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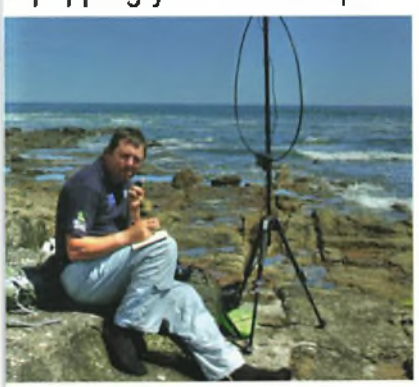

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- New KXPD2 compact keyer paddle

It's so easy. With a charged battery, the radio fits into your pocket or rucksack. It even has a built-in microphone! You can add the optional fist mic and plug any paddle key in. Alternatively purchase the lovely little matching paddle. If you fit the optional auto ATU you can even operate with an end fed wire. How's that for convenience? It also happens to perform better than most base stations - see www.sherweng.com.

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To maximize your freedom to roam, you can outfit your KX2 with an internal 2.6 amp-hour Li-ion battery. Current drain is as little as 135 mA, yielding up to 8 hours of typical operation on a single battery charge. There's also an internal automatic antenna tuner module (KXAT2), which can tune a random wire, dipole, or whip on multiple bands.

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- KXBC3.....Timer £99.95
- KXPD3.....Key.....£159.95
- DC Lead.....£11.95
- 2m Transvert.....£309.95
- 4m Transvert.....£309.95
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The Alex folds down into this very small package. Assembly takes no more than a couple of minutes. Tuning is continuous and smooth. Typical VSWR is 1.5:1 or less and no ATU is needed. It's the perfect travel companion.

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Almost every ham operator knows somebody who owns an IC-7300. That in itself is a great recommendation. It is the most successful radio for many years. Primarily because it is based on SDR that offers so many advantages and results in such a great receiver. And the added bonus with the IC-7300 is the 4m coverage. It's a great all in one station with lovely colour screen full of information. The internal ATU copes well with most antennas and the touch screen makes operations much easier to navigate the various functions.

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WARNERS GROUP PUBLICATIONS PLC

Keylines

Don reflects on a couple of recent news items and has some observations about the WRTC event.

We've certainly been enjoying an unusual long hot summer and no doubt many of you have been out operating portable. Portable operation is an increasingly popular aspect of the hobby, what with Summits on the Air, portable contests and the like, along with the ready availability of lightweight gear, masts and antennas. Sadly, there are negative drivers too – the increasing levels of interference (electronic smog) in many urban locations drive us to the hills. And many newcomers don't have the real estate for decent antennas or find that obtaining planning permission is too much of a struggle – indeed, I doubt I would get permission for my mast nowadays but, fortunately, it was granted over 30 years ago when life was less complicated!

New Australian Amateur Radio Society

One of our *News* items concerns the launch of a new national radio society in Australia. I don't know all the ins-and-outs but it appears that this development is due to disillusionment by many Australian amateurs with respect to the long-established Wireless Institute of Australia. It's always a pity when this happens. I recall an attempt many years ago to set up an alternative to the RSGB. It never really got off the ground, perhaps because, by definition, those behind it were strongly opinionated and therefore found it hard to work together. There are a couple of countries where an 'alternative' national society has become established and thrived but surely the best solution, if at all possible, is to work to overcome any deficiencies in the existing society rather than try to start another one in competition.

Cave Rescue

Many of us were on tenter-hooks during July, hoping for a good outcome to the cave rescue attempts in Thailand. Thankfully, the children and their coach all came out alive. Thanks are due to the efforts of a myriad of rescue workers but, also, as we report in our *News* pages, to communications technology developed many years ago by a radio amateur – many of us will recall the *RadCom* article describing the system but I hadn't realised that the same technology was still in use for underground communications so many years later.

WRTC

Contesting doesn't feature strongly in the pages of *PW* although I happen to be a fan of the major contest events and there is no doubt that the weekly RSGB VHF and UHF contests have transformed interest in those bands.

WRTC is a bit different, though. The World Radio Teamsport Championship started life in 1990 as part of **Ted Turner's** Goodwill Games, an attempt to bring Russians, Americans and others together for sport outside the world of politics. Since then, WRTC has been held every four years as a sort of Amateur Radio Olympics, with two-person teams from around the world coming together to one location to compete on the nearest thing amateur radio contesting has to a level playing field, by being limited to 100W and each team having identical antennas and, as far as possible, a similar location.

This year's WRTC was hosted in Germany, in parallel with the annual IARU (International Amateur Radio Union) HF Championship contest. The winning team was from Lithuania – LY9A and LY4L. These two operators, using Yaesu FT-5000 transceivers (at the 100W level – all teams are supervised by an on-site referee), a Spiderbeam (20 through 10m plus a dipole element for 40m) at 12m and an inverted-vee dipole for 80m, made over 5,000 contacts during the 24 hours of the contest, 71% on CW, the rest on SSB. However you look at it, that's a phenomenal achievement with a modest station (they were able to run the two radios throughout the 24 hours but, even so, that's over 2,500 contacts per radio/operator).

I was not at this year's WRTC but was a team referee in Brazil (2006) and a judge in Moscow (2010) and New England (2014). My abiding memory of those events is not so much the radio operating (the 24 hours of the contest always seem to go by in a blur) but the camaraderie. With perhaps 40 nations represented, these events truly bring out the international spirit of our hobby.

The next WRTC will be hosted in Italy in 2022.

Don Field
G3XTT

Practical Wireless

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

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

Technical Help
We regret that due to Editorial timescales, replies to technical queries cannot be given over the telephone. Any technical queries are unlikely to receive immediate attention so, if you require help with problems relating to topics covered in *PW*, please either contact the author of the article directly or write or send an email to the Editor and we'll do our best to reply as soon as we can.

Newsdesk

Send your information to:
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E-mail: practicalwireless@warnersgroup.co.uk

New Heavy-Duty Mast from SOTAbeams

Working with a specialist composites manufacturer, SOTAbeams has designed a unique heavy-duty fibreglass mast. The Tactical 7000 hds has been designed for portable operators who need a more rugged and reliable mast than the normal fibreglass telescopic poles that are available.

With a packed length of less than 60cm (23in), this is said to be very much a 'go anywhere' solution. The mast uses heavy-gauge composites to make it unusually stiff – ideal for use in extreme weather conditions where the tension in wire antennas can cause lesser masts to bend and ultimately fail. The Tactical 7000 hds also incorporates a base shock absorber and comes in a camouflage-style bag.

https://tinyurl.com/y8vst7zq

SOTAbeams also report a major firmware upgrade for their WSPRlite antenna testing system. Since its release a little under two years ago the WSPRlite system has become a popular way for DXers to compare antenna systems.

The upgraded firmware allows users to transmit compound callsigns such as F/G3CWI and also to transmit six-character grids. WSPRlites will run directly from an Android phone. The phone provides timing and position information. This combination, together with the firmware upgrade, makes a handy pocket-size package to take on holiday for some amateur radio fun from the beach! Firmware at **DXplorer.net**

Information on the WSPRlite system at: **https://tinyurl.com/y7e8llqz**

SteppIR UrbanBeam

Nevada Radio report the introduction of the new Urban Beam from SteppIR, covering from 40 to 6m. Designed for those with restricted space or smaller gardens, the turning radius is just 15.5ft. with a small 2ft. boom. The UrbanBeam is a high-performance two-element Yagi on 20 to 6m and a folded dipole on 40 and 30m.

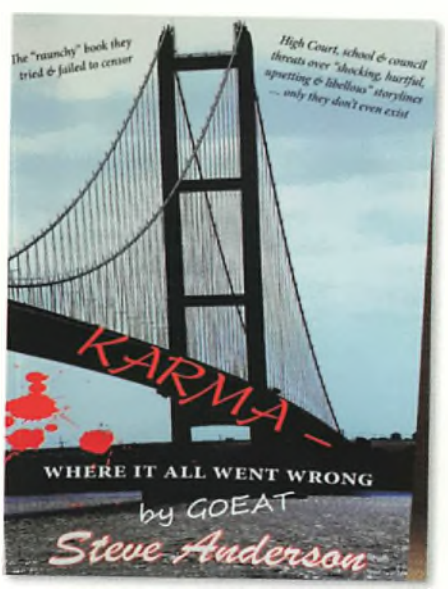
Supplied with the SDA-100 controller, it features 180° direction change, bi-directional mode and full element retraction for stormy weather. The antenna sells for £1869 and is now available from SteppIR authorised UK dealer Nevada, tel: 03292313090

www.nevadaradio.co.uk

A Yorkshire Thriller

East Yorkshire radio amateur **Steve Anderson G0EAT** has discovered the best antidote for poor mental health – burning the midnight oil to write a 120,000-word thriller instead of indulging his other passion of working DX on Topband! But he hadn't bargained on a High Court threat to sue him for alleged libel before *Karma – Where it all went wrong* had even been published.

