0…1000, -1000…1000 in chart mode
- Dimensions: 103mm x207mmx37mm
- Weight:310g (without batteries)
- Operating temperature: 0-40 C (32-104 F)

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249 WATTS

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SPECIFICATION
- Frequency: 0.1 to 600MHz
- Frequency input step: 1KHz
- Measurement for: 25, 50, 75, 100, 150, 200, 300, 450 and 600Ω systems
- SWR measurement range: 1-100 in numerical mode / 1-10 in graph mode
- R&X range: 0… 2000, -2000… 2000
- Dimensions: 185mm x 40mm x 33mm
- Weight:185g with battery
- Operating temperature: 0-40 C (32-104 F)

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£399.95

399 WATTS

RigExpert

STICK 230 Analyser

SPECIFICATION
- Frequency: 0.1 to 230MHz
- Frequency input step: 1KHz resolution
- Measurement for: 25, 50, 75, 100, 150, 200, 300, 450 and 600 Ohm systems
- SWR measurement range: 1-100 in numerical mode / 1-10 in graph mode
- R&X range: 0… 10000, -10000… 10000
- Dimensions: 185mm x40mmx33mm
- Weight: 185g
- Operating temperature: 0-40 C (32-104 F)

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399 WATTS

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TI-5000 Transceiver Interface

RigExpert TI-5000 is a new and powerful USB transceiver interface based on high quality stereo codec IC, for operating phone, CW and digital modes using personal computer.
All in one through a single USB port. Ideal interface for FT8 and WSJT modes!
Transceiver audio interface: Analog audio interface is a connection to transceiver audio output (external speaker connector or line output) and transceiver audio input (microphone connector or line input). Audio interface enables operating digital modes, recording and playing voice, as well as other useful functions (such as measuring levels of a signal from the air) by using a computer. Input (two channels) and output volume levels are adjusted by potentiometers on the front panel of the device.

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The SHARMAN AR-600 VHF/UHF Antenna Rotator with Base Control unit and Infa red remote control is designed for use with the smaller antennas Typical suitable antennas are smaller 2m and 70cm beams or tv antennas The AR-600 has programmable antenna controller with Infra-red remote-control. AR-600 remembers up to 12 antenna directions with back up Control over all functions is either with the infra-red remote control or control unit.
The control unit displays location chosen and relative position. Rugged Light-duty rotator is built in a weather-proof one piece cast aluminium housing. Has precision metal gears and steel thrust bearings for durability. Supplied with rotator, controller, 3-device universal remote, mount clamps and hardware.

SPECIFICATIONS
- Mast size : 28 to 44 mm (1.1/8" - 1.3/4")
- Rotation time : approx. 74 sec.
- Rotation torque : 21.5 Nm
- Weight : 4.2kg
- Control unit : with digital direction indicator
- Operating Voltage 220-230VAC
- Requires 3-wire control cable (not included)

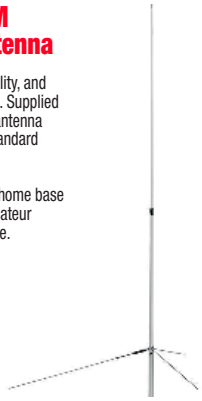
Buy the AR-600XLfor just
£199.95
199 WATTS

SHARMAN multiCOM

V-2000 6M/2M/70CM Triple Band Base Antenna

GRP fibreglass outer shell for durability, and pre-tuned for the appropriate bands. Supplied complete with mast brackets. This antenna is a two section antenna and has standard SO239 connection fitting.

A good value for money triple band home base antenna for the 50/144/430MHz amateur bands offer outstanding performance.



KEY FEATURES:
- Frequency range - 50 / 144 / 430MHz
- Max power - 150W
- Gain - 2.15dB @ 50MHz 6.2dB @ 144MHz 8.4db @ 430MHz
- Length - 2.2M
- Weight - 1.3Kg

Buy the V-2000 for just
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MC-4MT 4M 5D-FB Cable Kit SO239 to PL259

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SM-50II 50 AMP Switch Mode Power Supply Unit

Includes noise offset control to eliminate the pulse noise of the switching circuit. This patent pending function is specially designed for communication equipment use. Its effectiveness may vary depending on the frequency and mode.

KEY FEATURES/SPECIFICATIONS
- Input Voltage: 220VAC
- Output Voltage: 9-15Vadjustable
- Output Voltage regulation: less than 2%
- Output current: 50A
- Meter: Displays the supply voltage and current
- Cigarette plug terminal: 10A (max)
- Protection: Short circuit and automatic current limiting over 50A
- Dimensions:170mm (W) X 120mm (H) X 260mm (L)
- Weight: 3kg • Fuse: 8A

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£139.95
139 WATTS

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AV-508 – Deluxe Desktop Microphone

Suitable for most modern radios with required lead

FEATURES
High-sensitivity condensed microphone element - ensures better voice quality
Runs on 2 AA batteries (Not included),
Flexible goose neck supporting the microphone

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AV-SW2M - 2 Way SO239 Coax Switch

KEY FEATURES/SPECIFICATIONS:
- Sockets SO239 • Power 2kW (DC-30MHz), 1kW (30-200MHz), 500W (200-500MHz), 250W (500-1000MHz)
- Range DC-1000MHz
- Insertion Loss: DC-500MHz 0.05dB, 500-1GHz 0.10dB
- Size 89 x 70 x 40mm • Weight 446g

Buy the AV-SW2M for just
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BM145 -PL (SO239) Large Magnetic Base

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STORM 100 CB Base Antenna

The Storm 100 CB base antenna is ideal when you only need local range and a compact antenna.

SPECIAL FEATURES
- Frequency - 26-28MHz
- Max Power - 30W
- Length - 1m
- Radials -3
- Gain - 0.5dB
- Bandwidth - 500kHz

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Treat yourself to the Sharman AV-600 VSWR / Power Meter. It reads RMS and PEP and covers from 1.8MHz to 525MHz. It uses two sensors with five power ranges 0-5W / 20W / 200W / 400W

KEY FEATURES/SPECIFICATIONS
- 1.8-160MHz (S1) • 140-525MHz (S2)
- Two Sensors • 5W, 20W, 200W, 400W
- 13.8V DC Lamp • 155 x 63 x 103mm • Weight 720g

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The Sharman AV-6075NF is a lightweight, high performance, high efficiency, durable, switching power supply with highly visible back light, easy to read dual meters and audio noise cancel function.

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1

Michael Jones GW7BBY
michael@gb2mop.org

A PCR Restored!

Michael Jones GW7BBY not only covers the workings of these receivers but offers some history of their use.

The Portable Communications Receiver, or PCR, **Fig. 1**, was designed by Pye and reputedly based on the receive section of their Wireless Set No 19. It was manufactured in large quantities by Pye and Phillips who produced some 17,000 examples between April 1944 and December 1945. Its first intended use was to be dropped to the resistance and citizens of the occupied countries of Europe; the Netherlands and France in particular. It wasn't a spy set but a broadcast receiver covering Long, Medium and Short Waves. Domestic radios had been confiscated by the Germans in the Netherlands. In France most domestic radios had been exchanged for German propaganda receivers that would only tune to German stations. Although many citizens had hidden receivers at the start of the war there were severe penalties for anyone caught listening to the BBC. By 1944 the Allies at last felt they had the upper hand, D-Day was in sight, there was a need to keep the resistance appraised of invasion plans and to raise morale among the population in general. The BBC would include coded messages in their programme material. These fascinating stories could form a complete article in themselves but here are some interesting snippets.

The French Connection

In 1940 the BBC established a French service called 'Radio Londres'. Broadcasts were entirely in French and the service was run by free French who had escaped France before the occupation.

A Special Operations Executive (SOE) operative, **Georges Bégué**, conceived the idea of sending obscure, seemingly meaningless personal messages to agents in the field. In this way the volume of dangerous two-way radio traffic was reduced.

Starting in July 1940 using the programme 'Les Français Parlent aux Français' as a vehicle these overtly coded messages were preceded by an announcement, *"Before we begin, please listen to some personal messages"*. Messages included pre-arranged words or phrases, which had a clear meaning to a specific resistance group such as, *"Jean has a long moustache"* and *"There is a fire at the insurance agency"*. The meaning could be anything such as *"Blow up a particular bridge"* or *"keep civilians clear, we're bombing a certain facility"*. Of course, the Germans were monitoring Radio Londres transmissions but would have no knowledge of which resistance group was the intended recipient. Only one out of, say, three 'personal' messages might actually contain a code word or phrase. Indeed, four or five messages might be broadcast with none of them containing a code, simply to divert and confuse German resources.

It was during the approach to D-Day, the Normandy landings, that the PCR receiver featured prominently. Indeed, it is sometimes referred to as an 'Invasion Receiver'. Notice that production started in April 1944. Many thousands of PCRs must have been dropped in France by the beginning of June that year when the most famous of the coded BBC Radio Londres messages were deployed.

The BBC signalled the French Resistance to advise that the opening lines of the 1866 **Paul Verlaine** poem 'Chanson d'Automne' were to indicate the start of D-Day operations. The first three lines of the poem, *"Les sanglots longs / des violons / de l'automne" ("The long sighs of autumn violins")*, broadcast on 1 June 1944 meant that Operation Overlord was to start within two weeks. The next three lines, broadcast on 5 June, *"Blessent mon coeur / d'une langueur / monotone" ("Strike my heart with a weary tiredness")*, meant that the invasion would start within 48 hours and that the resistance should begin sabotage operations, especially on the French railroad system. Another message on 5 June, *"The carrots are cooked"*, announced the arrival of Allied Paratroops.

Following D-Day, PCRs continued to receive updates on the status of the invasion for the benefit of both the resistance and allied forces. This may be why PCRs used WS19 cases for both the receivers and the power supplies as this enabled PCRs to be strapped into the standard WS19 armoured vehicle radio set carriers – presumably Carriers 21, 22 or 23. Another explanation may simply be that the manufacturers had a ready supply of 19 set cases.

No account of the BBC's wartime broadcasts would be complete without mention of the morale boosting use of the opening motif of Beethoven's 5th Symphony. Radio Londres' broadcasts opened with the emphatic "dit dit dit dah" played on tympani to symbolise Churchill's "V for victory" in Morse code to all the occupied nations.

The work of Radio Londres is commemorated by a plaque at the Asnelles cemetery in Normandy, **Fig. 2** [1].

After the war, large numbers of these receivers

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Fig. 1: PCR Receiver and its mains power supply. Fig. 2: Plaque at the cemetery at Asnelles, in Normandy, commemorating the work of Radio Londres.Fig. 3: Circuit diagram of PCR1. Fig. 4: Circuit diagram of mains power supply. Fig. 5: Above chassis view showing space for modifications. Fig. 6: PSU showing wooden chest for fuses and spare bulbs. Fig. 7: Perished wiring to be replaced. Fig. 8: Lots of pictures were taken to ensure replacement components were correctly wired. Figs. 9 & 10: Below chassis view before and after replacing capacitors.

were used as NAAFI or entertainments receivers and inevitably in the 1950s and 60s found their way via the then very healthy surplus market into amateur hands.

Circuit Description

The three versions of the PCR: PCR (or PCR1), PCR2 and PCR3 are very similar. PCR is easily recognised as it has a built-in speaker. PCR2 and PCR3 relied on an external speaker or headphones. The other differences are in the frequency coverage. The PCR covers Long and Medium Waves plus 5.8 – 18MHz Short Wave, PCR2 has a different short-wave band: 6.0 – 22MHz. PCR3 dispenses with Long Wave and covers Medium Wave, plus two Short Wave bands: 2.3 – 7.3MHz and 7.0 – 23MHz.

You may come across the PCR3TPL: this is a tropicalised version. A rare development of the PCR is the PTR, which was fitted with a BFO and was thus suitable for SSB and CW reception.

The PCR is a 6-valve superhet with an intermediate frequency (IF) of 465kHz. The circuit consists of a first RF amplifier (EF39/ARP34), mixer/oscillator (ECH35/ARTH2), two stages of IF amplification (EF39s/ARP34s), detector/audio amplifier (EBC33/AR21), audio output stage, PCR1: EL32(VT52), PCR2/3: 6V6G, **Fig. 3** [2].

The power supply was a separate unit built into a WS19 power supply case, Fig. 1. There are two types, one is for AC mains operation (Power Supply Unit Rectifier No. 17) with a 6X6GT rectifier and the other for 12V DC with a vibrator pack (Supply Unit Vibratory No. 8 or No. 9. (Tropicalised)) to supply the HT voltages. HT is 250V DC @ 65mA and LT is 12V DC @ 700mA, **Fig. 4** [2].

Some PCRs were re-built by the REME Newark Depot between 1958 and 1960, they will be marked NEW 4/60 showing the depot, month and year. Others were re-manufactured by other contractors (including RACAL) and will have a marking such as WRNW 1958.

Post War

After the war a great many of these receivers became available on the surplus market and this is where I first encountered one: the Army Surplus Store at Telford's Wharf, off Canal Street in my

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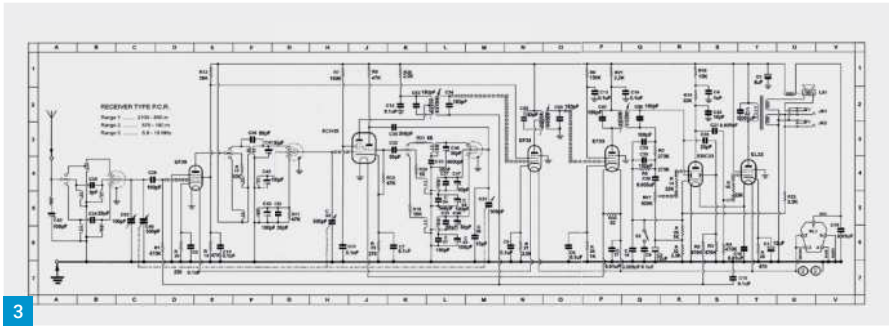
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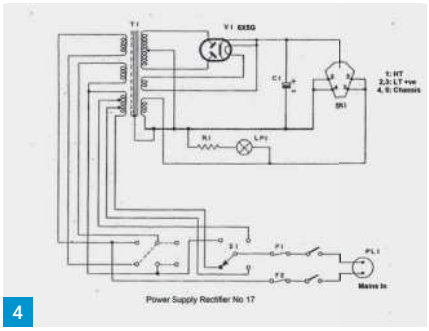
hometown of Chester. I was impressed with the dial and the general feel of the set, also it was considerably cheaper than other more sophisticated radios such as the AR88, HRO etc. In 1965 with 2/6d a week pocket money, two or three pounds for a PCR was still a lot of money. I would have to wait another 56 years until I had one!

Amateur Mods

In the 1950s and 60s many modifications for the PCR receivers were published in the radio press, including *Practical Wireless*. Such mods included improved selectivity, Beat Frequency Oscillator (BFO) for resolving CW and SSB, improved AGC, internal power supply, additional bands, notably topband, and replacing the electrostatic loudspeaker used in the PCR1. With hindsight some of these modifications would be of limited benefit on a receiver that unmodified, only gave coverage of the 7MHz amateur band and this occupied such a small span of the tuning dial that resolution of a CW or SSB signal would have been difficult. Of course, prior to the mid-60s AM would have been the most common voice mode and its wide bandwidth probably allowed it to be resolved without too much difficulty. However, before condemning these modifications we need to put ourselves back in that time when PCRs were plentiful and two a penny compared to 'proper' communications receivers such as the AR88 and HRO that might set you back quite a few months' pay. The PCR provided an inexpensive base on which to experiment and learn for a very modest outlay. Looking at the chassis, **Fig. 5**, there is plenty of spare real estate for adding RF stages, BFO or internal power supplies etc.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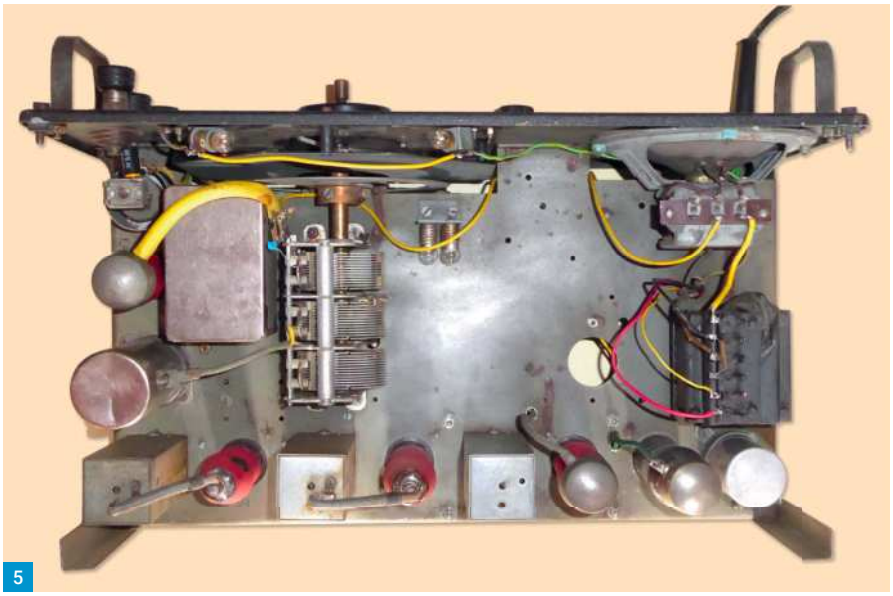
Mine

My example seems to be in remarkably original condition, free of modifications with a clean, fairly unmarked front panel. The separate power supply has been modified to provide two HT outputs, one at a slightly lower voltage. I assume that it may have been used with a different radio, a 19 set perhaps?

The power supply is worth a mention for the trouble taken to provide holders for spare dial light bulbs and a wooden chest for spare fuses, **Fig. 6**.

Much of the power supply wiring was perished and crumbling so all the PSU wiring was replaced. I was able to obtain a couple of long strain relief grommets for the power supply leads via eBay. The connecting leads would originally have been joined by 'drop' or 'snatch' connectors like those used on 19 and 62 sets. I used a pair of 4-pin in-line microphone connectors.

The original mains connector is unsuitable for modern use. I've left it in place but bypassed it and fed the mains cable through the hole left by a redundant switch fitted by a previous owner. The dial pointer had blackened and was very difficult to see against the black background to the dial. I painted the pointer white, which improved things considerably.



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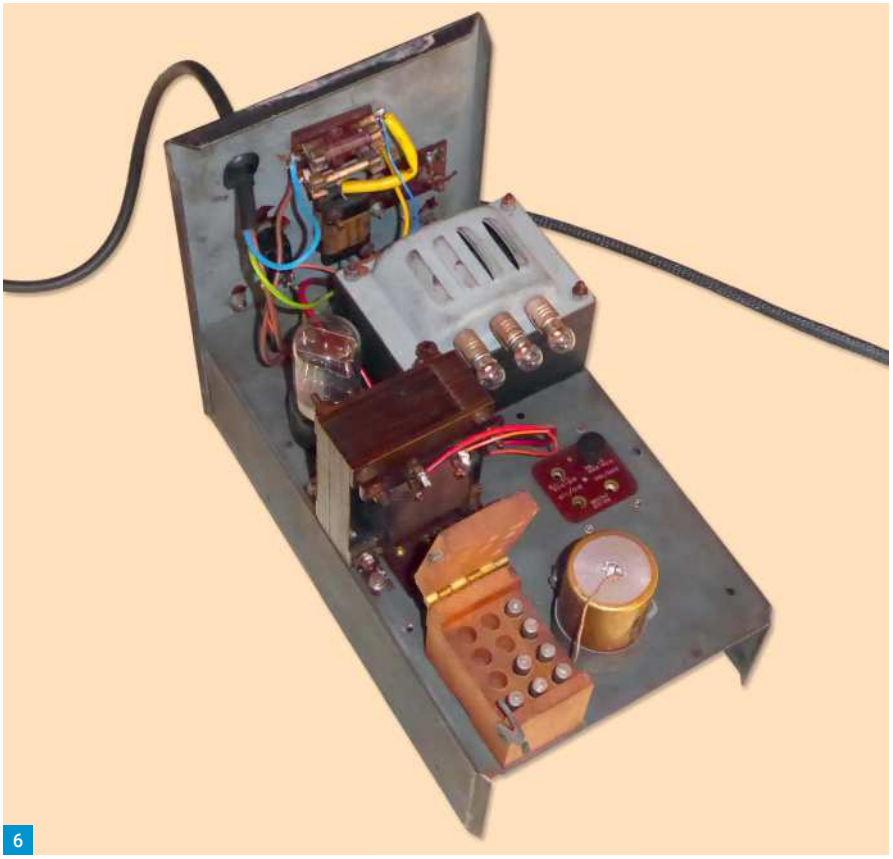

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Initial Evaluation

After ensuring that none of the perished wires were likely to cause trouble, I powered it up slowly with a Variac. If there were any seriously faulty capacitors, they would reveal themselves. All went well. The dial lights came on and after a short interval static could be heard, while with a short antenna Radio 4 could be heard faintly on Long Wave accompanied by some low frequency noise (motor-boating). There was no sign of activity on Medium Wave and Short Wave was completely dead. Poking around with the oscilloscope revealed the Local Oscillator (LO) signal on the grid of the Mixer Valve (V6: ECH35) on both Long and Medium Waves but nothing on Short Wave – possibly a dose of switch cleaner needed. I have a table of expected voltages on the valve bases and found some of these to be well out of specification. I also measured some of the wax paper and electrolytic capacitors: some were short and others of dubious value. A couple of the high value resistors were high.

Repairs

All the perished wiring in the PSU and the radio was replaced, **Fig. 7**. I decided to replace all the wax paper capacitors: mostly 0.1µF or 0.01µF and a couple of 0.02µF. Two 12µF electrolytics were replaced with modern 10µF capacitors. Some high value resistors were also replaced, see **Figs. 8**, **9** & **10**. Lots of pictures were taken to ensure that replacement parts were fitted correctly, Fig. 8. Upon powering up again all the voltages fell into place. Switch cleaner restored the LO on Short Wave. Attaching about 5m of wire to the antenna terminal brought a strong signal from Radio 4 together with activity on Medium and Short Waves. This was progress but I still had intolerable motor-boating on Long and Medium Waves, but not on Short Wave. I therefore, erroneously, concluded there was a fault common to Long and Medium Wave, I was even able to capture the fault on an oscilloscope. Hereby lies a cautionary tale for the unwary radio repair man! I spent a large part of two days trying to track down the mysterious motor-boating.

It was present at all stages, so I deduced that it was emanating from the first RF stage. I poked and prodded, checked voltages swapped valves around, all to no avail. Then at last the obvious, you've probably already guessed: disconnect the antenna and the problem goes away. The issue is external to the radio and is being picked up by the antenna. In my defence, the absence of motor-boating on Short Wave led me to believe that the problem was something to do with the wave changing switch, particularly for the first RF amplifier. Furthermore, other radios in the house picked

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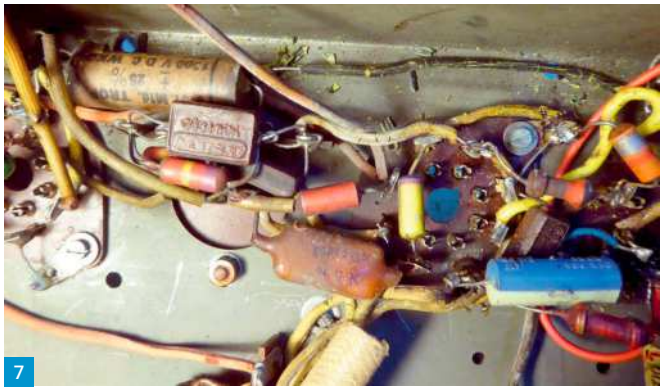
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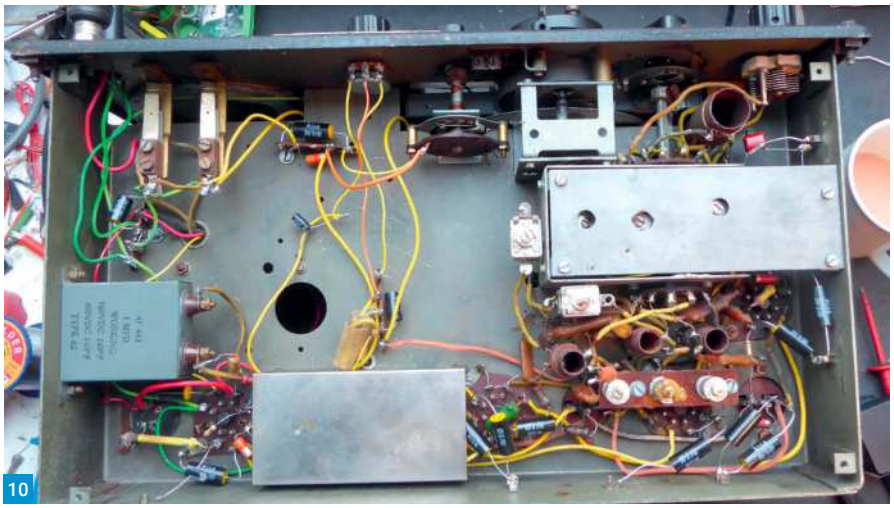
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up Radio 4 clearly. However, a big but, they were on VHF (FM). I took a portable radio tuned to long or medium wave and there it was, something being picked up from the local environment.

Walking from room to room failed to locate the source of the noise, but basic direction finding pointed me in a certain direction. We went outside and were able to pick up the noise for some 100 yards down the road before it faded. So, back home, turned off all power to the house and bingo, it disappeared! Cutting a long story short, turning on the circuit breakers, one at a time located the circuit containing the errant equipment, which turned out to be an LED yard light. Despite it being the middle of the day, of course, its circuitry was still active waiting for the sun to go down. Disconnecting the light and buying a better one solved the problem.

A final alignment check and peaking of the trimmers showed that the dial was accurate on Medium and Short Wave bands but was a bit high on Long Wave and fully unwinding the local oscillator beehive trimmer would not pull it down far enough, so a little less C was needed. The Long Wave local oscillator coil has a trimmer to ground in parallel with a fixed capacitor. What I needed to do was reduce the capacitance of the capacitor combination, but digging down through the rat's nest of wiring to the fixed ceramic capacitor was a bit daunting. It measured correctly, so I wasn't too worried about its value. I connected a small capacitor in series with the trimmer/fixed capacitor combination to the bottom of the coil and that brought the dial nicely into calibration with the trimmer approximately half meshed.

In Use

The set is a delight to use as a broadcast receiver for both national and international stations. It is simple and produces good quality sound. The dial spins very satisfyingly with a flick of the knob, the controls are simple and would have been ideal for its intended purpose. The tone control is not terribly effective but could probably be improved with judicious replacement of a couple of capacitors – *"what: modifications?"* I hear you say. So, mine has been 'modified' by fitting modern capacitors and some resistors. If I hadn't done so, it wouldn't work and I see no mileage in buying new, old stock, or second-hand period components that are as old as the originals and just as liable to failure. I know some people hollow out the old capacitors and fit modern replacements inside the old carcases. This way the unit is kept in working order while retaining its original appearance. I have done this with some museum equipment where originality was paramount.

In short, I love the PCR! It is amazing that these often overlooked radios played a significant role in the execution of the allied invasion of France. **PW**

References

1) Radio Londres plaque: Wikimedia Commons, original image by Wayne77.
2) Circuit diagrams drawn by Tor Marthinsen for the Norwegian "Hallo Hallo" magazine, no 142, May 2018, pages 28- 31: "The PCR Receivers again" written by Tore Moe Namsos.

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practicalwireless@warnersgroup.co.uk

1

The 'Dolphin' Straight Three

A splendid economy receiver, on modern lines, with many novel features. Cheaply constructed, it is extremely selective, and will reach out in an astonishing manner.

The most remarkable thing about this set is that in spite of the fact that it has not an "ode", "dyne", "stat", or any other fancy suffix, and probably because of its very simplicity, it yields remarkable results. Not only is it simple to operate and simple to build, but it is certainly cheap, up to date, and selective. I do not claim for it that it will do all that our Long Range Express will do, for that is a star set designed to satisfy the most meticulous home constructor. The difference between the two sets is that this will not give a greater output than about 230 mill-watts, and as such it is not suited for use in conjunction with a moving-coil speaker. With the speaker which we have selected, however, ample volume may be obtained, and I can- recommend its construction with every confidence. You will be amazed at the manner in which the set will reach out for a fair distance on to the Continent, for most of the foreign stations ordinarily required by the listener are brought in with a minimum of knob-twiddling.

Before proceeding with the description of the construction, a word or two about the cabinet is necessary. This is of Clarion manufacture, and, designed on modern lines, includes a complete slide-in frame upon which a frame aerial may be wound.

Certain modifications, of course, would be necessary to render the set suitable for frame aerial reception. This is a matter, however, we hope to deal with next week.

Owing to the minimum number of components included, the wiring will be found practically "fool-proof " and, finally, owing to the limitation in the number of control knobs, the tuning-in of stations will also be found "foolproof "; and, finally, owing to the type of intervalve couplings which have been included, the quality of the reception will satisfy even the most critical listener.

The first inter-valve coupling includes, besides the usual L.F. transformer, two additional components, which remove a certain amount of external wiring. In addition; the method of connection employed in the component enables a high standard of quality to be obtained.

The coil includes a wave-change switch, an on-off switch, and a variable selectivity (or volume control) device. These three controls are combined in the one knob. It will be seen, therefore, that although the circuit consists of the rather orthodox detector and 2 L.F. arrangement, there are sufficient novel features included in the receiver to warrant its inclusion in a new periodical in the year 1932.

Construction

Having described the special features of the receiver, we may now get down to the description of its construction, and even the beginner will find no difficulty in following, the instructions given below.

First of all lay out the various components on the baseboard in the positions shown in the wiring diagram. Note the arrangement of the two inter-valve couplings before screwing them down, so that the wiring will be correctly carried out without, for instance, having to remove one of the transformers and turn it round. It is little points like this that sometimes make the construction of a receiver irksome. Do not drive in a single screw until you are quite certain that each component is in its correct position, and the right way round. In this particular receiver all the components may be screwed down before any of the wiring is carried out. Note that a small hollow must be

We reproduce a constructional article from the very first issue of PW, by F J Camm himself. Clearly the team had been busy before launch, generating a number of tried and tested projects.

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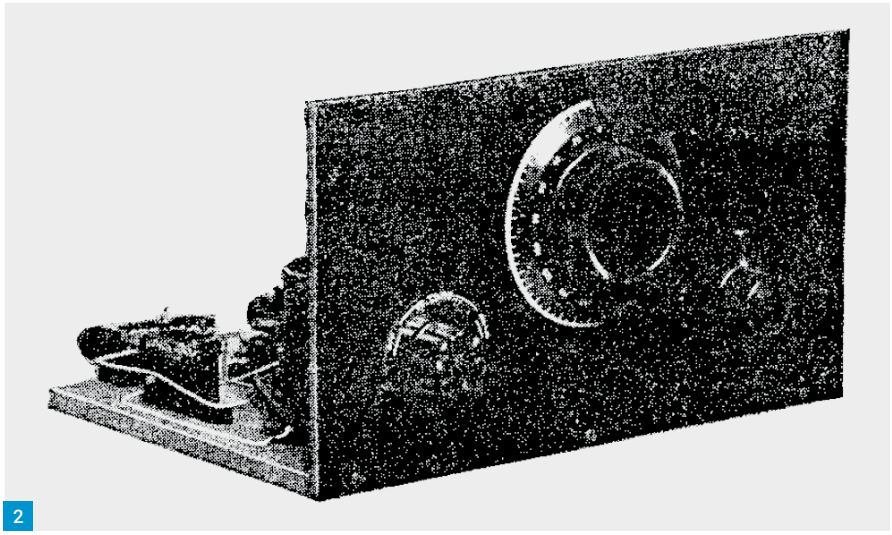
Fig.1. The set is housed in a cabinet constructed on modern lines, including a sliding frame, space for speaker, batteries and accumulator. Fig. 2. A three-quarter front view of the panel and baseboard. Fig. 3. A drilling diagram for the front panel. Fig. 4. A three-quarter front view of the set showing the attractive lines of the cabinet, and the operating controls. Fig. 5. A rear view of the set showing the fillet supports for the baseboard and the roomy compartment for the speaker and batteries. Fig. 6. The wiring diagram of the 'Dolphin' Straight Three. Fig. 7. The circuit diagram of the 'Dolphin' Straight Three.



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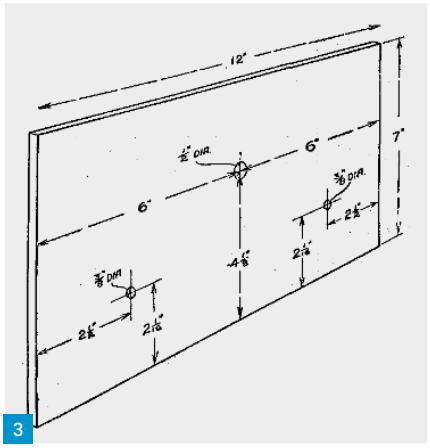
filed in the lowest portion of the terminal block carrying the pick-up terminals. This hollow should be just large enough to hold the battery cords firmly in position. Mark out and drill the panel in accordance with the panel lay-out, and then attach the two condensers by means of the fixing bushes. No problems of any kind should have arisen so far, and the receiver is now ready for wiring, a process which will take a little longer than the previous part of the work, and one which will require just a little care, although it will not be found actually difficult.