"The perpetrators cried 'libel' instead of seeking reassurance that nobody's character had been besmirched," Steve told *PW*. *"Lawyers dropped the case as soon as they'd read the 61 chapters but the stress this caused did nothing to ease my anxiety and depression."*



Karma, which explores the concept of the animal kingdom exacting revenge on humans for the suffering they have inflicted since time immemorial, contains various references to amateur radio, including a mention of the late **Lord Brian Rix G2DQU**, chairman and president of Mencap.

Available directly from York Publishing Services and Amazon, it has been praised as *"absolutely fabulous"* by folk-rock legend **Dave Pegg** (Jethro Tull and Fairport Convention). *"Interesting stuff, indeed"* was his verdict. *"I couldn't put it down until I'd read the last of the 61 chapters."*

Further details of the novel are on Steve's QRZ.com page.

RRC 25th Anniversary Awards Programme

Celebrating the Silver Jubilee of the Russian Robinson Club, the 'RRC 25 Years Award' is issued for QSOs made with stations with RRC-suffixed callsigns between 1993 and December 31st 2018. Complete information, including the list of past operations that qualify for the award, can be found on: **https://tinyurl.com/y7a9k95n**

The Award Manager for the above is Eugene RZ3EC at: **rz3ec@yandex.ru**
https://rrc.hamlog.ru

G-QRP Club Appointments

The G-QRP Club, which is devoted to low power communication, has 4,000 members and produces a quarterly journal *SPRAT*. Its annual Convention is now co-located with the Telford Rally, which takes place the first weekend in September: www.telfordhamfest.org.uk

The Club is pleased to announce three new appointments. Following the sad passing of **Dr Gordon Bennet G3DNF**, **Steve Hartley G0FUW** has been appointed as the new Chairman. Steve has been a member of the G-QRP Club for 35 years, has had articles published in *SPRAT* and has supported the Buildathon events at the G-QRP Convention.

Long-time *PW* and *RadioUser* readers will recognise the name **Tex Swann G1TEX**. Tex has been appointed as *SPRAT* sub-editor to help out Club Secretary, **Rev George Dobbs G3RJV**, who has had some health issues of late. With his experience at *PW*, Tex is well qualified to edit members' contributions.

The Club has a number of badges and awards for its members and **Nigel Flatman G0EBQ** has been appointed to ensure these are provided. Nigel has already got stuck into issuing Club callsign badges and will soon be issuing awards to those who are waiting.

Graham Firth G3MFJ is still the Treasurer and looks after Club Sales while **Tony Fishpool G4WIF** continues as the Membership Secretary.

More information about the Club can be found at: www.gqrp.com

New Home for Tynemouth ARC

The Tynemouth Amateur Radio Club have asked us to mention that they moved to new premises: Tynemouth Scouts Headquarters, 31-35 Norfolk Street, North Shields, Tyne and Wear NE30 1NQ. The club meets on most Friday evenings, please check the website (below) for the programme of events and contact can be made via the club e-mail address: mail@g0nwm.com
www.g0nwm.com

Essex Ham Summer Solstice

Essex Ham was active for the 2018 Summer Solstice, operating as GB1JSS for three days. An impressive number of amateurs from around Essex came along to support the event, which gave the opportunity to help new licence holders improve their skills 'in the field'. The prize for the best DX of the event went to **Andrew M6ONH**, who after holding his licence for less than two weeks, made contact with Hawaii using his new rig and homebrew antenna. Thanks to **Charlie M0PZT** for organising another popular Solstice event.

Doug Pike G3VMI.

Shefford Anniversary

The Shefford and District Amateur Radio Society (SADARS) is preparing to celebrate the 70th Anniversary of their inauguration in 1948/49 by radio and radar military servicemen following their demobilisation after WW2.

Organised by the late **Claude Pettifar G2DPQ**, early meetings were held in the Old Wharf Building by the River Flit in North Bridge Street but soon moved to the more spacious Shefford Community Hall, Ampthill Road in Shefford, Bedfordshire where they have remained. SADARS immediately established regular weekly meetings on Thursdays, always commencing on the dot of 8pm and concluding with refreshments by 10pm, a formula that has served them well.

Membership levels have varied over the years but have long stabilised around 30, the majority of whom are mature holders of the full 'Amateur Radio Transmitting Licence'.

Every Thursday evening, talks, video presentations and demonstrations are given on subjects ranging from the historic spark transmitters to the latest developments in microwave communications. The design and construction of radio antennas for the back garden and DIY projects, including from the club's own kits of parts, have always proved to be popular topics. Even in these days of instant public communications via satellite and the web, SADARS continues to train new Morse operators.

Historically, the club membership has been privileged to include many eminent electronics engineers, including **Ivan Howard G2DUS** who was a founder member of the British Amateur Television Club who it is thought gave the very first national 'open to the public' demonstration of Amateur TV at a club meeting as early as 1950.

Clive Wallis G3CWV, a prominent and especially active member, was awarded the G3AJJ Cup for services to Amateur Radio Satellites in 2001 by the British AMSAT organisation and the also the coveted Louis Varney Cup by the RSGB as recently as 2013.

Outside speakers have always been warmly welcomed, including **Prof. Colin Pillinger** of space and satellite fame, **Keith Skues** the popular radio broadcaster and **Jim Bacon G3YLA** the weather expert, BBC broadcaster and life-long radio amateur. The editors of the various popular amateur radio magazines down the years have been frequent guests of honour as have leading specialists in the many technical aspects of the hobby.

In turn, organised outside visits by members have included trips to radio stations at BBC Rugby, Daventry, Sandy Heath, Brookmans Park and the nearby Baldock Monitoring station.

Club members are fortunate to have private access to local farming field areas for their annual outdoor operations involving activity in national and international contests, during which the SADARS special callsigns G3FJE and G3B are activated. For such a relatively small club, they do quite well in these events.

A Brief History of SADARS by **Brian Farey G8GHR** is due for publication in October at the planned celebration party to which past and present members and wives are to be invited.

SADARS meet each Thursday at 7.30 for 8pm at the Community Hall in Ampthill Road, Shefford SG17 5AX. For more information, programme details and contacts see their website (below) or call Hon. Sec **David Lloyd** on 01234 742757.
www.sadars.co.uk

FA-VA5 600MHz Antenna Analyzer Kit from SDR Kits

SDR Kits have launched the FA-VA5 Antenna Analyzer, a portable high precision 600MHz instrument for measurements of antennas, cables and other one port devices, designed to meet the needs of all radio amateurs.

The designer, **Michael Knitter DG5MK**, has taken feedback from users of the previous VA4 instrument and incorporated many of the requested new features in the VA5, while maintaining high performance and excellent value for money.

The key features of the VA4 remain, including small dimension, low power consumption – up to 40 hours from 2 AA batteries – user-friendly design, a large display with good readability and Short Open Load (SOL) Calibration function.

Top of the wish-list of requested new features was connection to a PC to allow follow-on processing of measurement data. In response, Michael has included a USB-interface and collaborated with **Dr Thomas Baier DG8SAQ** to introduce support for the VA-5 in his well-respected DG8SAQ VNWA software application. The combination of FA-VA5 and VNWA Software will allow all kinds of one-port measurements included in the software. One example is Time Domain Reflectometry (TDR) which can help find defects in antenna installations. Other new features include a real-time clock, improved memory, audible buzzer alert for minimum SWR alignment and extended frequency range covering 10kHz to 600MHz.

The FA-VA5 is sold as a complete kit, including a preassembled PCB. Final assembly is considered to be of medium difficulty and consists of fitting and soldering just 12 through-hole components, which should take under three hours.

The FA-VA5 Kit with English language assembly and operation manual, and also post sales technical support, is exclusively available from SDR-Kits Webshop (URL below) and costs £175.00 incl tax. Shipping is extra. An optional three-piece 600MHz BNC SOL calibration kit with individually measured BNC load is also available.

SDR-Kits, founded 10 years ago in June 2008, is the well-known manufacturer and supplier of the DG8SAQ Vector Network Analyzer (VNWA). **www.sdr-kits.net**

Blackpool Rally

Stuart Mckinnon G0TBI of VMARS (Vintage and Military Amateur Radio Society) kindly sent us a report of this year's Blackpool Rally.

The weather was kind to those travelling to this year's rally, some coming long distances. This year saw all exhibitors located in the main hall, which managed to accommodate the myriad of stalls, club stands and points of interest.

I saw several pieces of Classic equipment for sale at very reasonable prices, including several HROs, a nice RA17, some Clansman equipment and several component ancillaries from the WS era.

*The VMARS stand was manned by **Bronek M0DAF** and **Glenis G6DVU Wedzicha, Ron Swinburne M0WSN**, Stuart G0TBI and **Anne M3TBI Mckinnon** and **Ian Pryde GM3LGU**, a young 88 years, who had travelled all the way from East, resplendent in his Royal Signals blazer and beret, suitably decorated with various Royal Signals and amateur radio insignia.*

*On display were an AN-GRC-9 and associated LV-80 linear amplifier, a WS19HP, a WS18 and WS88 on loan from **Chris Suslowicz G8KGS** and an early US Tube Tester loaned by **Roy Kavanagh GM4KVI**.*

The highlight on the stand this year was a homebrew transmitter from Bronek, which drew many visitors expressing interest and, looking at the build quality, it is no surprise that he went on to win the constructors competition. NARSA award four prizes: best website, best stand and two for construction, novice and experienced (expert). Bronek received the latter for his RF deck of a QRO VFO-controlled AM transmitter.