Wiring

In any receiver it is always preferable to wire up in a. systematic manner rather than by just putting in a wire here, and then another wire there. Personally, I have always adopted the procedure of wiring low potential parts first, then wires carrying high voltages, and so on. I would therefore suggest that the same idea be carried out in this set, that is, wire the filament leads first, then the leads to grid and plate terminals, and so on; as each wire is put into its place, cross out the corresponding wire on the wiring diagram. By working in this fashion one is assured of putting each wire in its correct position, and when the job is finished.no wires will be found to have been omitted or put into the wrong position. Note that one terminal on the transcoupler is not used in this particular circuit arrangement.

Testing Out

When the wiring is completed, plug a Mullard PM2DX. valve into the detector valve-holder, that is the one in front of the tuning coil ; a PM1LF into the next holder, and a PM 2 into the remaining holder. A 2-volt accumulator is used with these particular valves, and the two L.T. leads should be joined to the positive and negative terminals of the accumulator. The H.T.1 lead should be plugged into the 90-volt tapping on the high tension battery, and H.T.2 into the.120-volt socket. The grid bias. is also a critical adjustment, and the valves recommended by the valve-makers for the voltages applied in this particular circuit are



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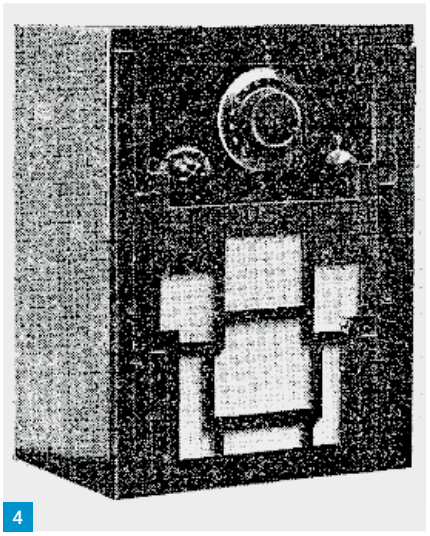

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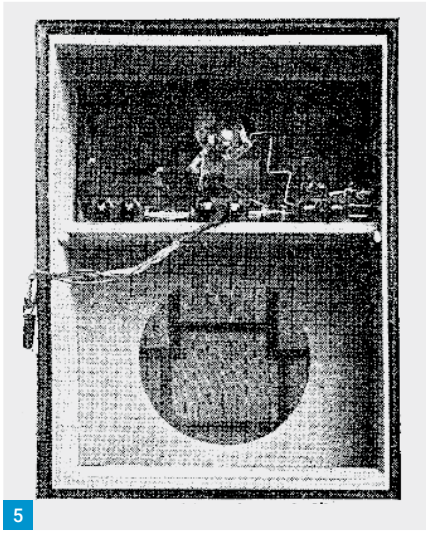

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4.5 volts for G.B.1 and 9 volts for G.B.2. By using these values you will be assured of quality and long life to the valves. Attach a loudspeaker to the L. S. terminals and you are ready to tune in. The knob on the left of the panel should be turned as far as it will go to the left when the set is not in use.

In this position the -valves are turned off. Now turn this knob a few degrees to the right and the receiver is switched on, and is in its most selective condition, which means, of course, that signals will be at their weakest. Rotate the centre dial, which will enable you to tune to various wavelengths, and you should soon be able to hear your local station, which you will find will only occupy a very small space on the tuning dial. You may be in. a good district, and be able to hear two or three stations with this particular setting of the first dial, and without the use of the third or right-hand dial, This controls the. reaction condenser and serves to increase the strength of the stations. Having rotated the tuning dial to the end of its scale, advance the left-hand dial a few degrees farther to the right, and again run round the tuning dial. You will find now that other stations are audible owing to the increased coupling afforded by the aerial coil.

When the left-hand dial is rotated completely to the right the receiver is automatically tuned to the long wave band, and Daventry, Radio-Paris, Hilversum, and other long-wave stations will be heard.

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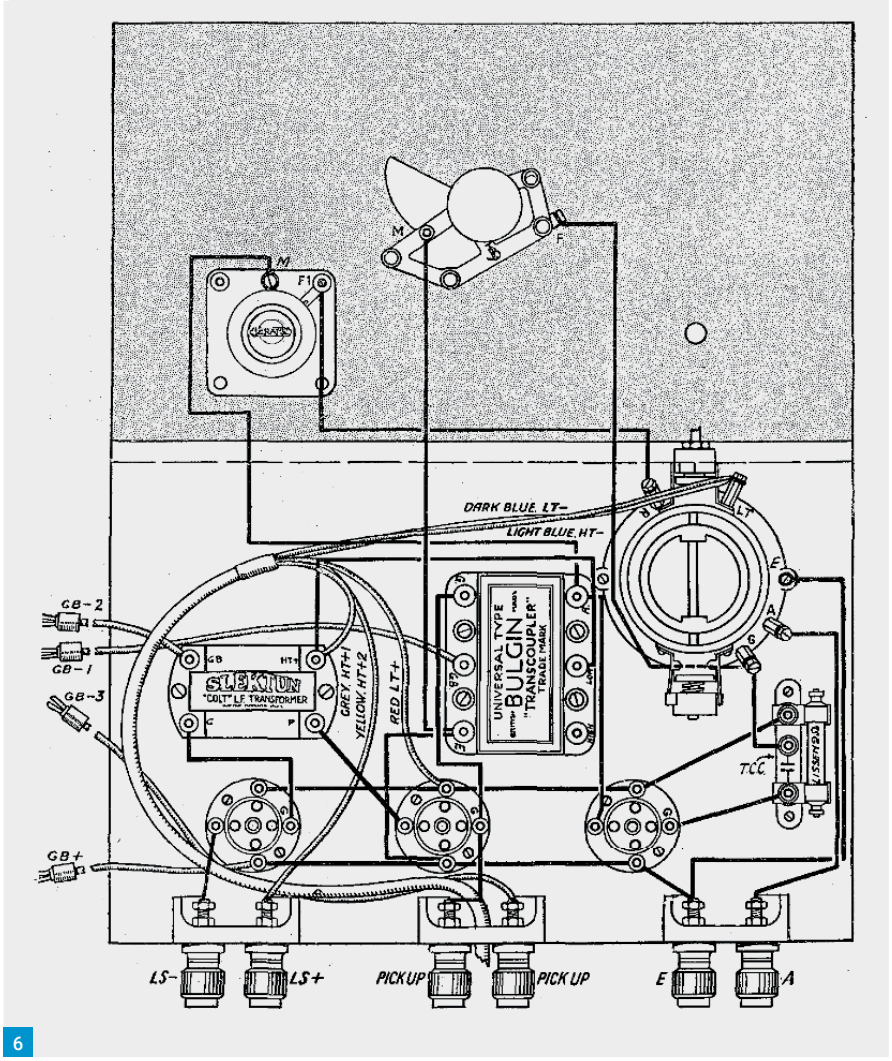
Specification for The 'Dolphin' Straight Three

- 1 Ready Radio Dual-range Coil Unit
- 1 Jackson Bros. J.B. .0005 mfd. Variable Condenser, mid-log line, with slow-motion dial.
- 1 Igranic .00015 mfd. Reaction Condenser.
- 1 Bulgin Transcoupler.
- 1 Slektun Colt 5-1 L.F. Transformer.
- 3 W.B. 4-pin Valve-holders.
- 1 T.C.C. .0002 mid. Fixed Condenser, three-terminal type.
- 1 Lissen 2-meg. Grid Leak.
- 3 Belling Lee Terminal Mounts.
- 6 Belling Lee Terminals (Aerial, Earth, Loud-speaker +, Loudspeaker -, and Two Pick-up).
- 1 Belling Lee 5-way Battery Cord.
- 4 Clix Wander Plugs, G. B. —, G. B. --- 1, G.B. — 2, G.B. +.
- 1 Permcol Ebonite Panel, 12in. by 7in.
- 1 Wooden Baseboard, 12in. by 8in.
- 2 Bulgin Panel Mounting Dial Pointers.
- 1 Coil Lewcos Glazite.
- 1 "Motor " S.40 Super Power Unit with Cone.
- 3 Ever Ready 2-volt 40 ampere hour L.T. Accumulator.
- 2 Ediswan 60-volt super-capacity H.T. Batteries,
- 1 Lissen 9-volt grid bias battery.
- 3 Mullard Valves, PM2DX, PM1LF, PM2.
- 1 Clarion " Dolphin Three " Cabinet.



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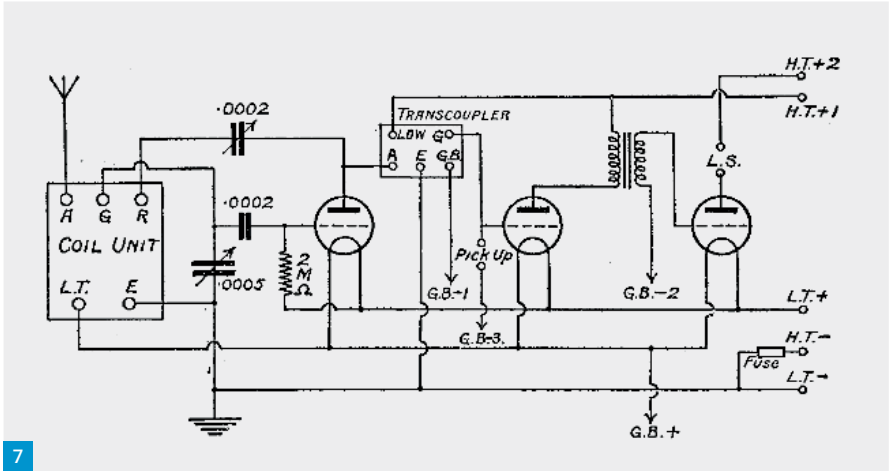
On the normal waves, in order to listen to some of the weaker foreign stations which transmit on a wavelength rather close to our own high-powered stations, a balance has to be struck between the left-hand knob and the right-hand one.

In other words, the selectivity has to be increased to enable the station to occupy a very narrow band on the dial, and this naturally reduces the strength. Then the reaction control has to be employed to build up the strength again, and in this way it is possible to bear such stations as Langenberg, for instance, without. any background. from the Northern Regional.

If you are situated very close to one of our main stations, you may find it advantageous— from the point of view of avoiding distortion due to overloading to use, in place of the P. M. valve. a larger power valve such, for instance, as the P.M. 202, or even the P.M. 252.

With these valves a greater output. is naturally obtainable, but it must be borne in mind that the high-tension consumption will be increased and this will destroy one of the features of this receiver--economical running.



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It. will be noticed that two pick-up terminals are provided in the centre of the baseboard. The bias lead from one of these terminals must be inserted into the grid battery at about 6 volts. whilst the other terminal is joined in the receiver to the grid terminal. When the pick-up is in use, the control knob on the coil unit. must be turned to its most selective position — that is, just as far as the first marking on the selector scale There will then be no risk of the wireless programmes being heard in the background. If the pick- up is very sensitive, a volume control will have to be used to reduce the output from. the pick-up to a level which can be safely handled by the P.M.1.L.F. Do not forget to rotate the left-hand knob to switch off. **PW**

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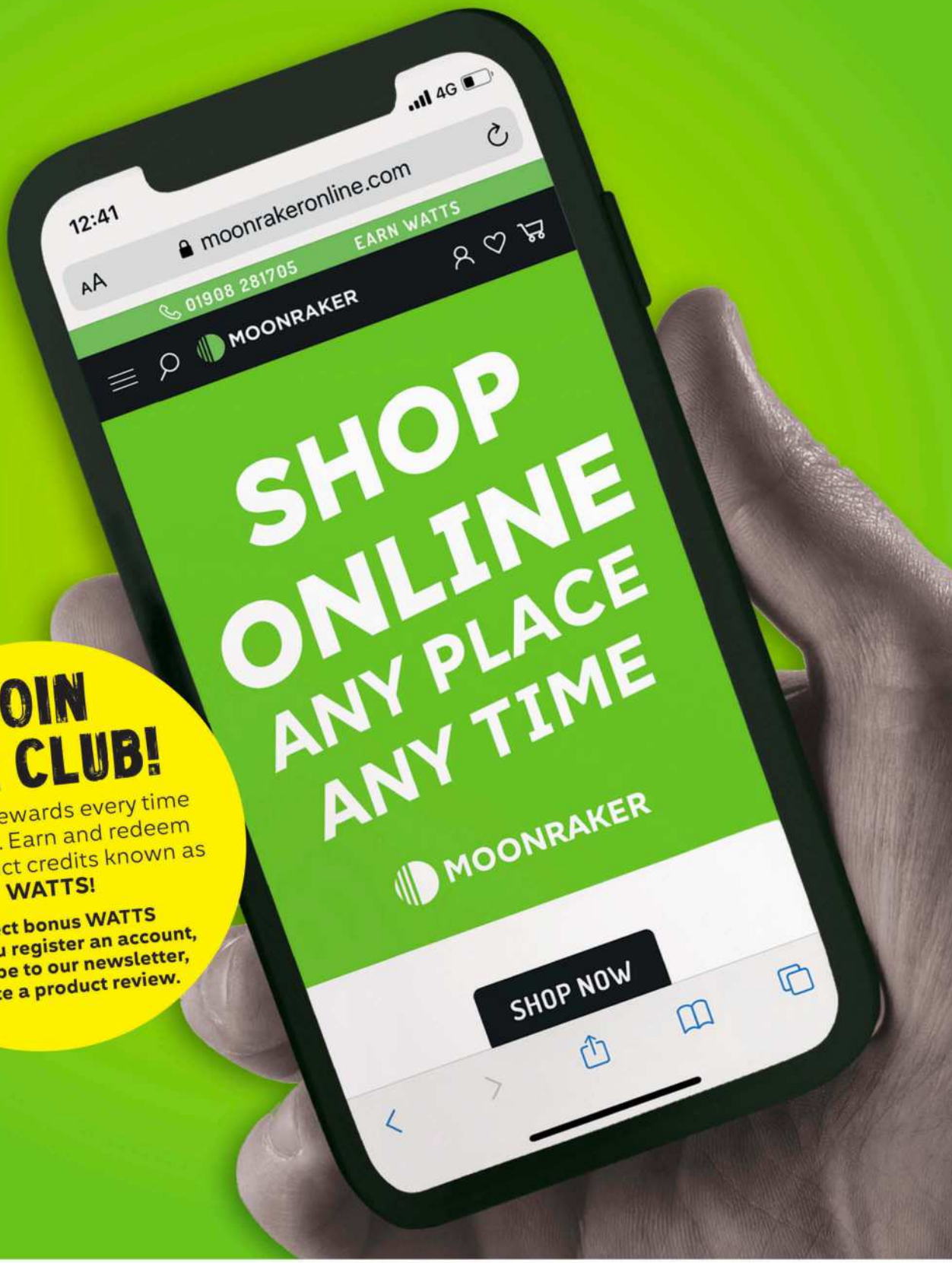

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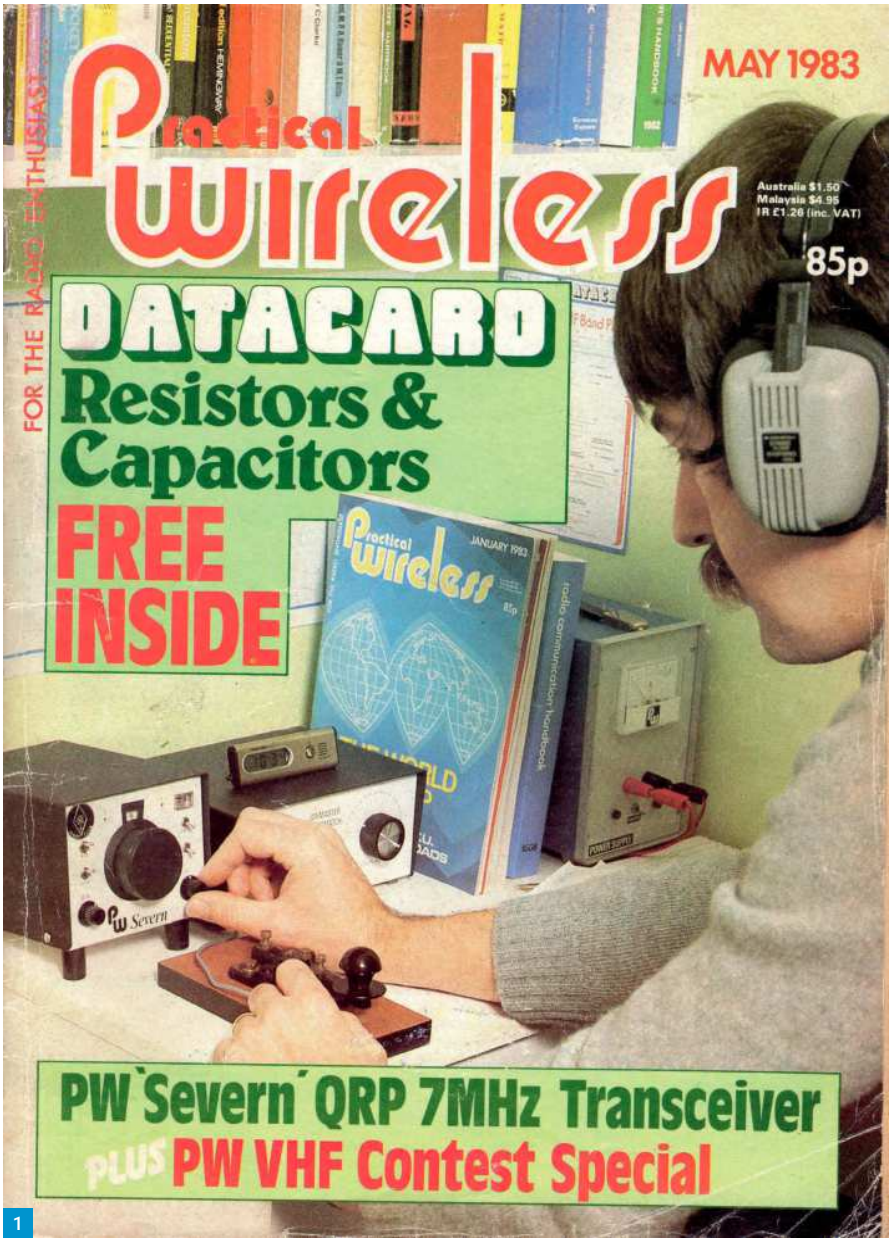

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How One Edition of PW Changed my Life

In response to our request for PW 'stories', **Steve Hartley G0FUW** explains how one edition of PW set out his course through amateur radio.