Julie from BBC Radio Norfolk receiving her 3rd clue for the treasure hunt from Steve Balders M0HET.

Museums on the Air

June 17th 2018 saw the Bittern DX Group operating a special event station GB2DRA from the Desert Rats Museum at the 7th Armoured Division Desert Rats Thetford Forest Memorial location.They operated SSB on 40 and 20m and FT8 on 40, 17 and 20m. Although there was a lot of QRM on site from generators supplying power to stalls and food vendors all around, a good number of contacts were made with quite a few other museum special calls being logged. They also had a satellite station running and a Morse table for the younger folks to try their hand at sending their name in Morse. All participants, including **Julie Reinger** from BBC Radio Norfolk who used the station as part of their regular Sunday morning show *Treasure Hunt* (it was Clue number 2), took the up challenge and received a certificate for their efforts. All agreed that it was good fun.

GB1GWA

Guildford & District Radio Society, Wey Valley Amateur Radio Group and the Guildford Repeater group are celebrating 100 years of amateur radio in Guildford. They started in 1918 as the Guildford Wireless Alliance and there has been a society in Guildford ever since. They will be running a Special Event Station over the August Bank Holiday (August 25th to 27th), on HF, VHF and digital modes and maybe DMR on the Guildford repeater GB7GF. They would also welcome visiting amateurs to the event at the Guildford Model Engineers HQ, London Road, Guildford, Surrey GU1 1TU. Further details from **Timothy Dabbs G7JYQ** sec.gdrs@virginmedia.com and at: www.gdrs.net

RASA

The Radio Amateur Society of Australia Inc. (RASA), was formed in March 2018 to promote the hobby and represent amateurs to the Government regulator. RASA is growing strongly, gaining over 500 members in three months, including some very influential and well-known Australian amateurs.

"We have established a good relationship with the Australian Communications and Media Authority and are working with them on a number of issues, including the new 5MHz HF band", reports RASA President **Glenn Dunstan VK4DU**.

RASA has also launched a review of the Australian MF/HF band plan, brought about by the tremendous growth of FT8 and other digital modes. *"The hobby is constantly evolving, and we need to ensure that band plans reflect and facilitate new technology"*, Glenn said.

www.vkradioamateurs.org

Benidorm or Bust for Chertsey's James

Our July *News* pages reported that Chertsey Radio Club's **James M0JFP** and colleagues would drive 1500 miles in Benidorm or Bust rally challenge. Here's James's report.

The team bought an old Vauxhall Vectra 1.8 for just £200 and worked on designing the pirate radio themed car. It had a giant flagpole attached to the back flying the classic skull and crossbones flag and the car had hundreds of pirate radio stickers including Radio Caroline and Radio Luxemburg. Moonraker kindly loaned an HF radio and antenna and James was able to make many contacts from the UK, France and Spain during his driving breaks. They also had sponsorship from Icom and Kenwood. As part of critical communications between cars, they had a pair of Retevis RT-95 mobile radios kindly donated by Retevis. The analogue VHF/UHF radios provided communication between James's car and his neighbour's (**Paul** and **Al**) so they were able to ensure the safety of the teams and get directions and pit-stops as needed.

The drive was divided into four days starting from Dover and taking the ferry to Calais along with 197 other rally drivers. On arrival in Benidorm on Day 4 they were awarded with medals and certificates for completing the challenge, while various prizes were given out for the best decorated car and best costumes. A lot of money was raised for the charity Busy Bees who look after vulnerable women and children in the local area. As a team they raised a few hundred pounds for the local children's ward at Ashford and St. Peter's hospital in Chertsey.

Peterborough Club News

May 23rd was a Peterborough club auction evening. The meeting started with a presentation of the newly created President's Shield. This award is to recognise outstanding input to PADARC. The shield was awarded to Geoff Wood G8SPG. Geoff, despite poor health, is the PADARC webmaster and also devotes a large amount of time repairing laptop computers, which he then gives to the club. These computers are used by the training team for Foundation and Intermediate courses and Exams for all three stages of the Licence. Geoff works tirelessly behind the scenes for the benefit of the club – a much deserved award.

The auction then followed with a lot of goodies on offer. These included transceivers, receivers, meters, antennas, glory boxes and lots more. **Tony G0IAG** (Chairman) was auctioneer and **Alan G8XLH** (Secretary) gave lot descriptions. At the end of the auction, every lot had been sold. A great success and a welcome boost to club funds.

Icom News

The IC-R30 is Icom's latest wideband handheld receiver. It receives over a wide (0.1 to 3304.999 MHz) frequency range in AM, FM, WFM, USB, LSB and CW but can also decode digital modes, including P25, NXDN, dPMR, D-STAR and Japanese domestic DCR.

A 2.3in dot-matrix display is incorporated, allowing for large amounts of information to be clearly and logically arranged. The four-direction keypad provides straightforward operation of all functions. The IC-R30 features high-speed scanning of 200 channels per second as well as various other scanning features. It also enables the user to monitor two different bands simultaneously via the Dualwatch Operation and to record the individual audio of two bands received while in the Dualwatch mode onto a microSD card in WAV format.

For more information, visit the dedicated IC-R30 Wideband Communications Receiver Product page on the Icom UK website. The IC-R30 is available from all authorised Icom amateur radio dealers with a suggested retail price of £575.99 inc. VAT.

Icom UK also report that they have added a video overview of the IC-7610 HF/50MHz SDR transceiver to their YouTube channel. The video explores the features and connectivity of the IC-7610 as well as showing the radio performing.

www.icomuk.co.uk

Thailand Cave Rescue Radio Aspects

The RSGB *GB2RS News* reports that the dramatic rescue of twelve young footballers and their coach from a cave in Thailand was facilitated, in part, by communications technology developed by British radio amateur **John Hey G3TDZ**. Ordinary radio signals don't penetrate the solid rock surrounding caves but very low frequency signals can do. Around the turn of the Millennium John designed a system that became known as the HeyPhone, which could penetrate some 800m of solid rock and provide reliable two-way voice communication. It used single sideband operating at 87kHz, with novel antenna techniques to couple the signals between units. The HeyPhone was featured in the January 2002 edition of *RadCom*. John became a silent key in 2016 but he saw his equipment used in countless cave rescue and other applications.

US Licensing

(From ARRL Letter) For the fourth year in a row, more than 30,000 new licensees joined the amateur radio ranks in the USA and ARRL Volunteer Examiner Coordinators (VEC) conducted more than 7,000 exam sessions, serving some 35,350 candidates for a new or upgraded license. At the end of December 2017, the US amateur radio population stood at 748,136. This figure has grown throughout the past decade.

At nearly 378,000, Technician licensees represented the largest segment, with General (174,206), Amateur Extra (145,034), Advanced (41,938) and Novice (9,056) trailing. Licensee numbers showed continued growth across all classes except Advanced and Novice, which the FCC no longer issues.

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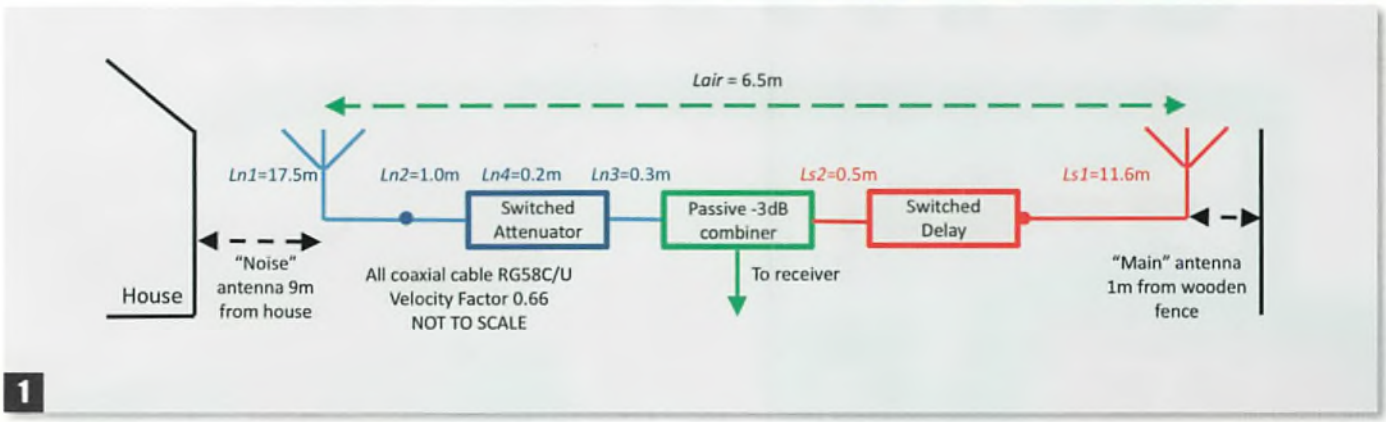
• E-mail: gxgriffiths@virginmedia.com

HF Band Passive Noise Cancellation

Gwyn Griffiths G3ZIL describes the construction and use of three simple modules that, together, may reduce your HF band noise.