I have been licensed for nearly forty years (where does the time go?). In that time, I have operated from four different Main Station addresses, numerous portable locations, up mountains, on islands and overseas. I continue to enjoy amateur radio and hope to do so for a good number of years to come.

I can point to two events that set me on that course. The first was when a work colleague introducing me to (illegal) CB radio; I was fascinated and enjoyed many hours operating and socialising with other CB operators. The second was when I picked up *Practical Wireless* during a wet camping bank holiday weekend in May 1983, **Fig. 1**.

An article in that edition of *PW* made me realise that I *could* become a radio amateur. You see, I had convinced myself that I was not smart enough to pass the City & Guilds Radio Amateurs Examination (there were no Foundation or Intermediate steps in those days) and there was no way I could afford to buy any equipment. How did one article do that?

To set the scene, there were many radio amateurs who also operated on the 27MHz Citizens Band and I was continually being encouraged to 'step up' to amateur radio. I had a few O-levels (GCSEs) in science and maths but my impression was that you had to be a bit of an electronics wizard to get an amateur radio licence and I doubted my ability.I also paid a visit to a local amateur radio shop (in Bolton, as I recall) and discovered that a 'basic' radio was nearly £300 and I was earning £36 a week at the time. With a small family, it was clear that I could not afford the much-coveted Yaesu FT-290 2m multimode.

So, back to the wet weekend and a visit to WH Smiths in Keswick. I had purchased the odd copy of *PW* and *Short Wave Magazine*, in my attempts to get my head around amateur radio, and the latest *PW* was purchased for something to read while sheltering from the awful Bank Holiday weather.

The cover photo related to the *PW Severn* project, a 40m CW transceiver that you could build yourself, in stages, and it would not break the bank. The author, the **Reverend George Dobbs G3RJV** (now Silent Key), wrote in such a way that he made you believe this was achievable, without masses of elaborate test equipment, and his descriptions included enough technical information to make it understandable, without going too far into the theory. This was practical, hands-on learning and it grabbed my attention.

In sharing my renewed interest in amateur radio, I was helped by some of the CB gang who were also licensed amateurs. I joined the G-QRP Club, studied for and passed the Radio Amateurs Exam and built the *PW Severn* as I learned. I also learned (a lot) from building the radio. The project presented several challenges; George was extremely helpful in correcting my mistakes and pointing me in the right direction.

My *PW Severn*, **Fig. 2**, has been hacked about over the years, repaired modified, and used on-air. The aluminium case, the VFO, the changeover/sidetone board and the SWR

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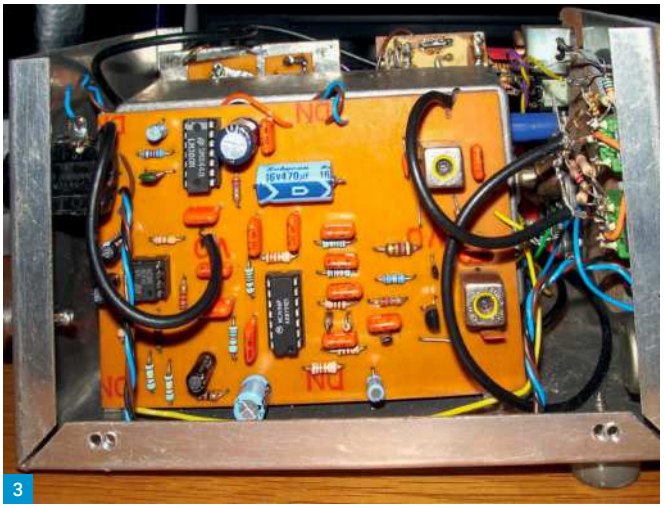
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indicator are all still the originals. The receiver board was replaced with a kind-of Heathkit HW-8 clone, **Fig. 3**, and the transmit board was replaced with one borrowed from another G3RJV *PW* project, the *Teme,* **Fig. 4**. It still needs a decent frequency display; over the last 30 odd years. I have often joked that my *PW Severn* was started in 1983 and it is *nearly* finished.

Following my initial correspondence with George, I came to know him quite well, **Fig. 5**, and had great pleasure in helping out with the G-QRP Convention Buildathons.

In 2018 was totally gobsmacked, and honoured, when I was asked to become the Chairman of the G-QRP Club, a post I continue to hold today. In my own small way, I hope to inspire others to, as George often advised, 'pick up your soldering iron, and begin!'

So you see, if it had not been for me reading that particular edition of *PW* that wet bank holiday weekend, I may never have become a radio amateur, never discovered homebrew, never known George and never even knew the G-QRP Club existed. Thank you to all who have been involved in *PW* over the years, and long may it continue! **PW**

Fig. 1: PW Front Cover. Fig. 2: G0FUW's PW Severn. Fig. 3: The replacement receiver board. Fig. 4: The changeover and replacement transmitter board. Fig. 5: Steve with George Dobbs at the 2015 Rishworth Convention.

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The Face behind the Call

This month you are invited to meet Mike Isherwood G4VSS.

Roger Dowling G3NKH
practicalwireless@warnersgroup.co.uk

Whatever your experience and knowledge, and however deep or shallow your pockets, radio amateurs are lucky to have a hobby that is accessible to all. At one end of the spectrum is a newly-licensed beginner; at the other, the experienced amateur who has done it all but is still finding new areas to explore.

I was particularly looking forward to meeting Warrington-based **Mike Isherwood G4VSS** as I knew that he was definitely in the latter category. I also knew that he was a keen educationalist always ready to pass on his knowledge and experience: not surprisingly he is a regular club speaker on amateur radio topics.

Born in Lymm, Cheshire, Mike, **Fig. 1**, had a slightly unusual introduction to the world of amateur radio. As a 13-year-old youngster he often found himself unwillingly accompanying his parents who were friendly with a couple living in the nearby village of Thelwall. Like most teenagers, he found these visits excruciatingly boring – until one day he made an exciting discovery.

"I noticed a shiny box on a table with a microphone next to it which looked rather interesting", Mike recalled. The owner of the 'shiny box', who turned out to be **Mike Wyse G3IWE**, offered a quick demonstration by proceeding to put out a CQ call on 80m and engaging in a friendly conversation with someone in the south of England. *"Wow, I've got to get some of this!"* thought Mike and the bug started to bite.

He soon discovered that there were a number of licensed amateurs in the Warrington area and to his delight (though no doubt to the dismay of his parents) found himself the willing recipient of an impressive array of cast-off radio equipment.

Mike also bought himself an R1155 receiver (without which no shack was complete in those days) and a Geloso VFO that he could use as a converter. He also started building VHF and UHF converters and in due course had a 50ft mast in the garden together with beams, a rotator and various long wires.

Licensed Amateur

College and work pressures meant that it was some time before Mike was able to become a licensed amateur himself, but in due course he decided that he was ready to consider taking his Radio Amateur Examination. Not being quite sure of the normal procedure, he took the somewhat unusual step of ringing Manchester University – with surprising results. Not only did the university offer the examination but the lady who answered the phone even offered to pay herself for the papers to be sent up from City & Guilds, for later reimbursement. *"She couldn't have been more helpful"*, said Mike. *"It transpired that she had a radio amateur who rented a room in her loft, so she knew all about the hobby!"*

With the help of the tail-end of a course at the Mid-Cheshire Amateur Radio Society, with whom he particularly remembers enjoying a number of VHF Field Days, Mike took his RAE at Manchester University and became the proud owner of Class B licence G8PVF in 1977. In due course he taught himself CW, took his test at Liverpool BT headquarters and became G4VSS in 1982.

American Call

I was intrigued when Mike told me that he also held the call KW4CN and wondered how that had come about. He explained that it arose from his interest in education and a belief that it was good for the hobby to keep abreast of the latest developments. How better than to study for an examination? Clearly, having passed the RAE once it was not realistic to take it a second time, so Mike hit on the idea of taking the American Federal Communications Commission (FCC) examination, which is open to radio amateurs all over the world in addition to those in the US.

"So, one year I spent the whole of a holiday abroad swotting up on the latest technologies and procedures in radio", he recalled. *"Then I took the FCC examination at the RSGB Convention at Milton Keynes and passed! I'm pleased I did it, because it then encouraged a number of members of our Club to do the same thing. It's been a valuable reminder to us all that we're still learners even if we regard ourselves as long-time experienced amateurs"*.

A follow-up to Mike's interest in the US exam was that he subsequently took a further online examination, which enabled him to become an active volunteer examiner for the US test here in the UK.

Mike has always been a keen DXer and is a member of CDXC (the UK DX Foundation, previously the Chiltern DX Club), which was set up in the 1980s by a small group of DXers based in the Chilterns and has now become one

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Fig. 1: G4VSS at his home QTH. Fig. 2: Antennas. Fig. 3: Adjusting position of the low noise block (LNB) of his 1.1m satellite dish. Fig. 4: Footprint of QO100 amateur radio satellite.

of the largest and most respected DX groups in the world. Mike has helped to fund a number of DXpeditions around the UK and elsewhere.

He also retains an interest in CW as a member of the International Morse Preservation Society (FISTS CW Club). This was founded in 1987 by the late **George 'Geo' Longden G3ZQS** of Darwen, Lancashire, who recognised the need for a club in which veteran operators could help newcomers and less-experienced operators to learn and improve their CW proficiency.

Digital Radio

Digital radio in its various forms has also been an interest of Mike's over the years. Back in the 1970s and 1980s Mike was a committee member of the North-West Packet User Group and ran the packet node WARR bringing the Cluster to the Warrington area long before the age of the internet. Later, with **Mike Mansfield G6AWD**, he developed a satellite store-and-forward packet mail system on the now-defunct low orbit Fuji-Oscar 29 satellite. Moving to the present day, he is keeper of the GB7WC 70cm D-STAR repeater on the Daresbury Tower in Cheshire, one of the first such repeaters in the UK.

Antennas

Like most radio amateurs, Mike has always taken a keen interest in antennas, **Fig. 2**. Out in his garden a substantial mast carries an impressive number of arrays, the largest of which is a five-element Yagi for 6m, rotated by a KR40C Kenpro rotator. For 23cm, there's a 35-element Yagi and a collinear for 2m and 70cm. The mast also supports the ends of a ladder-fed dipole for 80m and a loaded dipole for 40m and 20m.

Down at ground level, a 1.1m diameter satellite dish, **Fig. 3**, is evidence of Mike's current interest in amateur satellite communication using Qatar-Oscar 100 (QO100), the geostationary satellite launched from Kennedy Space Station in November 2018. It is no exaggeration to say that QO100 has transformed amateur communications in all modes within its vast footprint, which covers almost half the globe, **Fig. 4**. It carries two amateur radio transponders: a narrowband SSB/CW transponder and a wideband transponder for digital amateur television and other high bandwidth modes. The uplink is in the 2.4GHz band and the downlink is on 10GHz.

Digital Amateur Television

Returning indoors, Mike took me on a quick tour of the wide range of gear at his station. His two principal receivers are an Icom IC-6100 base station covering HF through to 23cm and an Icom IC-9700 VHF/UHF/1200MHz transceiver with real-time spectrum scope and waterfall. For his QO100 satellite equipment, he is quick to pay particular tribute to the British Amateur Television Club (BATC), which has developed a wide range of specialist gear, for which BATC can supply the necessary components. At the heart of the system is the BATC 'Portsdown' touchscreen transceiver, which uses a Raspberry Pi (RPi) computer running a BATC-customised version of the Rpidatv software originally developed by **Evariste Courjaud F5OEO**. Associated with the Portsdown unit is an Adalm-Pluto transmitter and either a home-built 'Winterhill' 4-channel satellite receiver (named in

memory of the late **Brian Pugh G3SMU** who lived near the Winter Hill transmitter in Lancashire) or a 'Minitourner' receiver developed by **Jean-Pierre Courjaud F6DZP**. *"The great thing about this satellite equipment is that the parts from BATC are largely supplied for home construction or home assembly"*, said Mike. *"I feel that's very much in keeping with the spirit of amateur radio."*

An Amateur Radio Family

Mike's ongoing enthusiasm for amateur radio is such that it came as no surprise to me to learn that he is not the only member of his family to be licensed: his wife **Carmel** is **M3CFI** and grown-up children **Emily** and **Joseph** are **M3FIY** and **M3FIW** respectively.

A keen supporter of amateur radio groups generally, Mike is currently President and a former Chairman of his lively local Warrington Amateur Radio Club and is Chairman of the Northern Amateur Radio Societies Association which organises the North-West's largest annual rally at the Norbreck Castle Hotel in Blackpool.

While himself aways seeking new technological challenges, he is never happier than when helping others to get the most from the hobby.

You could truly call G4VSS a radio amateur's radio amateur. **PW**

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Antenna Relay Switching Unit

David Allen G8LHD has a design for an Arduino-based antenna switch.

David Allen G8LHD
practicalwireless@warnersgroup.co.uk

Amateur radio has changed significantly over the years with many new digital modes to experiment with and for class B licensees such as myself returning to the hobby, a lot more frequencies available from 4m through all the HF bands. Getting on the air and working the bands has never been easier with the so-called shack-in-a-box, multimode, multiband SDR rigs of today.

What hasn't changed though is the requirement for a suitable antenna farm (My garden's beginning to look like one) to work the bands, which means a lot of coax feeders potentially coming into the shack. To keep things tidy and manageable, what's needed is a simple way of identifying and selecting the appropriate antenna to connect to the rig and using relays to connect the appropriate feeder into the shack.

This is what inspired me to design an antenna switching control unit based around an Arduino NANO module, a 2-line 16-character LCD display and an open collector current sink relay driver IC to control up to six external relays with future proof built in to extend this up to nine.

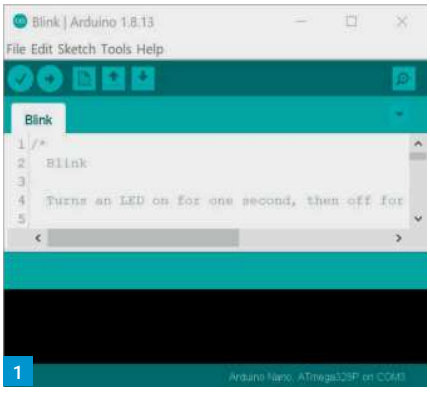
Outline Specification

- Six switched open collector ports capable of sinking 500mA.
- Control via single momentary toggle switch.
- Two-line x 16-character LCD display. First line used for station callsign + Maidenhead locator, second line displays the antennas description/band.
- Relay power save feature to reduce relay current (and heating) of the selected relay after latch on.
- Power-on recall of last setting/selected antenna.
- Expansion capability to drive a further three external relays with a second part-built board.
- Supply from 13.8V rig SMPS.

The first line of the LCD display is used to show the station callsign followed by the Maidenhead locator reference, very handy when contesting. The second line of the display shows the user's description of the selected antenna. Changing between different antennas is by means of a simple toggle switch, centre off and momentary up/down. This changes the page address in software and rewrites a new description while at the same time reconfiguring an output driver IC to switch the appropriate relay assigned to that antenna.

As the antenna switch is controlled in software it also becomes quite easy to add a power save function to prolong the life of the relays. On changing the antenna selection, the power supply to the relays is set to 12V, this falls to a much lower standby voltage after a suitable delay in hardware (R/C time constant). Creating a long delay in hardware is advantageous as it doesn't prolong the software code runtime monitoring the status of the antenna switch input.