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Like many, my HF band reception is affected by noise. Nigel Squibb G4HZX and I described a number of measures that reduced our noise in *PW* October 2017 but it's an ongoing challenge. One method that I thought I should try was noise cancellation prior to the antenna socket of the receiver. **Paul Beaumont G7VAK** wrote an interesting and informative *PW* article on the topic in March 2014. There are several commercial devices available, including the MFJ-1026, the NCC-2 from DX Engineering and the ANC-4 from Timewave. This method of noise cancellation needs an auxiliary or 'noise' antenna, a means to match the amplitudes of the noise from the noise and main antennas and a method to alter the phase so that at a combiner the two noise components are 180° out of phase.

Paul's article and online reviews of the commercial devices provide compelling evidence that the method can work. However, getting good results can be fiddly and much depends on your own noise environment and the noise antenna. My approach was to see if I could implement the method and achieve useful results with three aims in mind:

- A completely passive solution, avoiding broadband preamplifiers that might degrade receiver performance.
- To leave me with useful modules if the method did not work in my own situation.
- To have just two controls (amplitude and phase) and for those to be of fixed known steps and to have definite meaning.

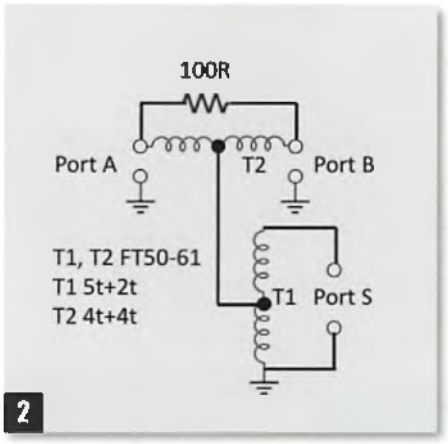
The Modular Passive Approach

Three modules are needed, whose construction is described in this article: a broadband zero phase passive combiner, a switched delay line and a switched attenuator. The block diagram, **Fig. 1**, shows how they are connected together. Also shown are the interconnecting coaxial cables (RG58C/U), their lengths, and the positions of the two antennas. In my case both are shallow inverted-V dipoles for 40m. The cable lengths are not important; they are what they need to be for the particular antenna arrangement and the location of the passive combiner. The cable length on my noise antenna is longer than it need be in this arrangement because I wanted to keep the same length while I tested various noise antenna positions.

The main antenna is as far from the house as possible. Both dipoles run in the same orientation parallel to the back wall of the house. The attenuator is placed in the noise antenna feed because its noise output has been found to be equal to, or greater than, the main antenna. The switched delay is in the feed from the main antenna so as to ensure 180° phase shift given the cable lengths, the antenna separation and that the noise to be cancelled comes from the direction of the house. As the set-up and cable lengths may need to be different at different locations you may find that if you cannot find a null, you may need to connect the delay line in the noise antenna feed.

The Passive Combiner

The passive combiner module is built in to a 92 x 38 x 31mm aluminium diecast box (type 1590A, often known as a 'stomp box'). The circuit chosen is that of two autotransformers and a single resistor, **Fig. 2**. I used a 0.25W 1% metal-film resistor in this micropower application. Both transformers are wound with 22swg enamelled wire. T2 is centre-tapped, and because equal and opposite currents flow in the transformer and the resistor there should be high isolation between the two ports A and B. With 50Ω impedances connected to ports A and B, the impedance at the centre tap is 25Ω, hence T1 is a 25 to 50Ω matching transformer with a turns ratio of



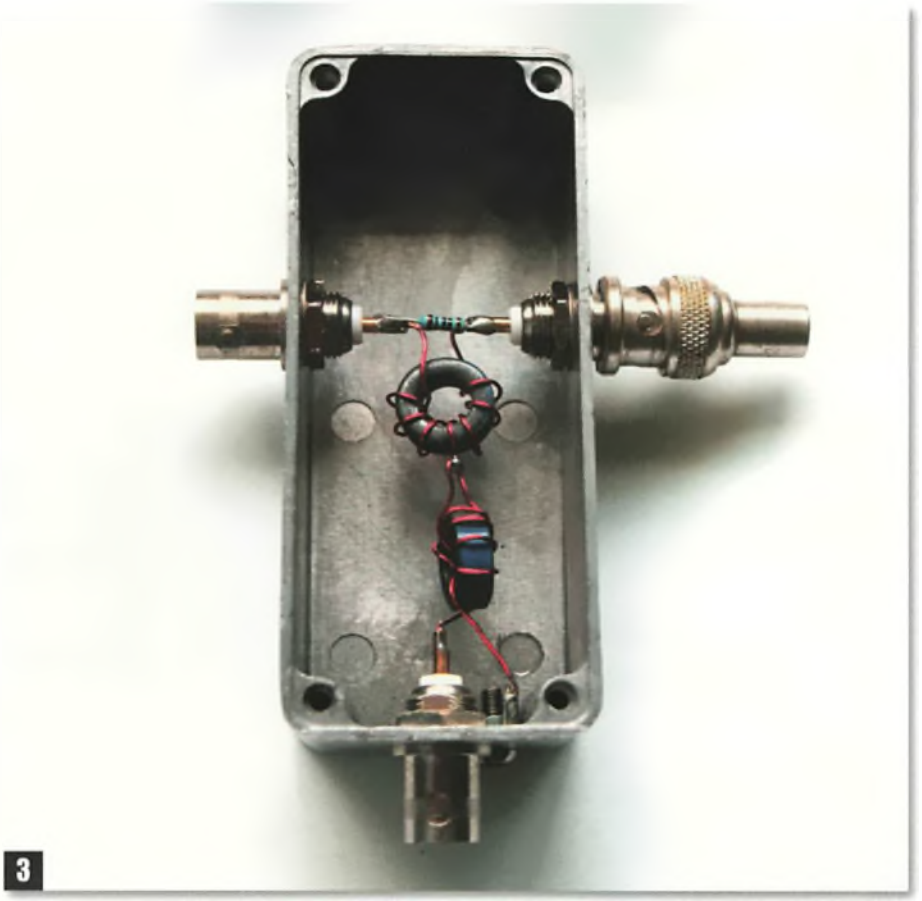


Fig. 1: Diagram showing the three modules for passive noise cancellation together with the 'noise' and main antennas, the interconnecting cables and key distances. Fig. 2: Circuit diagram and component details for the passive combiner that can also act as a splitter. Fig. 3. The physical arrangement of the passive combiner components within a 1590A diecast box.

1.4:1, that is, the tap is at five turns from the earthed end. While the theoretical loss is 3dB, the actual loss was no more than 4.3dB over the HF bands. The module can also be used as a splitter by applying the input signal to port S. The arrangement within the box is shown in **Fig. 3**, with short leads and the two toroids at right angles to achieve good isolation.

The Switched Delay

Commercial noise cancellers and that described in *PW* by Paul G7VAK use a transformer-driven bridge network with a variable resistor to set the phase shift over a 180° range. I took the alternative approach of using coiled lengths of coaxial cable to provide fixed delays. In part, this was to take a slightly different approach but it does make setting repeatable and certain, which can help with interpreting the results. With six cable lengths my aim was to span up to 76ns (71ns being 180° on my band of main interest, 40m, with a little extra in hand) in steps of (mostly) 1ns, that is, in phase increments of about 2.5° on 40m. **Fig. 4** shows the simple circuit with the cable lengths and the measured delays while **Fig. 5** shows the completed unit. The cable length needed is simply the speed of light in vacuum multiplied by the required delay time and the cable velocity factor, *vf*. For RG58C/U *vf* is 0.66. You can use other cable but do recalculate the lengths with the appropriate *vf*.

The switched delay line was housed in a simple bent aluminium sheet U-shaped box, with short cables to two front-mounted sockets. One additional switched section with 14.2m of cable would extend operation to 80m. From the results below, 1ns resolution should mean that the unit is usable to 10m.

As an aside, the front panel lettering was done by inkjet printing onto Letraset Safmat self-adhesive film. After printing, the sheet was sprayed with several coats of clear acrylic lacquer and left overnight. The biggest challenge in applying to the panel is avoiding air bubbles. Those that do form can be pricked with a fine needlework pin and pressed out.

The Attenuator

The attenuator is perhaps the module you may already have to hand. There are a number of inexpensive commercial step attenuators available and one of these could be used but building your own is a simple job. A range of 0-15dB in 1dB steps is likely to prove more than adequate, given that too much disparity between the two antennas may compromise noise cancellation. The simple 50Ω four-stage switched attenuator of **Fig. 6** using T sections with standard E24 value resistors is sufficiently accurate. I used 1% 0.25W metal film resistors for 11Ω and above but could only find 0.25W carbon film 5% for the 2.7 and 5.6Ω. Nevertheless, from 100kHz to 100MHz the measured attenuation was no more than 0.2dB from the correct value for all settings. 2.5mm copper wire was used for the ground bus-bar and 1mm copper for the interconnections. Another aluminium diecast box type 1590A provides the housing, **Fig. 7**.