Settings of the unit are saved to internal EEPROM so that if power is lost or the unit is switched on after a period of inactivity, the same settings are reloaded and thus the same antenna as when last used.



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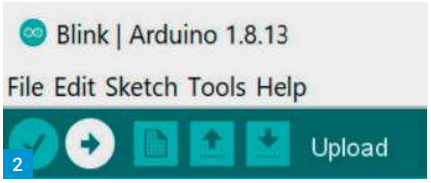


Fig. 1: Blink Example. Fig. 2: Upload Button. Fig. 3: Schematic of Arduino NANO interface to relay driver IC. Fig. 4: Power Supply schematic. Fig. 5: Arduino Sketch [code] flowchart. Fig. 6: 3D rendering of board mounted in enclosure. Fig. 7: Board mounted in enclosure; rear panel omitted for clarity. Fig. 8: Top PCB assembly drawing. Fig. 9: Bottom PCB assembly drawing. Fig. 10: Completed PCB assembly ready to slide into the enclosure. Fig. 11: Front panel of Hammond box. Fig. 12: Rear panel drawing Hammond box. Fig. 13: Hammond box base panel drawing.

For those of you unfamiliar with the Arduino NANO it is a complete microprocessor with user-defined I/O (input and output) pins, an I2C bus and a USB interface, all on a single small board. On its own it's just a dumb terminal waiting for the user to upload code, i.e. software, to configure the ports and tell it what to do. To give it some intelligence we need to upload code to it, but first we must install the open-source Arduino IDE programmer available from the Arduino website. Options for windows-based systems or Apple Mac OS are available. In the 'SOFTWARE' tab at the following Arduino Home page select the download compatible with your system:

www.arduino.cc/en/software

At the time of writing Arduino IDE version 1.8.19 is available. Once installed I suggest you test the connection by hooking up an Arduino NANO board via a USB cable to your PC. For those using Windows 10, follow this procedure:

In Windows 10, go to 'Start' and select 'Arduino' this will start the IDE interface software.

Now go to ***File***, ***Examples, 01.Basics,*** and select ***Blink*** example as in **Fig. 1**. Make sure the NANO board is plugged into a spare USB port, it will take its power over the USB bus.

In Tools tab select from the drop-down menu,

Board, select 'Arduino Nano'

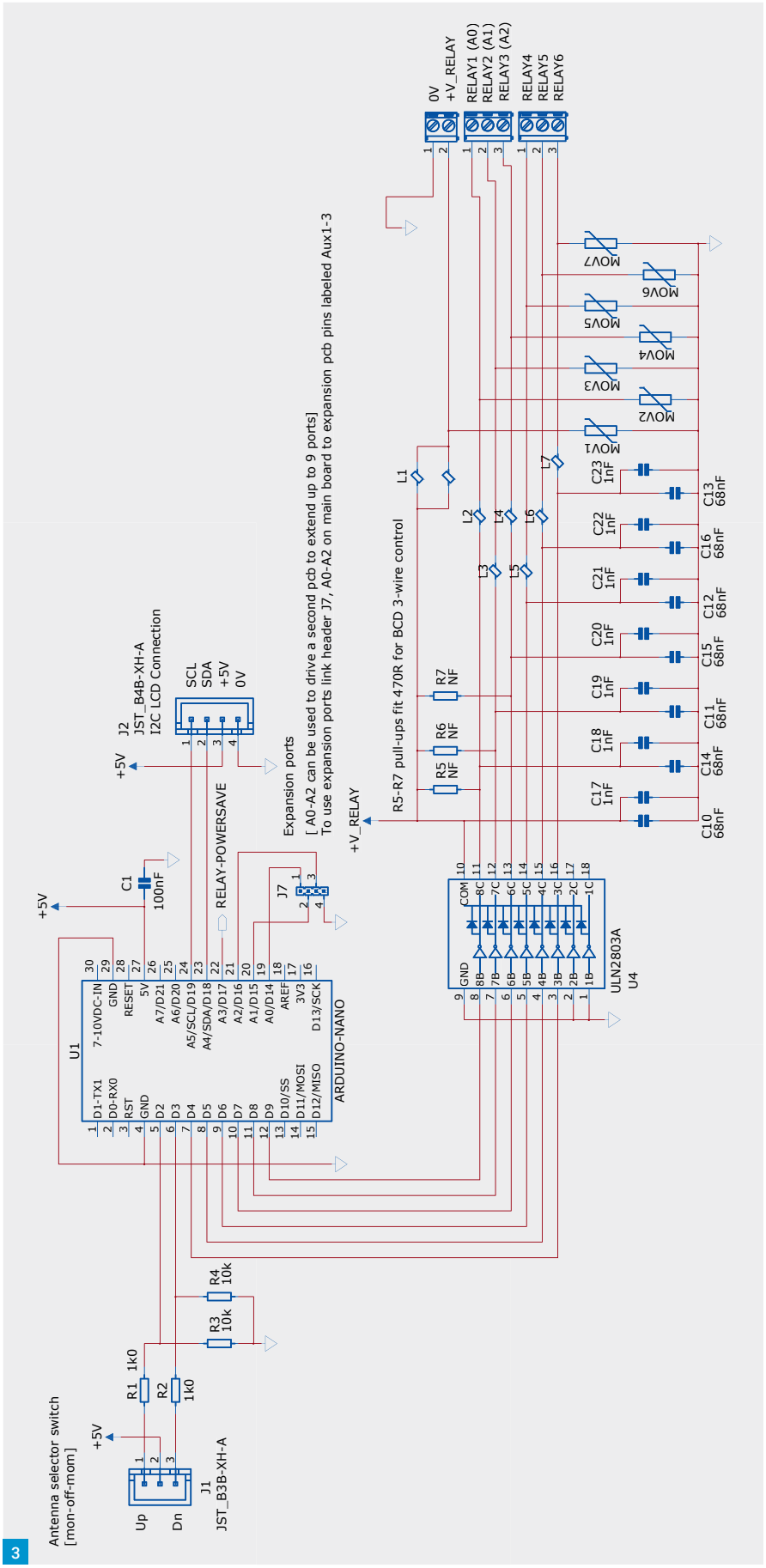
Processor, select 'ATmega328P'

Port, select COM port (the host PC USB port).

Programmer, AVR ISP

You can now Upload the simple sketch to your Arduino NANO board by pressing the upload button shown in **Fig. 2** (Hover the mouse over the buttons and the function is shown to the right of the buttons).

In the Blink sketch you can change the delay timer of an on-board LED. By changing code lines 34 and 36 delay(1000); enter a different number and the LED blinking rate will change. The



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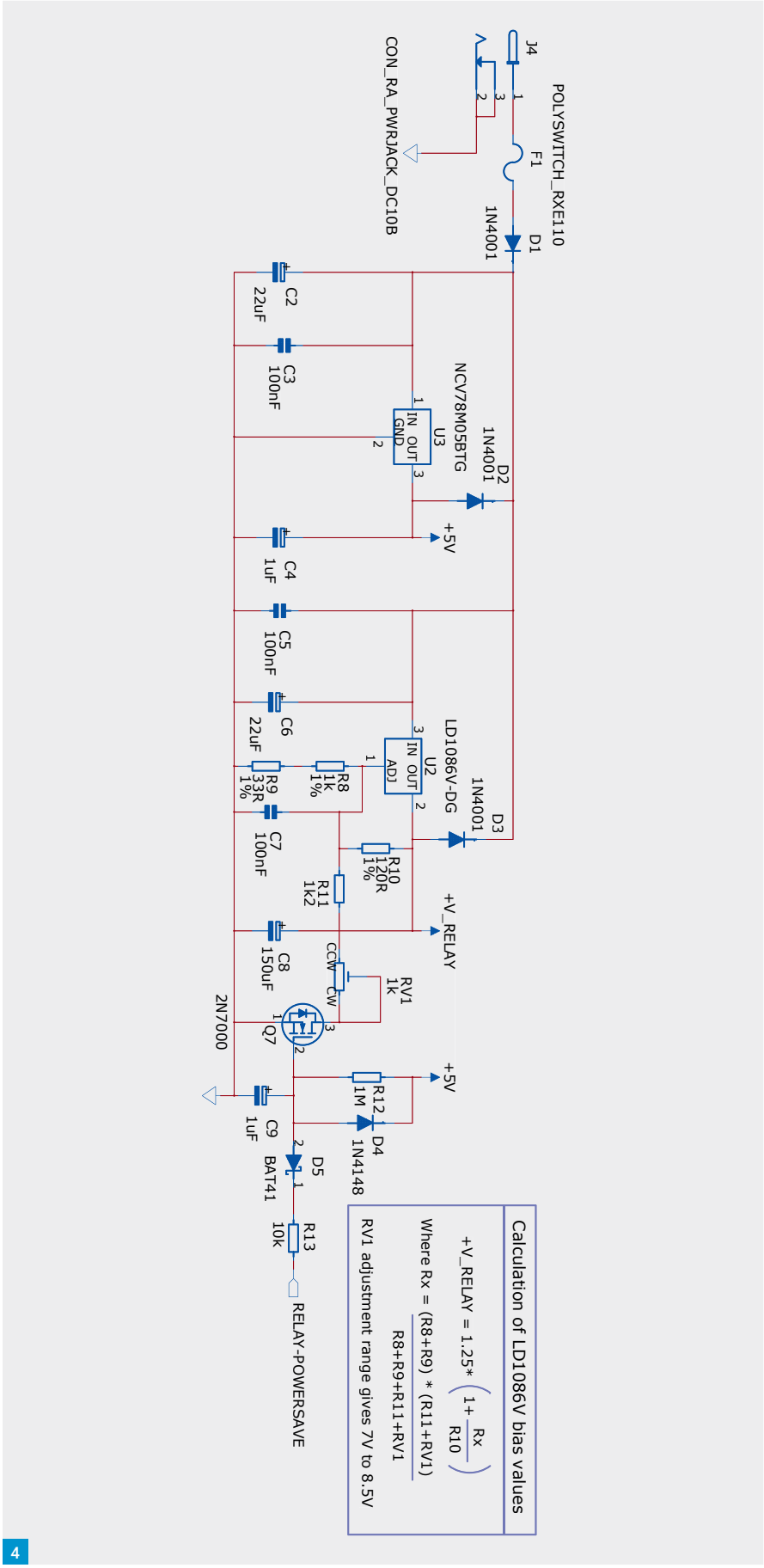

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numbers are in milliseconds so halve the number and see what happens. Be careful, playing with Arduino sketches is quite addictive.

If you get error messages, it's usually because the wrong COM port is selected. You may find more than one available in the above procedure. It's also worth a note that if you purchase an Arduino NANO board off the web, I would only buy from sources that provide the module with what's called 'Bootloader' pre-installed.

Without the 'Bootloader' the Arduino IDE software won't talk to the NANO board. This is not the end of the world but a bootloader procedure has to be followed to get the cheaper NANO copies to communicate with a PC.

Back to the Project

You don't have to worry about writing code or learning C/C++ to try this project, the code is all prepared for you. All you have to do is open the sketch that contains the code and change a few descriptive lines between quotation marks "" using the Arduino IDE software.

However, a precondition is required, writing to an I2C LCD display requires an additional library to be installed into the Arduino IDE.

Download LiquidCrystal_I2C zipped library from GitHub:

https://tinyurl.com/3yp2xx2r

install in Arduino > libraries > new folder 'LiquidCrystal_I2C'

After placing in folder run Arduino IDE software, Sketch > Include Library >, Add.ZIP Library, and finally reboot Arduino IDE software after library installation. A full tutorial on library installation is available from the Arduino website here:

https://tinyurl.com/2u5b28db

The Arduino NANO board port functions are all silkscreened on the board so it's easy to hook-up on a 'Vero' stripboard if preferred. Arduino NANO ports D2 and D3 are used to detect a change of page request in software and switch debounce is taken care of in the CPU code. An external I2C LCD display is connected to the serial clock and data ports (SCL/SDA) together with 5V power and ground on header connector J2. This is to connect an external 16-character x 2-line LCD display with backlight with I2C interface board (usually supplied as a pair). The relay driver is a ULN2803A Dip18 package IC. This has protection from flyback voltages when switching inductive loads via internal diodes. However, as these relays may be remote from the shack, I suggest you mount both a diode and an MOV (Metal oxide varistor transient suppressor) across each relay coil. In the configuration in **Fig. 3** it will drive six external relays and sink up to 500mA on each port. Should you have an unusual configuration of relays where more than one is required active at any one time, this can be set up in the code. Each external port is

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suitably filtered with 2012 (0805 in old money) chip Ferrite beads and RF decoupling capacitors, plus an MOV protecting each port. The filtering function is twofold, to stop unwanted localised RF radiation from our station affecting the unit but secondly to filter any possible clock source from the Arduino NANO radiating out of the box and causing local interference in the bands of interest.

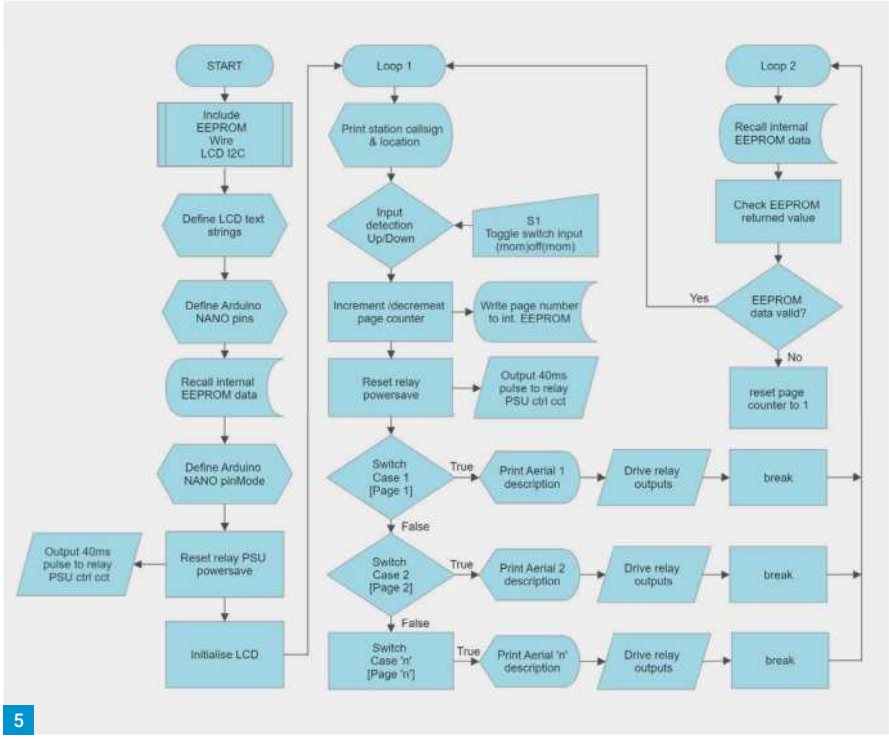
Should you wish to configure the output to drive a BCD decoder this is possible by fitting R5-R7. As the ULN2803A ports are open collector the addition of R5-7 will pull the ports RELAY1-3 high. The code adaptation in this configuration is quite simple to amend in the Arduino sketch.

Power Supply

Power supply for the board (see schematic, **Fig. 4**) is designed to be drawn from the rig's SMPS 13.8V supply. Protection is afforded by a fuse and diode to give some reverse protection. This configuration is a bit safer than placing the diode across the supply and relying on the fuse to blow to protect the unit. Its drawback is the series voltage drop across the diode. However, the adjustable power supply U2 has a low drop-out voltage so the series diode drop shouldn't be an issue. In operation, at power on start-up a short negative pulse of 40ms is applied to Relay-Powersave from the NANO board port D17/A3. This pulse discharges C9 via R13 and D5. With Q7 N-channel MOSFET gate low, the LDO regulator U2 is nominally 12V. After C9 charges to the gate threshold of Q7 the MOSFET turns on and the supply to the relay(s) is reduced to a hold current. This occurs after about a second determined by the time constant of R12 and C9. This is more than adequate for relays where latch-up is quoted in the order of tens of milliseconds. In low power mode, RV1 gives a +V_RELAY adjustment range between 7.0-8.5V. It should be noted that with the ULN2003A driver IC, due to its Darlington output configuration, the saturation voltage is typically 0.8~0.9V so the actual voltage applied to the relay coil is a little less than +V_RELAY setting. The user should experiment on the setting of RV1 to guarantee the hold current keeps the relay energised. Experiments on CX120P and CZX3500 coaxial relays with +V_RELAY set at 8V indicated there was a 50% reduction in power dissipation. This should stop overheating of the relay coils and prolong the life of the relays. U3 is a 7805 series regulator and is used to supply the NANO board CPU and eternal LCD module.

Arduino Sketch

Fig. 5 shows the general arrangement of the software written in C++. At the start of the sketch we define the libraries the Arduino IDE software requires to run the code. We then define the text strings used to describe our station



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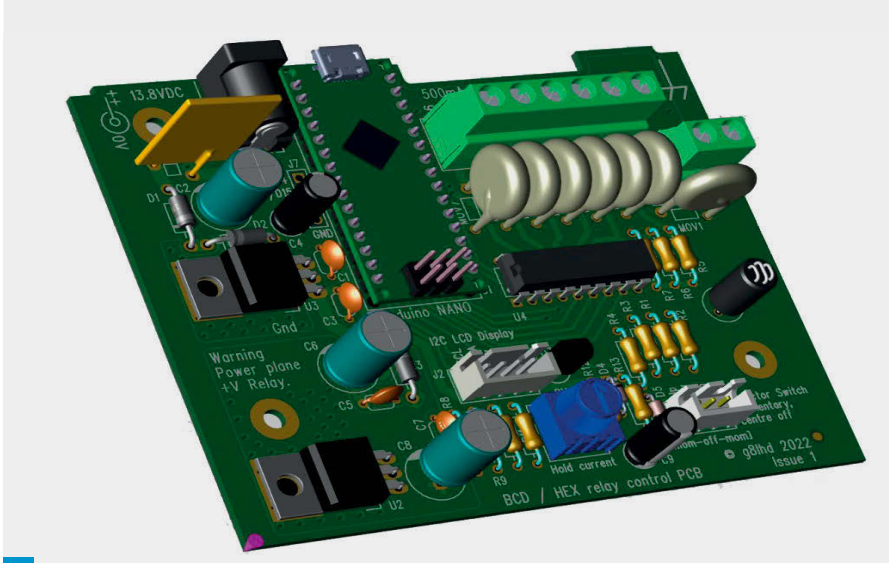

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callsign, Maidenhead location and description of antennas. These are called during the execution of the code. Pin setups for the Arduino NANO board are then defined and internal EEPROM data is retrieved, which recalls the antenna setting when the equipment was last used. After the code initialisation the PSU power save feature resets the LDO power supply to 12V and the LCD is initialised. The sketch then writes the station callsign plus location to the LCD over the I2C bus. The recalled EEPROM data sets a page_counter integer. With no input from S1 the page_counter integer value is compared with each Switch Case statement for a match. Upon finding a 'True' match the corresponding antenna description is written to the display and the relay driver outputs are configured for that particular antenna.

The second loop continuously checks the validity of the returned EEPROM value. If the integer returned isn't valid, the page_counter is reset to 1. This is a failsafe in code so that the page_counter value can never exceed limits that the sketch cannot execute. The internal EEPROM has ~100,000 write cycles, but it is only written to when the page number changes, so it should last well over a decade before any sign of corruption occurs, which would reveal itself by resetting to page/case 1. Changing the EEPROM address value in these circumstances would extend the life of the unit considerably.

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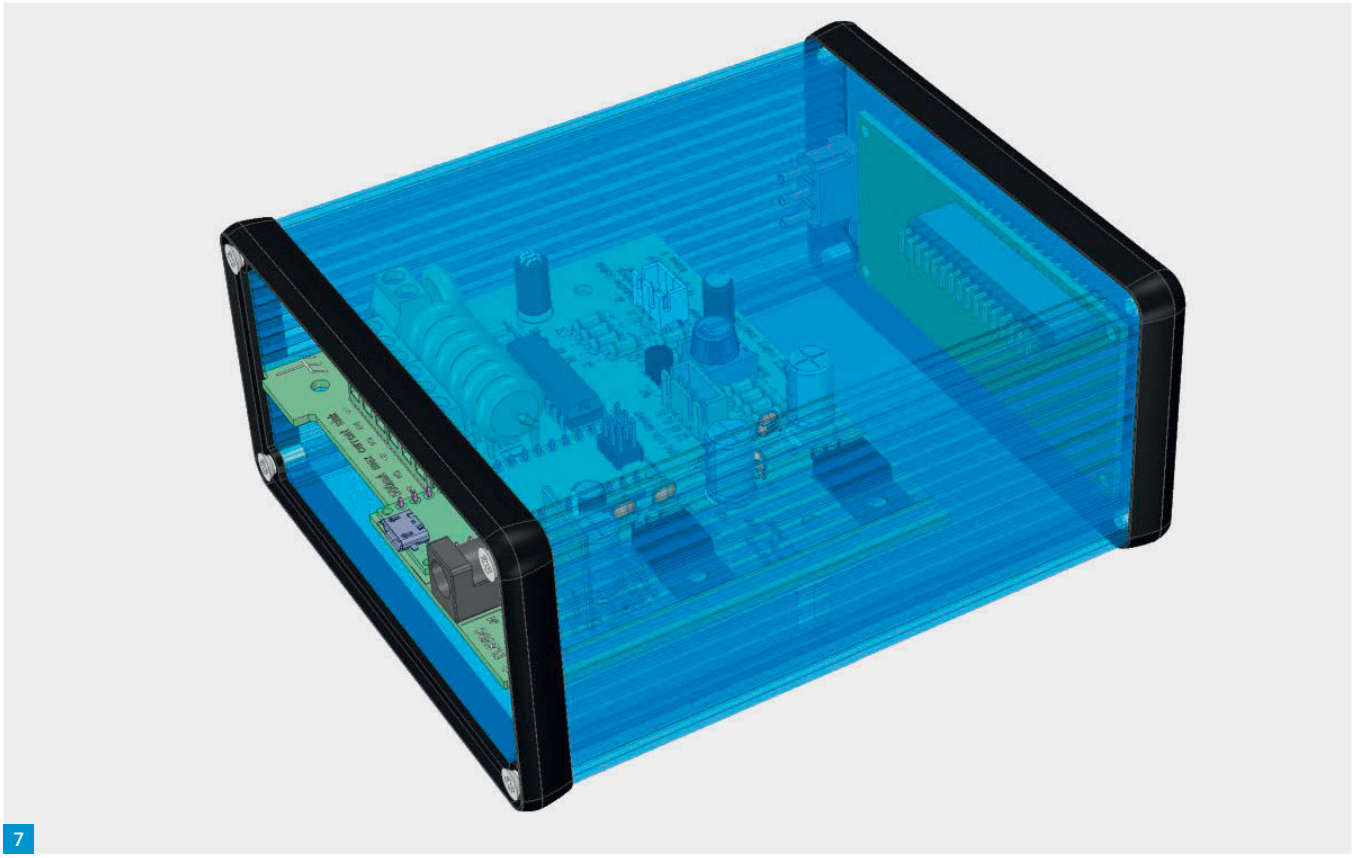

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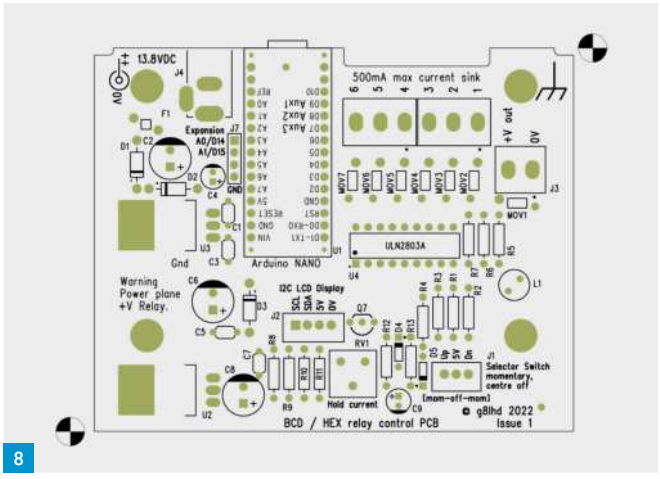

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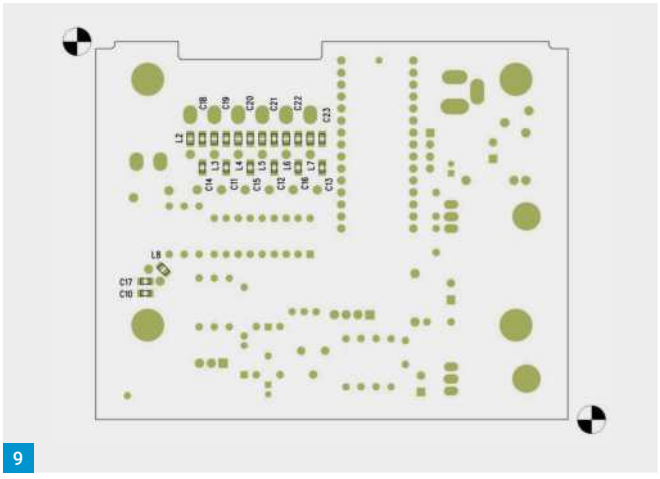

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The code now monitors S1 toggle switch status. If an input is detected, the page_counter integer is incremented/decremented depending on the respective 'up' or 'down' input from S1. Switch de-bounce is taken care of in software and is omitted for clarity. The new page_counter integer is written to EEPROM and the relay power save function resets the LDO supply to 12V. The new page_counter value is then matched to its respective Switch Case function and the new description and antenna port configuration is selected.

As an example, if page_counter value returned is 2; the code executed in switch case 2 is actioned.

```
178  case 2: { //Design of page 2
179  digitalWrite(output1,LOW);
180  digitalWrite(output2,HIGH);
     //Relay2 enable
181  digitalWrite(output3,LOW);
182  digitalWrite(output4,LOW);
183  digitalWrite(output5,LOW);
184  digitalWrite(output6,LOW);
185  digitalWrite(output7,LOW);
186  digitalWrite(output8,LOW);
187  digitalWrite(output9,LOW);
188  lcd.setCursor(0,1);
189  lcd.print(StringAnt2);
190  }
191  break;
```

Each relay driver port is written to so the code is customisable. A logic HIGH signifies an active relay. Note the relay driver IC is open collector and pulls the ports low when the NANO port is driven high. After the port address configuration is set up, the LCD is written to over the I2C bus to print the antenna description.

But first before we upload code to the Arduino NANO it's necessary to do a little bit of editing to add user details. The sketch has been written in such a way as to make the task of adding callsign and antenna descriptions quite simple.

Download the Arduino Antenna Switch software from here (or email the editor):
https://tinyurl.com/2p8u7m7v

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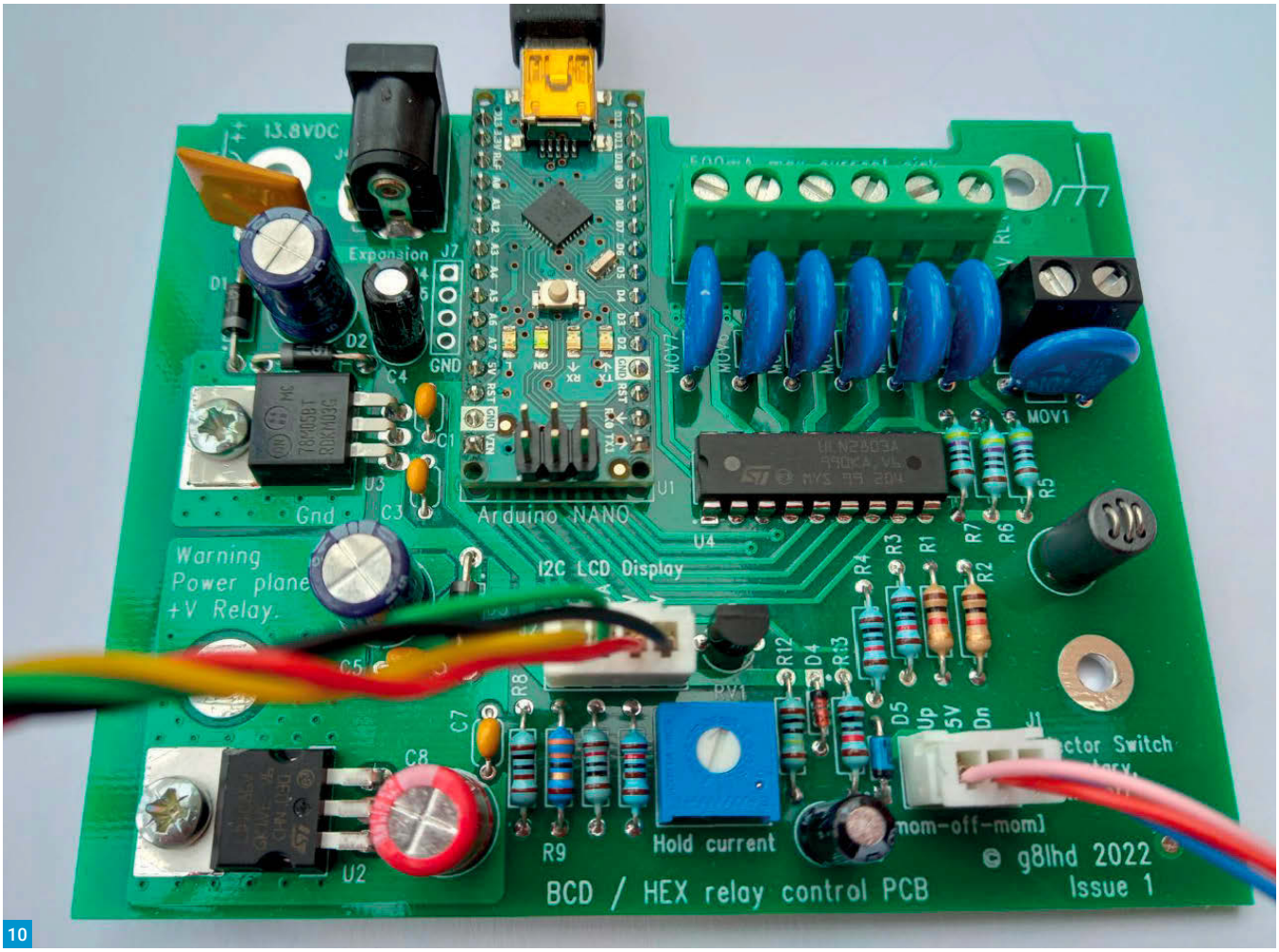

10

Open the Arduino sketch and scroll down to the following lines of code.

```
23 String StringStn = "***** Loc ******"; // Replace with your callsign and Maidenhead locator
24 String StringAnt1 = "Aerial select 1 "; // Second line of LCD display, antenna one description
25 String StringAnt2 = "Aerial select 2 "; // Second line of LCD display, antenna two description
26 String StringAnt3 = "Aerial select 3 "; // Second line of LCD display, antenna three description
27 String StringAnt4 = "Aerial select 4 "; // Second line of LCD display, antenna four description
28 String StringAnt5 = "Aerial select 5 "; // Second line of LCD display, antenna five description
29 String StringAnt6 = "Aerial select 6 "; //Second line of LCD display, antenna six description
30 String StringAnt7 = "Aerial rlys off "; // Second line of LCD display, antenna seven description
```

In each text string between the quotation marks (" ") you can edit the description. Take care to keep the description to no more than 16 characters and if less, fill with spaces. Failure to do so can lead to some interesting LCD display buffer overflow issues. Take care not to omit the quotation marks or end of line ';' character. You'll notice that code line 22 has a guide to help keep the character set within these limits.

```
22 //..String guide  "1234567812345678"
```

The next item of code you need to edit is the variable 'countUp', this is on code line 36.

```
36 int countUp = 7; //....
```

The Integer value for countUp should be between two and ten, default is 7. This controls the maximum page number selected by S1 before it loops back to antenna 1 description (Case1 / page 1 LCD screen). Changing the integer allows you to skip unwanted pages. Seven is used as default so that the LCD displays "All relays off" in this position.

Finally, check the LCD I2C address for the type of LCD you are using. The commercial LCD modules available from Amazon, eBay and other vendors are usually supplied with an I2C address of 0x27. If the LCD module fails to communicate over the I2C bus, you may have to check that the correct address is used. Code lines 90 and 110 stipulate the I2C address for the LCD and may require amending, check with the supplier the I2C address of your display. Also note, the LCDs are fitted with a contrast potentiometer. Sometimes they appear not to function if the contrast is turned down, adjust the contrast to reveal the text strings.

Construction

A 3D rendering of the PCB is shown in **Fig. 6**. The board is designed to fit into a standard Hammond aluminium extruded box (1455N1201BK black extruded case), which takes the LCD module and a [mom] off [mom] toggle switch on the front of the unit. **Fig. 7** shows a 3D rendering of the board mounted in the Hammond case. The board and box should be earthed and the shack and rig earthing strap go to a four-foot copper rod buried in the garden. The full parts list appears in the **Sidebar**.