Bench Tests

I tested the three modules in combination on the bench using an amplified zener noise source and a spectrum analyser connected to port S of the combiner. The total cable length in the attenuator path was 2.45m and 2.58m for the switched delay path. At the test frequency of 7.04MHz you would expect a setting of 71ns to give 180° phase shift. With the approximate attenuation in RG58C/U cable of 0.036dB/m at 7MHz, the calculated attenuation in the delay path would be 0.5dB but perhaps a few tenths higher due to switch losses. Therefore, I'd expect to have to set the attenuator to 1dB to give equal noise levels at the two ports of the combiner.

Fig. 8 is a 3D plot showing a maximum of 36dB noise reduction at settings of 72ns and 1dB. If either parameter (delay

or attenuation) is away from its optimum setting, the 'dip' for the other parameter is both broader and shallower. Interestingly, at 1dB either side of the optimum attenuation setting the delay settings changed by 1ns. At 0dB attenuation the maximum reduction (29dB) was at 71ns and at 2dB attenuation was at 73ns (24dB). Therefore, even on the bench with a single noise source there was some interaction between the delay and attenuation settings.

On-air Tests

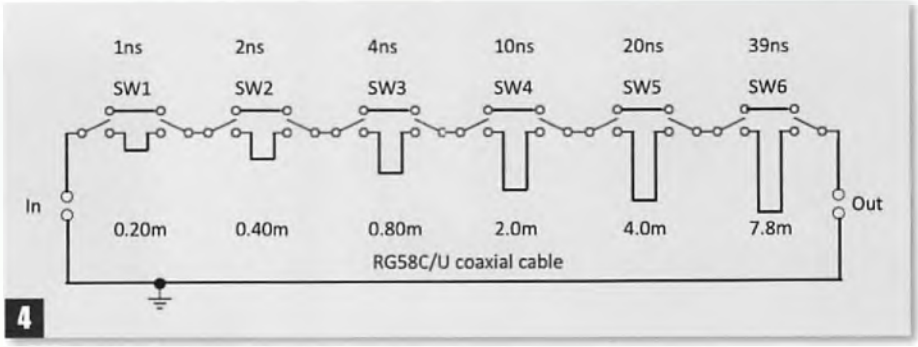
The on-air tests were carried out with the three modules, two antennas and cable lengths as in Fig. 1. In this design there is minimal interaction between the delay and attenuator settings so a null can easily be found by first noting the noise level with each antenna separately, putting the attenuator in the path of highest noise, and setting it to give equal noise levels at the receiver. Next, with both antennas connected and the receiver connected to the combiner output, start with the delay at mid-value and use successive approximation to find the optimum. Alternatively, you could, with patience and steady signals and noise, map out the full response as shown below.

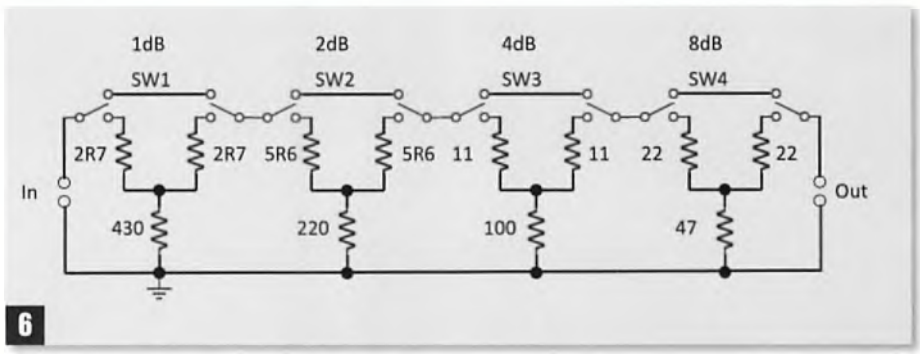
Three example audio clips from 40m are available online as a single .wav file at: www.dropbox.com/s/qv02it2wpskepkp/G3ZIL_NR.wav

Except for the SSB audio clip, where the receiver was a Drake R4B, the receiver for the following tests was the homebrew WSPR direct conversion design with no AGC that I described in April 2016 *PW*. The three clips are:

- OE6ETF on SSB.
- DL4YDU on CW calling CQ.
- A WSPR station at an audio tone of 1430Hz and DJ6UX calling CQ at 330Hz. This clip starts with no noise cancellation and steps through the spoken delay settings.

For a detailed assessment of performance, I recorded the audio level from the WSPR receiver during a period of steady signals with little fading and measured using the Audacity application on an Apple Mac (it's also available for Windows). **Fig. 9** is the on-air equivalent to Fig. 8, where the noise was measured in a 100Hz band when there were no signals present. Clearly the maximum noise reduction at 12dB was much less than the 36dB achieved on the bench. In addition, the delay and attenuator settings were less critical. Maximum noise reduction was at a delay of 63ns and an





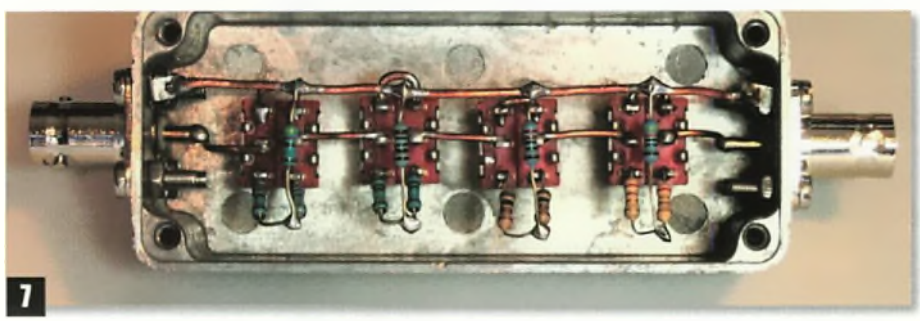
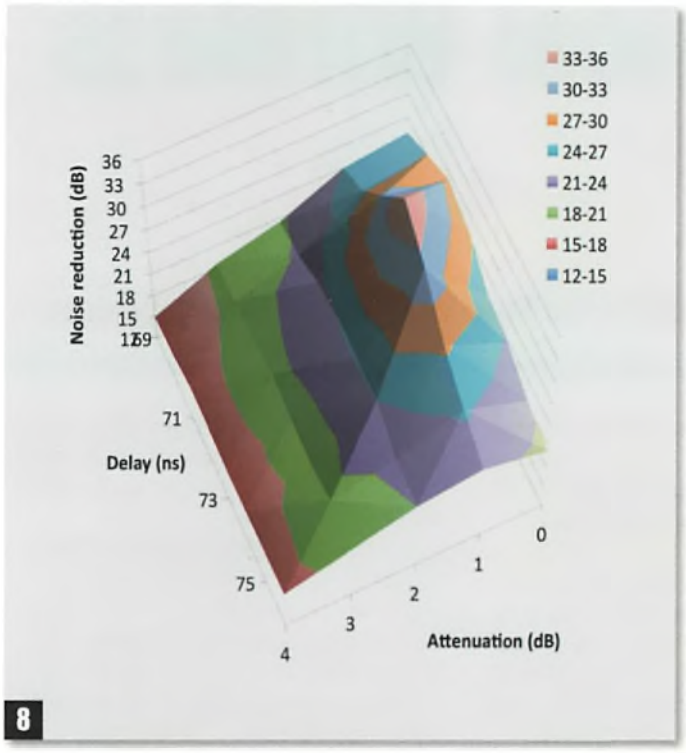


Fig. 4: Circuit diagram of the switched delay line with the cable lengths and measured delays. All switches are DPDT. The connections shown are for the inner of the coaxial cables. The shield is connected to ground at each end of each section. Fig. 5: Physical arrangement of the switched delay line within the bottom of a simple folded aluminium box. Fig. 6: Circuit diagram of the 0dB to 15dB attenuator. All switches are DPDT, resistor values are in ohms. Fig. 7: The physical arrangement of the switched attenuator components within a 1590A diecast box. Fig. 8: 3D graph showing the noise reduction in dB on the bench with a single noise source. Fig. 9: 3D graph showing the noise reduction in dB on 40m during on-air testing in a multiple source noise environment. Fig. 10: Audio spectrum level showing a steady WSPR signal from ON7KB at about 1500Hz and a QRSS signal at about 1240Hz with delay settings of 0ns and 39–76ns. Both show the effects of delay setting on noise reduction and signal level. Attenuator setting was 0dB.



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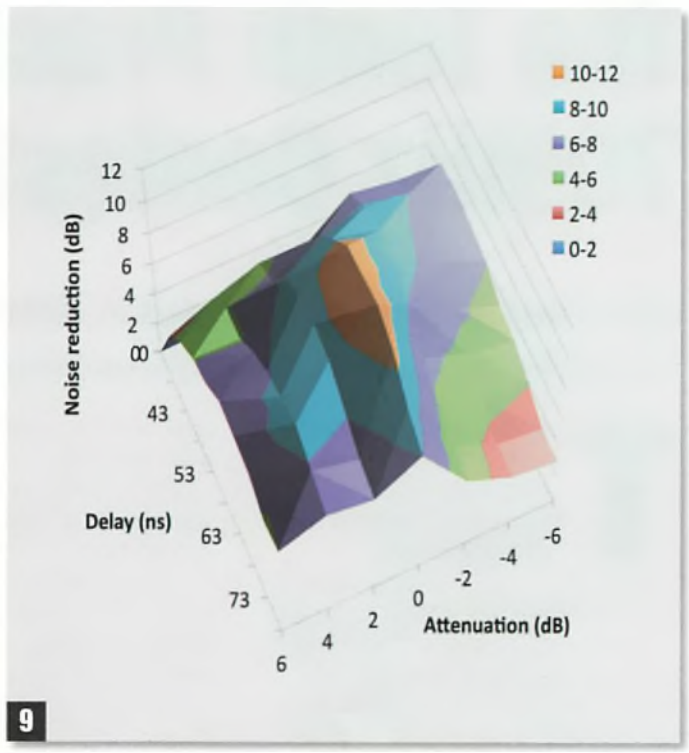

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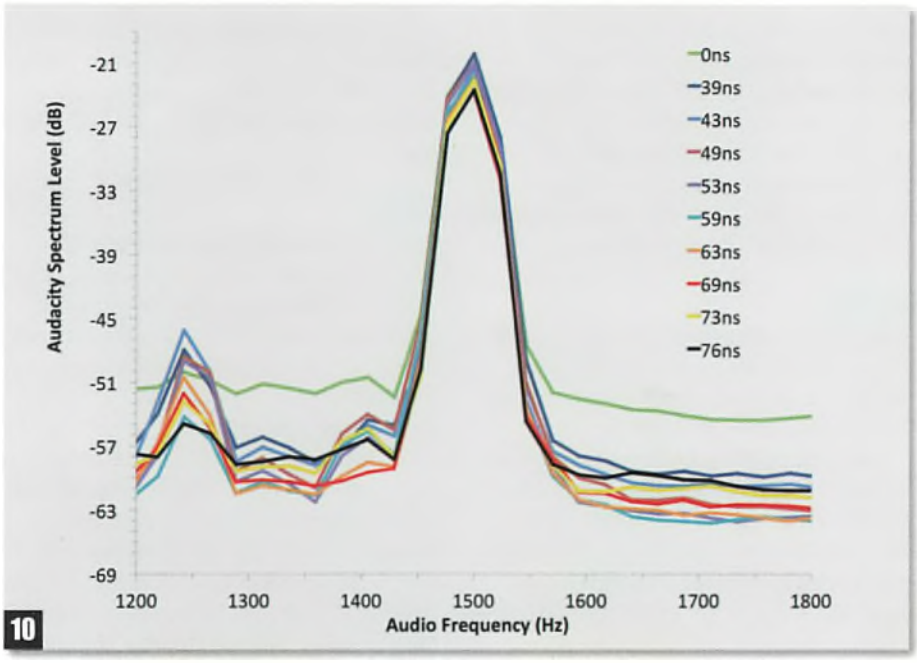

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attenuator setting of 0dB.

My intuition is that these observations are compatible with multiple noise sources in and around the house, all on the same side of the noise antenna, spanning some 60° from a telephone line one side of the house to a street lamp the other. Having reduced the received level of these noise sources, noise from other directions remains. While not spectacular, a 12dB noise reduction is useful and this was on top of a 6dB noise reduction achieved by having the antenna at the far end of the garden away from the house.

This phasing method of noise cancellation also alters the far-field beam pattern of the main antenna. That alteration will depend on the attenuator and delay settings. The result will be alterations to signal levels as well as noise. An early-morning WSPR signal from ON7KB that was both strong and free from QSB provided a good example. Recalling that in these measurements the noise was measured in a 100Hz bandwidth, ON7KB's signal-to-noise ratio (SNR) was 34dB with no noise reduction and 43dB with optimum settings (delay of 53ns in this case), a 9dB improvement in SNR. The variation in signal and noise levels with delay settings are shown in **Fig. 10**.

The signal at about 1240Hz is from a QRSS sender. The signal was barely above the noise with no delay (green trace), with the best SNR of about 14dB at a delay of 53ns.

Conclusions

Noise cancellation prior to the antenna socket of the receiver certainly works for me. The simple approach using three passive modules, a switched attenuator, a switched delay line and a combiner, proved effective on SSB, CW and digital modes. However, the noise reduction that can be achieved is likely to be very dependent on the local noise environment, including the spatial distribution of the noise sources and their levels. If you are literally surrounded by multiple noise sources of much the same level, this technique is unlikely to prove effective. Conversely, if you suffer from a single dominant noise source that spans a small angular range at the antennas, your results may approach the bench results of a single source noise reduction of 30dB or more. The online comments on the commercial devices span this range of experiences. They include many tips for getting the most out of this method. If you try this passive modular approach and it does not work for you, at least you will have built three items with a myriad of other uses and probably learnt a bit more about your local noise.

• E-mail: practicalwireless@warnersgroup.co.uk

The Tenth Practical Wireless 70MHz Contest

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

The 10th Annual *Practical Wireless* 70MHz Contest takes place on Sunday September 23rd 2018 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 conditions.

You may operate from a fixed location or portable – a good hilltop location can make a huge difference to your score.

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) has improved over recent years. A number of FM transceivers for 4m have come onto the market such as the Wouxun KG-UDV1P/L 4m and 2m dual-band and KG-699E 4m handhelds, the Wouxun KG-UV950PL mobile and the Mydel ML-5189 mobile.

For SSB and CW operation, Icom's IC-7100 and IC-7300 transceivers both offer the 4m band in addition to the traditional HF and 6m bands. Both have been used by recent entrants in the contest.

Less well known is the Noble NR-4SC, a dedicated 4m SSB/CW (but not FM) transceiver, which was reviewed in the March 2015 issue of *PW* and used by at least one station every year since.

The UK version of the older Yaesu FT-847 also covers 4m. These are often available second-hand.

Transverters are still popular with 4m operators. Most use an intermediate frequency (IF) of either 28MHz or 144MHz, taking the 28MHz output from an HF or the output from a 144MHz transceiver and mixing with a local oscillator to give to 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 just a few milliwatts. You'll need an attenuator unless your main transceiver has a low-power transverter output. 4m transverters are available from a number of sources in both kit form and ready-assembled – try a-search on Google or eBay.

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.

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 would 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 in for quite a surprise 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 reappear.

Entries

Don't forget to submit your entry after the contest. Although electronic entries via e-mail are preferred and make the task of the adjudicator much easier, legible paper entries continue to be welcome. Please note the new e-mail address for logs for 2018: **entries@pwcontest.org.uk**

Do make a note in your diary now. The 10th *Practical Wireless* 70MHz Contest takes place on **Sunday September 23rd 2018.** If you plan to use batteries, don't forget to charge them a day or two before and do put a reminder in your diary to submit your entry to be received by **Tuesday October 16th.** Let's hope for some good weather and propagation on the day so that we can all have a really enjoyable time.

The 10th *Practical Wireless* 70MHz Contest Rules

www.pwcontest.org.uk

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. The duration will be from 1300 to 1600UTC on September 23rd 2018.

All stations must operate within the terms of their licence and only transmit within the 4m allocation allowed by their licence. Stations using transverters are reminded to be particularly careful to ensure that they don't 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. However, crossband 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 (the 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 at least one contact with a station in the square.
Contacts via repeaters or satellites or using any digital modes (including D-STAR, Fusion and DMR) and data modes or machine generated modes, such as FT8, JT65, PSK31 and RTTY, are not permitted. The use of the DX Cluster, 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 (as defined by the first four characters of the universal locator) in which contacts were made.
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 e-mail).

5. The Log: Logs may be submitted by e-mail or by post. In either case the log 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 sent by e-mail. This may be generated by contest logging software such as EI5DI's SDV or MINOS, or a file in any other suitable format (plain text is fine) provided each of the items above is separated by a separating character such as a comma or tab (please don't mix separators). Give the file a name, including the station callsign (e.g. g6mxl-p.log), and send as a standard e-mail attachment to: **entries@pwcontest.org.uk (Note the change of e-mail address).**
The REG1TEST, .log, .edi and .adi formats or the spreadsheet available on the contest website are preferred. If there is any problem with your entry, you will be contacted by e-mail.
Log sheets and covering information sheets for paper-based entries are available for downloading from the contest website.

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 e-mail message to which the log file is attached. For postal entries, 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 e-mail 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 e-mail must be sent to:
entries@pwcontest.org.uk
(Note change of e-mail address)

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 October 16th 2018. Late entries will be disallowed.