Top side assembly of the PCB is shown in **Fig. 8**. Fitting J7 'Expansion' port would allow up to nine relays to be controlled, which would be some antenna farm! To do this you would need to utilise a second part-built board with just the ULN2803 and parts associated with output ports 1 to 3. This is done by linking the expansion header

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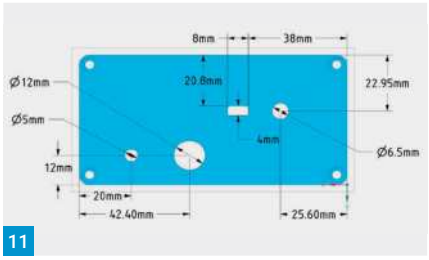
J7.A0-A2 on the main board to Aux1-3 on the second board. Link J7 GND pin on the main board to one of the Arduino GND pins on the second PCB. Relay power and ground of main board should then be connected to the second PCB J3 positions. The ULN2803 relay sink drivers are then available on ports 1-3 of the second part populated PCB and will appear as antenna descriptions 7 to 9 in the Arduino code. Amend the code for these port descriptions and change code line 36 integer to 10.Locations for ferrite bead chips and RF decoupling capacitors are shown in **Fig. 9**. L8 is a No Fit if L1 is fitted on the top assembly. The reason for L1 and L8 in parallel on the schematic was to provide a higher output current option if the board is used as a BCD driver. Therefore, an ancillary BCD decoder board can be powered remotely. The photo, **Fig. 10**, shows the completed PCB assembly ready to slide into the enclosure.



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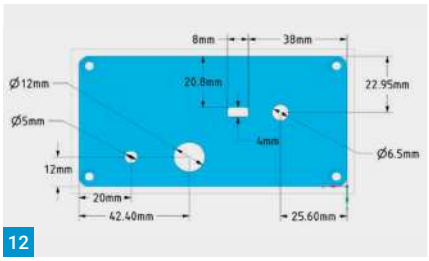

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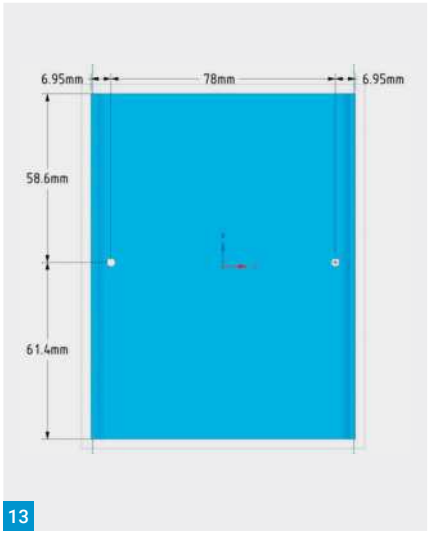

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Mechanics/Box Bashing

Fig. 11 shows the front panel of the Hammond box. The 6mm hole is for a miniature toggle switch. The small 2.5mm holes are to mount the LCD module to the front panel. These dimensions should be checked against the LCD module used as they may change between vendors.

Fig. 12 shows the rear panel drawing for the Hammond box. The square aperture is to allow access to the USB connector on the Arduino NANO board. DC power connection is via the 6.5mm diameter hole on the right-hand side. The 12mm hole is for control cable restraining gland and the 5mm hole is used as a ground stub M5 thread to earth the box and PCB. The final part of the enclosure is the slide-in base plate. Holes should be transferred from the PCB to the base plate, the PCB can then be secured with a pair of stand-off pillars m3x20. When placing the board into the enclosure, strap an earth braid suitably insulated to prevent shorting components on the board and connect this between the PCB earth and the M5 stud on the rear panel. **Fig. 13** shows the Hammond box base panel drawing.

The photo, **Fig. 12**, shows the completed antenna switch in use in the shack. **PW**

Item	Qty	Reference	Manufacturer	Manuf Part No	Description	Value
1	3	D1-3	VISHAY	1N4001	Diode, 2-Pin DO-204AL 1N4001	
2	1	D4	Philips Semiconductors	1N4148	Diode	
3	1	Q7		2N7000	N-CHANNEL MOSFET, 200mA, Vdss 60V, TO-92	
4	1	U1			ARDUINO NANO	
5	7	MOV1-7		B72210S0140K101	14V 5A 2.0J 43V Clamp Voltage Varistor	
6	1	D5	On Semiconductor	BAT41	Schottky Diode VF 0.4V, 100mA DO-35	
7	4	C1 C3 C5 C7	KEMET	C322C104M5U5TA	Multilayer Ceramic Capacitor MLCC 50V DC ±20% Z5U	100nF
8	7	C17-23			CAP SMD 1nF 50V 0805	1nF
9	7	C10-16	KEMET	C0805C683K5RACTU	CAP CERAMIC 68nF 10% 50V 0805	68nF
10	2	C4 C9	RS PRO		CAP AL ELEC 1µF 100V	1µF
11	2	C2 C6	Rubycon	100YXF22MEFC8X11.5	22µF Electrolytic Capacitor 100V DC	22µF
12	1	C8	Panasonic	EEUFC1V151	150µF Electrolytic Capacitor 35V DC	150µF
13	1	J7			HEADER, 2.54MM,1X4WAY PTH	
14	1	J4	Cliff	DC-10B	DC Power Jack, 2.5mm pin	
15	1	J1	JST	B3B-XH-A	3 Way Shrouded Header 2.5 Pitch	
16	1	J2	JST	B4B-XH-A	4 Way Shrouded Header 2.5 Pitch	
17	1	U2	ST	LD1086V-DG / alt. LD1117V	LDO VOLTAGE REGULATOR ADJ 1.5A [LD1117V = 800mA]	
18	1	U3	ON Semiconductor	NCV78M05BTG	POSITIVE VOLTAGE REGULATOR; FIXED +5.0 VOLTS	
19	1	J3	PHOENIX CONTACT	MKDSN2.5/2-5.08	TERMINAL BLOCK, PCB, 2WAY, 24-14AWG	
20	2	J5-6	PHOENIX CONTACT	MKDSN2.5/3-5.08	TERMINAL BLOCK, PCB, 3WAY, 24-14AWG	
21	1	F1	Raychem		Polyswitch Resetable Fuse 1.1A RXE110	
22	2	R3-4	TE Connectivity		RES 10kΩ 5% AXIL 0.25W	10kΩ
23	2	R1-2	TE Connectivity		RES 1kΩ 5% AXIL 0.33W	1kΩ
24	1	R13	TE Connectivity		RES 10kΩ 5% AXIL 0.33W	10kΩ
25	1	R10			RES 120Ω 1% AXIL 0.33W	120Ω
26	1	R12	TE Connectivity		RES 1MΩ 5% AXIL 0.33W	1MΩ
27	1	R8			RES 1kΩ 1% AXIL 0.33W	1kΩ
28	1	R11			RES 1.2kΩ 5% AXIL 0.33W	1.2kΩ
29	1	R9			RES 33Ω 1% AXIL 0.33W	33Ω
30	3	R5-7	TE Connectivity	CFR25J470R	RES 470Ω 5% AXIL 0.33W	NF
31	1	RV1	SUNTAN	TSR3386F-EY5-102-TR	1kΩ 10% 3/8 1-turn Trim Pot	1kΩ
32	1	U4		ULN2803ADW	Darlington Transistor Array SOIC18W	
33	7	L2-7	WURTH	742792096	Ferrite Bead, 2 x 1.2 x 0.9mm (0805 (2012M)), 1000	
34	1	L1	Wurth	74275043	6 hole ferrite bead 960R @ 100MHz 3A	920R@ 25MHz

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All information published here reflects the situation up to and including 25th July 2022. Readers are advised to check with the organisers of any rally or event before setting out for a visit.
The Radio Enthusiast website **www.radioenthusiast.co.uk** has the latest updates, please check it regularly.
To get your event on this list, e-mail full details as early as possible: **wiessala@hotmail.com**

21 August
RED ROSE RALLY: Organised by West Manchester Radio Club. St Joseph's Hall, Leigh WN7 2PJ. Those requiring tables, please contact Colin. (BB | CR | FP | MS)
rally@wmrc.co.uk
www.wmrc.co.uk

21 August
RUGBY AMATEUR TRANSMITTING SOCIETY RADIO RALLY: Princethorpe College, Princethorpe, Rugby CV23 9PY. Open 10:00 (CBS).
Steve G8LYB: 07956 855 816
rally@rugbyats.co.uk
www.rugbyats.co.uk

28 August
MILTON KEYNES ARS RALLY: The Irish Centre, Manor Fields, Watling Street, Bletchley, MK2 2HX (Opposite Dobbies Garden Centre). The entrance fee is £3.00. Open to the public from 9:00 am. Outdoor pitches and indoor tables are available. (FP | CF | D).
Brendan G8IXK, Vice Chairman
rally@mkars.org.uk
www.mkars.org.uk

28 August
TORBAY ANNUAL COMMUNICATIONS FAIR: Newton Abbot Racecourse, Devon TQ12 3AF. Doors open at 10 am, disabled visitors access at 9.30 am. Indoor event (FP | BB | RSGB CF).
Pete G4VTO: 01803 864 528
Mike G1TUU: 01803 557 941
rally@tars.org.uk

29 August (Bank Holiday Monday)
HUNTINGDONSHIRE ARS (HARS) ANNUAL RALLY: Ernulf Academy, St Neots PE19 2SH. Gates are open for Traders at 7 am, public at 9 am. Indoor and outdoor stalls available. Talk-in on 145.550 MHz on GX0HSR. (BB | CR | FP).
Malcolm M0OLG: 01480 214282
events@hunts-hams.co.uk
www.hunts-hams.co.uk

3 September
G-QRP CLUB AND TELFORD & DISTRICT ARS CONVENTION: Harper Adams University Campus nr. Telford, Shropshire TF10 8NB (See also the entry for 4 September). Featuring the famous G-QRP 'Buildathon'.
Martyn G3UKV: 01952 255 416
John M0JZH: 07824 737 716
www.gqrp.com/convention.htm
www.telfordhamfest.org.uk

4 September
ANDOVER RADIO CLUB BOOT SALE: Wildhern Village Hall, SP11 0JE (just north of Andover). Open for sellers at 9 am and buyers at 10 am. Costs are £8 per boot and £2 for buyers. The tables in the hall are £10. Organised by ARAC.
http://www.arac.org.uk
arac@arac.org.uk

4 September
TELFORD HAMFEST (AND CONTINUED G-QRP CONVENTION): Harper Adams University (HAU); TF10 8NB (See also the entry for 3 September). Presentations by three excellent speakers.
Martyn G3UKV: 01952 255416
www.gqrp.com/convention.htm
www.telfordhamfest.org.uk

9-11 September
67TH WEINHEIM VHF CONFERENCE: The traditional Weinheim VHF Conference has been organized by committed radio amateurs (on a non-profit and voluntary basis) since 1956.
It sees itself in its tradition as a meeting place for everyone interested in radio and electronics. amateurs from all over Europe present their experiences at this forum, provide information on innovative developments and share their know-how […].
https://tinyurl.com/4rkv6cxm
https://ukw-tagung.org

11 September
CAISTER LIFEBOAT RADIO RALLY: Caister Lifeboat Station, Caister on Sea, NR30 5DJ. The entrance is via the car park on Beach Road; admission is free for the public. Doors are open from 9 am to 2 pm (8 am for sellers). Inside tables £10 each, outside £5 each. Raffle, onsite cafe, gift shop, museum.
Zane M1BFI: 07711 214790
m1bfi@outlook.com

11 September
RIPON RADIO RALLY: Hugh Ripley Hall, Ripon, North Yorks, HG4 2PT, 100 m west of High Skellgate traffic lights B6265. Traders from 7 am to 9.30; tables £10 each. Doors open at 10 am. £3 per person. The Bring-and-Buy is upstairs: if you can't carry it, don't bring it! Donation £1 per item to a local charity.
https://www.g4sjm.co.uk/contact-us

25 September
WESTON SUPER MARE RS 7TH RADIO & ELECTRONICS RALLY: The Campus Community Centre BS24 7DX.
https://tinyurl.com/2p986v6t

25-30 September
EUROPEAN MICROWAVE WEEK 2022 (MILAN)
https://tinyurl.com/y49mv8j6
https://www.micomilano.it/en

2 October
WELSH RADIO RALLY
NEW VENUE: Llanwern High School, Farm Rd, Newport, South Wales NP18 2YE. Doors open at 10 am. (BB | TS)
www.gw6gw.co.uk

7-9 October
THE RSGB CONVENTION
(Friday to Sunday)
https://tinyurl.com/265yh44r

14-15 October
THE NATIONAL HAMFEST: George Stephenson Pavilion, Newark & Nottingham Showground, Lincoln Rd, Winthorpe, Newark, Notts. RG24 2NY. (BB CBS | RSGB | SIG). Tickets can be purchased online.
http://nationalhamfest.org.uk

16 October
HORNSEA ARC RALLY: Driffield Show Ground, Driffield, E. Yorks YO25 9DW.
www.hornseaarc.co.uk

22 October
ESSEX CW BOOT CAMP/ CW CONVENTION: 3rd Witham Scout & Guide HQ Rear of Spring Lodge Community Centre Powers Hall End Witham Essex CM8 2HE. Doors open at 08:30 for registration. Begin 09:00. Finish approx 16:30. Entry is £10, with free drinks. Pre-register with G0IBN (CR | FP).
0745 342 60 87
g0ibn1@yahoo.com

30 October
GALASHIELS RADIO RALLY: Volunteer Hall, St Johns Street, Galashiels, TD1 3JX. Open 11 am. (BB | CR | TS)
http://galaradioclub.co.uk/?cat=7

30 October
HACK GREEN RADIO SURPLUS HANGAR SALE: Hack Green Secret Nuclear Bunker, Nantwich, Cheshire CW5 8AL. Sale of electronic equipment, amateur gear, components, military radio items, and vehicle spares. The doors are open at 10 am.
01270 623 353
www.hackgreen.co.uk
coldwar@hackgreen.co.uk

6 November
BUSHVALLEY ARC RALLY: Limavady Football Club. Doors open at 11 am; entry is £3 with a door prize ticket.

6 November
HOLSWORTHY RADIO RALLY (HARC): Holsworthy Leisure Centre, Well Park, Western Road, Holsworthy, Devon EX22 6DH. Traders from 8:00 am; doors open to the public at 10 am. (BB | CR | D | TS). Traders & General Enquiries, contact the Secretary:
m0omc@m0omc.co.uk
https://tinyurl.com/yckypn5v

20 November
CATS 43RD RADIO AND ELECTRONICS BAZAAR: Oasis Academy Coulsdon, Homefield Road, Coulsdon, Surrey CR5 1ES. Open from 10 am to 1 pm.
Andy G0KZT: 07729 866 600
bazaar@catsradio.org.uk

27 November
BISHOP AUCKLAND RAC RALLY: Spennymoor Leisure Centre, High St, Spennymoor DL16 6DB. Open 10.30 am. (BB | CR | D | FP | TS).
Bob Dingle G0OCB: 07710 023 916
g4ttf@yahoo.co.uk

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

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E-mail: practicalwireless@warnersgroup.co.uk

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Valved Radio Repair Memories

Dear Don,
The article by **Bernard Nock G4BXD** (*Valved Radio Repair*, August) features a Bush DAC 90A, which having a plastic cabinet and no external connections was perhaps one of the few reasonably safe AC/DC radios. His article brings back many memories and a few horror stories, from when I started my career in the radio and TV trade in the 1950s.

Many radio and TV sets in those days were designed for AC/DC mains operation, and while there were then few areas of the UK that still used DC mains, this saved the makers the cost and weight of a mains transformer, but bluntly some were potentially lethal, and would be banned on health and safety grounds now.

The metal chassis on these sets is wired directly to the mains supply, which as Bernard correctly states should be connected to the neutral mains lead if the plug is correctly wired. Unfortunately, many mains sockets are wired in reverse, and it is always good practice to check this with a neon screwdriver. However, a few homes have the sockets in one room correctly wired, and in another they are reversed; you just cannot win.

Years ago, after moving house we had the new house professionally rewired, the old round pin sockets removed, and a ring main installed, but when I checked, half of the 13A sockets were wired in reverse. I, of course, complained and got the work corrected, but most house owners would have been blissfully ignorant.

AC/DC Radio and TV sets were supposed to be made so that even if the mains plug was incorrectly wired, customers could not touch a live part, but there were many traps.

What happens if the volume control knob works loose, and you grab the spindle to adjust the volume? Some manufacturers fitted a control with a plastic spindle, others used a metal spindle with the hole for the grub screw filled with wax, touch the spindle or the screw and you are touching the mains. What happens if a TV or radio has been assembled, or reassembled, with screws that are a fraction too long? A toddler died because of this after licking a metal speaker grill, and a TV viewer fell off the roof after grabbing a live TV aerial.

Frankly if anyone now asks me to look at any old AC/DC equipment, I warn them that they are potentially lethal, and refuse. Repairing a radio for yourself, when you can double check that it and the house sockets are correctly wired is OK, but please do not pass it on to a relative or charity shop.

Harry Leeming G3LLL
Huddersfield

*(**Editor's comment:** Thanks Harry and good to hear that you are still going strong!)*

On a Budget

Dear Don
I have just read **Daimon Tilley G4USI's** article on *Amateur Radio on a Budget* in the July edition of *PW*. I just wanted to say how much I enjoyed the article. It was very informative and inspiring.

Thank you so much for publishing it. Keep the great work up.