Any other general comments about the station, the contest and conditions during it are welcome (written on a separate sheet of paper in the case of entries sent by post). Photographs relating to the operation are also invited. Please note that photographs cannot be returned and may be used for publication in *PW* or on the contest website. If these are not available by the time the entry is submitted, they may be sent later by e-mail or post, **to arrive by October 23rd 2018.**
Warners Group has taken the necessary steps to ensure that your personal data is handled in conformance with the recent changes to data protection regulations (GDPR). 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.
Take reasonable precautions to avoid choosing a site that another group is also planning to use. It is wise to have an alternative site available should this problem.

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 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.

• E-mail: practicalwireless@warnersgroup.co.uk

In Focus: Amateur Radio in the Philippines

Editor Don G3XTT visits the Philippines and wonders whether some of the initiatives being taken elsewhere in the world have lessons for amateur radio in the UK.

I recently spent a week in the Philippines, not specifically for amateur radio but, such is the nature of our hobby, I was welcomed by several Filipino radio amateurs and had the opportunity to visit PARA, the Philippine Amateur Radio Association. I always find it interesting to compare and contrast aspects of the hobby in different countries. I felt it worth a short article to talk about the state of the hobby in that country. I hope you agree.

1. Don G3XTT with Brian DU1MS, a regular island activator for the IOTA awards. 2. Don meets some of the ladies at the PARA social get-together. Fourth from left is Thelma DU1IVT, Treasurer, Director and past COO of PARA.

The Philippines

The Philippines is a huge country, stretching hundreds of miles from north to south by way of a large number of islands. The country sits on a geological fault line (the Pacific Line of Fire) so is prone to volcanic activity and also suffers extremes of weather, particularly during the rainy season – their rain is of a different order of magnitude to what we typically experience in the UK! They can expect around 20 typhoons during each rainy season.

Politically, there are parts of the country where there is unrest and the island of Mindanao, in particular, has a Muslim majority who would like to secede from the rest of the country. Historically, Mindanao has been Muslim for many hundreds of years, while much of the rest of the country is Catholic as a result of some 400 years or so of Spanish rule. More recently, the US ruled for 50 years up to the end of WWII so most people speak English as well as Filipino. From an amateur radio point of view, of course, should Mindanao secede and become independent, we would presumably have another DXCC entity to chase.

As with many Asian countries, the population is relatively young, increasingly tech-savvy (everyone has a mobile phone, shops offer a range of ways of using your mobile to pay for goods and so on). One amateur commented to me that for young Filipinos, mobile phones take priority over meals – they would rather go hungry than run out of credit on their phones!

Amateur Radio in the Philippines

There is a strong tradition of amateur radio in the Philippines centred to a large extent on public service. This continues to be the case. Given the ever-present risk of extreme weather and other natural disasters, there is official recognition that amateur radio is a resource to be supported. HF DXing and contesting is somewhat more difficult. The main cities (the capital is Manila) are densely populated and it is by no means easy to erect decent antennas. And even when you do, electrical noise is ever present. The ideal is a rural location but those who live in rural areas are usually subsistence farmers without the interest or the money to take up amateur radio. On the other hand, there is significant interest in the Islands on the Air (IOTA) awards programme because there are many IOTA groups across the Philippines, many of them relatively easy to access for a fun DXpedition.

Licence Classes

There are four classes of licence, Foundation, Novice, General and Extra, with increasing privileges as each higher level is achieved. There is still a 5WPM Morse test to reach the highest licence level but those who get there are allowed to run up to 2kW of power! The prefixes DU or 4F, DV, DW and DY are used for the four licence classes, with the DX and DZ prefixes reserved for special event and DXpedition callsigns. There are also prefixes starting 4E, 4G, 4H and 4I, again according to licence class. Filipino amateurs may also hold up to three vanity callsigns (short calls such as DU1A), each valid for a maximum of three years. The various prefixes are summarised in the sidebar.

All licences attract an annual fee although it's quite modest in UK terms. However, all transmitters must be registered with the authorities and there is a registration fee, less for handhelds than, say, for a base station transceiver. You can do this registration yourself but in some cases the vendor will help with the paperwork.

Recruitment

Recruitment into amateur radio comes from from CB, from those interested particularly in public service communications and from those using the amateur

bands illegally. This latter is not something we experience in the UK but is all too common in the Philippines. But rather than see these intruders as a threat, PARA sees an opportunity to attract them to the legal side of the hobby.

There has yet to be a full changeover to digital TV, with 57MHz still used for analogue TV broadcasting, a problem for 6m band operators. The reason for keeping analogue going is that many of the poorer members of the population cannot afford to upgrade their TVs to digital. Again, though, for the younger generation this less of a problem – they want to watch video on demand on their phones!

Talking about digital, the digital voice modes have yet to take off in a big way because the equipment is so much more expensive than, say, a Chinese-made FM handheld. That said, DMR is starting to grow, largely because DMR gear is cheaper than D-STAR or C4FM. There is also a growing interest in the FT8 mode – it offers the possibility of making QSOs with low power and limited antennas, which is the lot of many Filipino amateurs.


3


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3. Don with a selection of Filipino amateurs and would-be amateurs. Nearest the camera is 'Jojo' DU1VHY, current COO of PARA. 4. Enjoying dinner with Robin DU9RG and his wife Christine DU3YL. 5. Manila is famous for its Jeepneys although nowadays they are banned from many main thoroughfares. 6. Enjoying a beer with Prof. Eddie Valdez DU1EV, PARA President and representative at the International Amateur Radio Union.

PARA

PARA are fortunate that, thanks to the official support for amateur radio that I mentioned above, some four years ago they were provided with office space in the regulator's office building (the equivalent of the RSGB being given space by OFCOM). This came about largely as a result of a request to PARA from the regulator (National Telecommunications Commission – NTC) to train up operators for the official emergency net, which comes into action after natural or other disasters. It quickly became clear that the two organisations could help each other – there are now, in effect, two country-wide emergency nets that can be brought into action, one on commercial frequencies and one on amateur frequencies.

PARA has two full-time staff but otherwise relies on volunteers. Just a few years ago the membership was around the 600 mark but is now above 3000, so they must be doing something right. The total amateur radio population of the country is around 7000.

Training and Development

The regulations require that anyone aspiring to an amateur radio licence must have completed a one-day seminar. These are run by PARA on every second weekend of the month at their offices, although PARA volunteers also travel to other provinces to run seminars when there is sufficient demand.

PARA also run various other types of training, including working with the Girl Scout movement once in the Spring and with the Boy Scout movement once each autumn (I use these seasonal terms in a European sense – the Philippines has two seasons – summer and the rainy season!). As in many Asian countries, these youth organisations are well supported.

PARA has, thanks to the generosity of various Filipino amateurs, also been able to set up school radio clubs in various provinces. The schools chosen are ones with an emphasis on technical education and obviously it is hoped that these initiatives will lead to new, young blood coming into the hobby. If nothing else, it will increase awareness of amateur radio. The schools expect the students to gain a basic amateur radio licence to complement their theoretical studies.

PARA lacks the resources to produce a regular magazine but finds that Facebook is an excellent way of reaching members and promoting itself to the population at large – a case of social media being beneficial to the hobby rather than competing with it.

Thanks

I cannot end this piece without thanking those amateurs I met in the Philippines for their kindness and hospitality. I particularly enjoyed my time spent at PARA on one of their training days, which attract not only would-be amateurs but existing ones too – these days have turned into informal get-togethers with a great atmosphere. People bring food and it turns into one big buffet and party. Great fun!

Philippine Callsign Prefixes

DU or 4F	Extra Class (You have the option to change from DU to 4F)
DV	General Class
DW	Technician Class
DY	Foundation class

New sets of callsigns
(see note, below)

4E	Extra Class
4I	General Class
4G	Technician Class
4H	Foundation class

Note that, for example, DU1ABC is different from 4E1ABC

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MRM-100 MICRO MAG 2/70cm, Gain 0.5/3.0dBd, Length 55cm, 1" magnetic base with 4m coax and BNC **£19.95**
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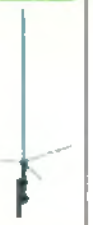

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TM-7 Network Mobile Radio £139.95
Android based POC Radio (PTT over Cellular)
The Inrico TM-7 network radio is the first mobile network Radio. Great for amateur radio use with the new IRN platform, for Zello, Team Speak 3 and Echolink via 3G or WiFi. And it works as WiFi hotspot too!

T320 4G/WIFI Network Handheld Radio £169.95
This radio is cellular so works like a walkie talkie but uses the cellular network as a repeater! This means hand held to hand held or handheld to mobile comms around the world. Companies like ID offer a suitable sim with EU roaming from £3.99 a month or if you are in the UK Freedompop is available otherwise you can use it on Wifi! Using Apps like Zello & Teamspeak you can talk privately for just the cost of your sim! Please note this radio does not transmit on the amateur bands. For the Radio amateur you can link to many networks using the International Radio Network For the non-amateur think of it as well behaved CB with worldwide coverage or Private 1 to 1 calls! For the private use all the advantages of cell phone coverage while looking professional. Please note this version uses unlocked Android and allows you to fully utilise the PTT functions

Features

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TRX-1 25-1300MHz Digital Handheld Scanner (left) **£419.95**
TRX-2 25-1300MHz Digital Base Scanner (right) **£479.95**

DMR Dual Band Transceiver

MOONRAKER

Dual Band DMR has arrived with twice the fun with the MOONRAKER HT-500D Dual Band DMR Digital & Analogue hand held Radio!
The HT-500D takes the experience of DMR to a new level with features designed for the amateur radio user.
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Dual band mobile transceiver
136-174/400-450MHz 25W
Amazing value £79.95!