Paul Devlin G1SMP (GB1NHS)
Lichfield

Magnetic Loop Antennas

Dear Don,
Magnetic loop antennas have always beguiled me. Infuriated me too. If only they were as straightforward as normal loop type antennas – basically, just a length of wire in the form of a cube, a delta loop or whatever, and each end separately connected to a point of your choosing. And depending on what loop it is, it may or may not need a transformer of some sort. So far so good, and simple. The KISS thing.

Magnetic loops are, by default, not simple beasts to tame ('resistance' for one thing, as **Maurice** rightly points out) construction wise. They do give the appearance of being a magic wand – compact, tend to mitigate the number one enemy that plagues amateur radio, RFI, can be rotated to null out tuner-uppers and other annoying interlopers, a similar radiation pattern to a bog-standard dipole and low angle of radiation. Oh, and it's directional as well. One downside, as **GW0UGQ** (August 2022) mentions, is bandwidth. And that can drive you nuts, having to re-tune the loop each time a frequency change is necessary, with a motor driven capacitor or not. Unless of course, you're fan of FT8 or FT4, as Maurice appears to be. Each to his own.

Another thing of course, is that you can save a bundle of cash if you decide to build one, rather than whip out the plastic for a commercial variant. And if you do decide to homebrew a magnetic loop, it probably won't look very pretty (mine wouldn't have won a beauty contest). But so what? Electromagnetic radiation doesn't give a damn what an actual antenna looks like. It will function whether it's pretty or ugly. So, no real need to prettify it. One more thing, I don't think variable

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capacitors can be bought in 'general hardware stores'. Well, the last time I visited B&Q I didn't see any.

Lastly, after reading about **G6NFE's** (same issue) trepidations about moving QTH, I now know why I've never moved completely to an alternative location!

Ray Howes G4OWY
Weymouth

Reminiscences

Dear Don,

Just prior to WWII, when aged 11, the domestic receiver had a Short Wave Band, which I listened to all of the time.

After the conflict I became an Indentured Apprentice in the building trade and one of the sites was in a printing works.

While waiting for a material delivery, I walked through the presses, saw *PW* being produced and asked the operator if I could have a copy. He refused, saying sorry but all copies had to be secured for release on a certain date – quite rightly.

Later, when closing my workbag, a person stood beside me and said, *"hide this quickly"*, dropped a copy of the 'Green one' in my bag and disappeared.

If I could afford it, I brought one each month since.

Geoff Voller G3JUL
(Founder and Manager of GB2SM)
Ashford

Direct to Full

Dear Don,

My thanks go to Essex Ham for publicising the new Direct to Full licensing route (see this month's *News* pages – **Ed**).

The similarity with the RAE is striking but, to my mind, no bad thing. I fear that in this age of Wokeness, however, clubs will set their teeth against this because Direct to Full is aimed at scientific, educated engineering types of people.

Equality does not mean treating everyone the same – it means addressing everyone's needs with parity. Direct to Full gives people who are pre-qualified for Amateur Radio a way into the hobby suitable for them.

I do not decry the three-tier system, which continues to produce new amateurs in large numbers. But it is a fact that very few go all the way to a full licence, and Direct to Full will go some way to counter this.

Charles (Tony) Jones G7ETW
Ruislip

August's Articles

Dear Don,

August's *PW* had two articles I thought particularly interesting. I didn't know the magazine covered what may be thought of as vintage test gear: though this is an interest of mine. So, firstly then, congratulations to **Gary Clark G0BKR** for

Valve and Vintage

Tony Smith G4FAI
g4fai@btinternet.com

Stories about enemy spies who were captured and 'turned' to send false or misleading information to the enemy during WW2 can be found in many articles, books, films, and on the internet, and their activities impacted, in some cases to a considerable degree, on the outcome of the war.

This article describes how one of these double agents maintained radio contact with his control masters in Germany with a simple one-valve transmitter and a three-valve regenerative receiver, keeping up the illusion that he was undetected and freely able to obtain and send information of value to them.

Arrival by Parachute

On the evening of 19 September 1940, **Wulf Heinrich Schmidt**, a Danish citizen, designated by the enemy as Agent 'Leonhard', parachuted into a field near Willingham in Cambridgeshire. He was arrested by the police the next day, and taken into custody at Camp 020, MI5's centre for captured civilian agents, at Ham Common in South London.

Under interrogation he said that his instructions were to establish himself somewhere in a triangle between Cambridge, Bedford and London. He was to report by wireless on anything likely to be of interest to the German invasion force (Operation Sealion) which, he had been told, would arrive in Britain very shortly.

Faced with the possibility of trial, and execution, as a spy, he agreed to become a double agent and was given the code name 'Tate'. Controlled by MI5 and the Double Cross (XX) System, which co-ordinated the work of all the double agents, his task would be to transmit false information to the enemy, obtained by fictitious intelligence-gathering activities and imaginary contacts with important people in high places.

He was then taken to Willingham under escort where his parachute, flying overalls and helmet, transmitter, receiver, batteries, Morse key, two aerials and a map, were recovered.

Confirmation Expected

His crystal-controlled transmitter had an output of 3 watts, with two plug-in crystals, for 4623kc/s and 9135kc/s. He had two aerials, one for each frequency. His instructions stipulated that they were to be erected, running from East to West, as high and free as possible and, if necessary, the shorter aerial could be used for either frequency.

He had received no instruction in wireless theory but knew how to erect the aerial and tune the transmitter.

He was to contact his control station in Hamburg as soon as possible after he arrived. If the transmitter failed, he was to report this on a postcard sent to an address in Lisbon, writing his message with invisible ink on the reverse of the card. If that happened, Hamburg would not expect to hear from him again.

Morse Operation

He was to transmit between 0000 and 0200 GMT, and listen for a reply on 4200kc/s. He knew Morse from his previous service in the Danish army, but to improve his skill he had been on a course in Brussels. Although he could send at 18-20 words per minute (wpm) he had been told to reduce his speed to 6-8 wpm. One German operator, **Brand**, who he had met during training, knew his style and they had a private arrangement. If Brand was operating, he would send Leonhard (i.e. Tate) HR BRA in greeting.

Tate was asked if there was an emergency signal that he should send to indicate that he was being used by the enemy. He did not know of one. The possibility of being captured and 'turned' was never mentioned by his instructors.

All messages to and from his control were to be coded by use of a circular disc he had brought with him, and the callsigns for the day could also be determined from the disc.

First Transmissions

Under escort, and supervised by an MI5 radio officer, Tate now attempted to send his first message to Hamburg, to report his safe arrival in England.

Several locations were tried, using different aerials, to simulate typical situations where he might have tried to set up his station if he had not been caught. These included Central London, Cambridge, Steeple Bumpstead, near Cambridge, Ham Common, and a house in Barnet, all without any response from Hamburg.

On one occasion a weak chirpy signal was heard on 5200kc/s, sending material that was unreadable. It sent a series of Vs (QSV after Tate sent QRZ? QSV (who is calling me? Send a series of Vs), but it was not clear if they were replying to him.

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84 PRACTICAL WIRELESS August 2022

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Double Agent Ham Chat

Tony Smith G4FAI relates a curious tale from the war years.

I thought a very well written article on the very useful Marconi 2955 Radio Test Set. No, I don't have one, but it would be useful.

Tony Smith G4FAI's Double agent article managed to throw light on an important war-time story, and several bits of vintage kit simultaneously, and again I found very readable.

One little note though, that applies to many articles is the substitution of function by functionality. Making a word longer does not increase its meaning...

Philip Moss M0PBM
Surbiton

Next Month

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

VALVE & VINTAGE: Philip Moss M0PBM takes a look at a once popular transistorised communications receiver.

AMATEUR RADIO ON A BUDGET: Daimon Tilley G4USI looks at the shack computer and software.

DOING IT BY DESIGN: Steve Macdonald G4AQB builds a Digital VFO with an Analogue Display.

RADIO AMATEUR MATHS: Tony Jones G7ETW tackles 'radio maths' a thing if not of joy, then of relative comfort to some, a world of dread for others.

CW KEY TO PC: Billy McFarland GM6DX explains how to connect your CW key to your PC.

There are all your other regular columns too, including HF Highlights, World of VHF, What Next, The Morse Mode and Data Modes as well as your Letters, the latest News and more.

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Peter Hart said in RadCom, April 2019...
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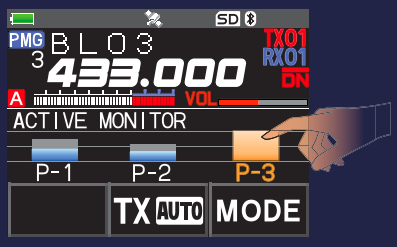

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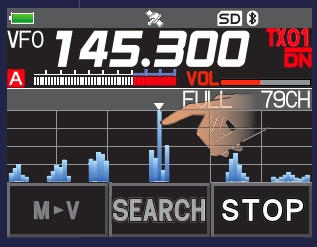

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Your Dog
The perfect go-to guide for all loving dog owners filled with advice & expert tips.

Your Cat
The must-have magazine for all cat lovers and cat owners alike.

Leave us a review

If you have enjoyed this magazine then do the next thing to shouting it from the rooftops and leave us a review instead! We all like to know when something is good and if something has been rated highly by others. Leave us a review to let others know what you think of Practical Wireless.

The Battle of Britain
IN COLOUR

"Praise where due. This is the best magazine available which I have read - I am very impressed. I thoroughly enjoyed reading each chapter and it was written in such an easy style. It covered every aspect and I was saddened when I reached the end."

This 164-page special collector's edition commemorates the 80th Anniversary of the momentous Battle of Britain, making it the perfect gift for any aviation or Battle of Britain enthusiast.

THE BATTLE OF BRITAIN IN COLOUR

The Battle Looms

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

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

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

Predicted Catastrophe

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

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

— 6 —

BACKGROUND TO BATTLE

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

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

Below right Panzer IV ... France in May 1940. The ... was rapid and overwhel... weeks France had colla... were evacuating from D...

...ed in an hour-glass' ... Dunkirk epitaphe if Churchill ... ship the falling sky. This ... the Air Minister, on ... spy will have ... and ultimately ... darkest hour.'

"I have the honour to ... House calls which have ... made upon the Home Or... units in an att... to ... mission on all ... joined the Air ... as now been ... Squadrons ... set as a matter of pa... Air Ministry will cons... final level of attrit... Fighter Command. I ... ensuing and will ensure ... not has been reached, ... all be sent across the C... sistent the q... for.

"I believe that, if an att... ence is kept at this coun... remains in being, and t... the nation's exposure ... he should be able to ... fought bravely for so ... indefinitely. But, if th... pace is drained away in ... attempts to remedy ... fence, defeat in France ... complete and irremediab... meaning."

It was a hard-hitting l... Dowding's words had th... while the French still ... fighter squadrons to ... left opposite ... other squadrons of H... deployed over France, ... used in the U...

THE RAF FIGHTER PILOT

were not afraid that they were either liars or foolish. However, a strident jangling of the telephone could mean several things. Sometimes, to intense relief, it could send a message to 'Stand Down'. Other times, it called pilots to readiness, and then to the heart-pounding order: 'SCRAMBLE!'

Years afterwards, veterans of the Battle of Britain told how they hated the sound of a ringing telephone.

On the order to scramble, there was a mad rush by pilots to their allotted aircraft where the fitter and rigger were ready and waiting: the rigger on the wing ready to help in his pilot, and the fitter standing by with the starter plugged in on the starboard side of the engine. Heaving himself into the cockpit, the pilot went through a number of tasks: helmet pulled on, oxygen plugged in, radio jack-plug in its socket, magneto switches 'on', Ki-Gas cylinder priming pump given a couple of brief strokes and thumb ready on the starter. Meanwhile, leaning into the cockpit, the Fitter helped the pilot with his parachute harness straps, then his Sutton seat harness.

By this time, the starter button was pushed after a thumbs-up from the fitter, who unplugged the starter trolley, ensuring it was clear of the aircraft. Unable to communicate over the roar of the Merlin engine, the pilot and rigger exchanged thumbs up signals, the rigger slapping his pilot on the shoulder to convey reassurance and good-luck as he leapt from the wing. As he jumped, the aircraft was already rolling, and the rigger dodged out of the way of the tail-plane, buffeted by the slipstream which was kicking up dust and grass. Getting out of the way, he was hit by a blast of hot exhaust gasses. Now, the aircraft gathered speed ahead, into wind, bouncing and rocking across the grass airfield. Others careered along around it, in the organised chaos that was a squadron scramble.

Getting airborne, the pilots concentrated on keeping station as they selected 'Gear Up', closing the cockpit canopy while listening out for instructions from the CO or flight commander who was talking to the Sector Operations Room and garnering instructions as to heading, altitude and

Facing page Pilots of 19 Squadron are delivered to their dispersal point at RAF Duxford ready for operations early one morning during the summer of 1940.

Above Their relaxed look perhaps concealing the tension, these Hurricane pilots of 501 Squadron pose for the camera during the summer of 1940. All of them saw action. Several of them shot down enemy aircraft and some of them were killed.

what it was they were intercepting. It may have been an instruction along the lines of: "MITOR Squadron, ANGELS 18, Vector Two-three-zero, Fifty Plus. BUSTER." Listening in, the other pilots could interpret these coded instructions: "40 Squadron to climb to 18,000 ft on a heading of 230 degrees. Fifty plus enemy aircraft. Maximum cruising speed."

Mentally and Physically Draining

Settling into the climb, the pilots automatically slid into section order and the preferred squadron formation. Meanwhile, the CO or flight commander concentrated on setting course as the

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THE RAF FIGHTER PILOT

...ber pilots concentrated on what ...s going on in their cockpits: oil ...mperatures and pressures, fuel state, ...ygen contents checked and selected ... 'On', microphone not on 'Transmit' ...his could effectively block all other ...transmissions), straps tight, gun-sight ...ve' and illuminated, straps tight and ...neaky firmly shut. A surprising number ...ould carry out a little good luck routine ...he feeling for a lucky charm, or even ...ressing themselves.

Now, the workload was high, and still ...ery needed to concentrate on formation ...eeping while permanently keeping ...wary eye open for the enemy and ...patrolling the sky in a relentless search. ...t moment of relapse could literally spell ...ath. The squadron 'Weaves', winding ...em side to side, kept a rather more wary ...e open than the rest, as the squadron ...ot closer by the second to their quarry. ...ther instructions might crackle through ...he headphones: "Close up Red 2 or, on ...ceipt of further instructions from the ...ighter Controller: "Turning to Port, Go!"

Meanwhile, pilots fiddled with the ...dio tuner, struggling to tune and re-...ine their wireless sets in a constant ...ttle to receive and properly understand ...he messages. Sometimes, a squawk ...f static drowned out everything, ...sometimes resulting in one section ...haring off suddenly, upwards or ...downwards, the rest of the squadron ...watching in bemusement and puzzled ...because they received no transmission, ...or else just couldn't understand what had ...been said. Meanwhile, constant juggling ...of the throttle setting with the left hand, ...and judicious adjustment of position ...through the control column and rudder ...pedal inputs, were all necessary just to ...keep station. It was incredibly hard work, ...and mentally and physically draining.

By now, the squadron was 'on oxygen', ...masks clamped securely to pilot's faces ...as cold began to permeate the cockpits. ...Now, with all the hard work of take-off, ...formation flying and getting to altitude, ...came further nervous tension with ...realisation that the enemy were near. ...Then, a tight knot of fear returned as ...the gunsight was checked and the SAFE ...and FIRE ring-on the gun button turned, ...ready, to the FIRE position. Goggles ...pulled down. And then the shout:

'BANDITS! Ten o'clock, above. Coming ...down now! Break, break, break...'

Chatter Of Gunfire

Suddenly, to avoid the 'bounce' of ...fighters coming out of the sun, the ...squadron had dispersed in a pre-ordered ...plan. Now, the enemy fighters were ...among them. This time, there was no

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Facing page Although posed for a news cameraman, the squadron telephone orderly shouts instructions for a 'scramble' as pilots lounge in the dispersal hut. The smartly dressed officer is Duty Pilot – the pilot rostered for ground admin tasks such as recording take-off and landing times etc.

Above It was not unusual for aircraft to return damaged after an engagement and with pilots wounded. This brand-new Spitfire had just been delivered to 602 Squadron at RAF Westhampnett when it was hit by cannon shells from a Messerschmitt 109 in a combat on 18 August 1940. The aircraft was written off and Flight Lieutenant Dunlop Urie wounded in his feet.

...chance of a well-ordered textbook 'Number One Attack'. Instead, it was every man for himself, but with 'wing men' desperately trying to maintain station and protect their section leader.

Now, the pilots were climbing and hanging on their props, the sun glaring and blinding as they turned, all the while listening out and looking out. Now, there were shouts: "Behind you Blue 3!", permeated by chattering gunfire. A cacophony of shouts and static made communication unintelligible. One pilot may be drawing a bead on a

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