MT-SC Software cable **£9.95**
MT-DC Cigarette lighter and power cable **£9.95**
MT-RM Replacement microphone **£12.95**

PRESIDENT ELECTRONICS

Ronald
10/12m mobile transceiver
AM/FM 50W+ PEP
Amazing value £169.95!

Lincoln II Plus 10/12m mobile transceiver AM/FM/LSB/USB/CW 35W **£239.95**

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AT-778UV
Dual band 136-174/400-490MHz
30W FM mobile transceiver
Amazing value £99.95!

AT-D868UV

VHF/UHF DMR Handheld **£139.95**
The AnyTone D868UV radio was developed to conform to the DMR Tier I and II requirements. The radio offers 4,000 Channels, 10,000 Digital Talk Groups with 150,000 Contacts. The large colour display offers clear information about the radio operation and function, including displaying who you are connected to. The powerful transmitter is very reliable and offers up to 7 Watts of power for a hand-held. The Anytone AT-D868UV has been designed for radio amateurs and has the ability to take the radio outside of the code plug in VFO mode (Single button press) So it is a dual band Hand held with DMR rather than a DMR radio with a dual band handy!

LEIXEN

VV-898 £59.95
Dual Band
136-174/400-470MHz 10W
mobile transceiver
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VV-898SP Dual Band 136-174/400-470MHz 25W mobile backpack transceiver, this mobile backpack transceiver you can take virtually anywhere you need it! Leixen combined their micro-compact, 25 watt Dual Band UHF/VHF Mobile Radio with a powerful 12A Li-ion rechargeable battery and put it all in a sturdy chassis you can fit in your pack or emergency bag for use anytime, anywhere!.. **£149.95**
VV-8SC software and cable for all Leixen transceivers

ICOM

Base

IC-7610 HF/50MHz SDR base transceiver **£3499.95**
Following on from the technology incorporated into the IC-7300, the IC-7610 adopts the same RF direct sampling system for signal processing. By converting the analogue signal directly to a digital signal and processing it within the FPGA (Field Programmable Gate Array), it provides improved transmission phase noise and excellent RMDR of 105 dB (at 1 kHz detuning).

IC-7300 HF/50/70MHz base transceiver **£1199.00**
The IC-7300 is a revolutionary compact radio that will excite HF operators from beginners to experts. This new model has a high-performance real-time spectrum scope and employs a new RF direct sampling system.

Mobile

ID-4100 D-Star dual band mobile transceiver **£475.00**
The ID-4100 makes using DSTAR more fun and more comfortable thanks to the terminal mode / access point mode for the first time in mobile devices . This feature enables DSTAR via the Internet from any location you do not have access to a DSTAR repeater.
IC-2730E Dual band mobile transceiver **£289.00**
This stunning new dual band mobile transceiver features a large high-contrast LCD screen with backlight, V/V and U/U simultaneous receive capability and optional Bluetooth® connectivity for hands-free and remote control communications.

Handheld

ID-51E PLUS2 D-star dual band handheld transceiver **£379.00**
This is the third generation of the successful D-Star handheld transceiver. Like the original ID-51E, it covers 2 meters and 70cms and receives two bands simultaneously (V/V, U/U & V/U)

BAOFENG

New version of this ever popular handie - and now with a 4.5W on 2m - Comes complete with desktop charger, antenna, belt clip & high power 1800mAh battery and now with FREE earpiece all for less than £30!

UV-5RC+ Dual band 136-174/400-480MHz 4.5W handheld transceiver **£29.95**
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UV-5BE Battery eliminator **£9.95**
UV-5SC Soft case **£9.95**
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Another great product from Baofeng making DMR affordable to everyone. Comes complete with high gain antenna, belt clip, hand strap, desktop charger, 3800mAh battery, user manual and earpiece

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- Frequency editing under Channel mode
- Digital Monitor Mode: support communication when frequency, time slot and colour code is paired, regardless of Contact ID, RX Group list

Customize shortcut keys: including long-press and short-press with Side Keys. Edit shortcut keys with Programming Software

- Support analog repeaters and digital ones
- Dual-standby and dual display
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ALPHA ANTENNA complete multiband loop for 10-40m + tripod & bag £349.95
The rugged & waterproof Multiband Loop is a complete HF antenna that transmits from 10-40 meters and has low noise receive capabilities from 7.0MHz to 29.7MHz. It can be assembled in less than 60 seconds even with thick winter gloves on. It is directional, packable into less than 25% the space of any other, and at 1.3 Kg (3 pounds), which includes Tripod, Bag, and Antenna, it is the lightest Complete Magnetic Loop ever made.

ALPHA ANTENNA 10-40M ALPHA LOOP JR with 6:1 reduction drive (inc tripod+bag) £399.95
A personal favourite of the Founder of Alpha Antenna, Steven Deines/NOTES. The Alpha Loop Jr+ for most CAP (SKARES), MARS, and Amateur Radio frecuencies offers you a light 6.350MHz to 29.7MHz 15 watt PEP SSB transmit/receive antenna in a small package that deploys in approximately 60 seconds, which now has a 6:1 reduction drive.

ALPHA ANTENNA 6-80M complete multiband tuner free hf antenna £399.95
Directional Multiband System definition: A complete directional 500W PEP SSB multipurpose antenna, which can be configured to launch your signal as circumstances require from 6 through 80 metres.

ALPHA ANTENNA 6-160M J-POLE JR 34FT ANTENNA . £179.95
The Alpha J-Pole Jr Antenna is only 34 feet in length. The unique design characteristics of this 6-160 Meter HF JPole antenna enables it to approach resonance on the major HF bands

Tarheel Antennas

LITTLE TARHEEL II MOTORISED 80-6MHF ANTENNA 3.5-54MHz £449.95
When properly installed on your vehicle this antenna will provide continuous coverage from 3.5 to 54 MHz with the supplied whip. The Little Tarheel II antenna like all Tarheel motorized antenna models are built to meet the highest standards but in a more user friendly size. This antenna comes with the sensors already pre-installed so if you decide to add one of the auto controllers (SDC-100 Simple Controller, SDC-102 Programmable Controller, Turbo Tuner, Antenna BOSS and BOSS II) now or later everything is ready. This antenna has been designed for the person who wants to enjoy HF mobile but prefers smaller antennas. Don't let the small size fool you because when mounted higher on the vehicle you have less ground losses equalling higher performance

OTHER MODELS
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LITTLE TARHEEL II-HP MOTORISED 40-6M HIGH POWER HF ANTENNA 7-54MHz £449.95
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TARHEEL M100A-HP MOTORISED 80-10M HIGH POWER HF ANTENNA 3.4-30MHz £529.95
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TARHEEL M300A-HP MOTORISED 160-10M HIGH POWER HF ANTENNA 1.7-30MHz £499.95
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Chameleon Antenna

CHAMELEON CHA F-LOOP PLUS 2.0 £549.95
The Cha F-Loop Plus 2.0 was designed with portability, ease of use simplicity, ruggedness and high performance in mind. Unlike any other similar antennas on the market, it is made with premium materials that are precisely manufactured and assembled in the USA! This is an exciting new product from Chameleon Antenna. Easily deployable HF magnetic loop antennas, also called small transmitting loops, have been routinely used for many years in military, diplomatic, and shipboard HF communication links, where robust and reliable general coverage radio communication is a necessity.

OTHER MODELS
CHAMELEON CHA F-LOOP 2.0 ..... £449.95
CHAMELEON CHA P-LOOP PORTABLE HF ANTENNA £549.95

CHAMELEON CHA SKYLOOP 3.0-54 MHZ HF BASE ANTENNA £149.95
The CHA SKYLOOP is a 250' (14 gauge) full wave loop antenna cut for 80M. A yard of at least 60' X 60' will be required to install and support the antenna properly. With the help of an antenna tuner the CHA SKYLOOP will cover all the bands between 80M and 6M included. To match the loop to the coax cable a high power 4:1 air core balun (1000W CW) has been inserted in a waterproof container at the feeding point of the antenna. Even if the antenna can be installed at a minimum of 10' above ground the antenna should be ideally installed at least 30' to 40' off the ground for maximum performance. The antenna will be suspended by four evenly spaced support points. The main advantages of a sky loop are the reduced background noise and a better gain over a dipole

CHAMELEON CHA TD PORTABLE 1.8-30MHZ ANTENNA . £399.95
The CHA TD (Tactical D-pole) is a HF broadband antenna specially designed for portable HF communication where rapid deployment and simplicity of operation is essential.

CHAMELEON CHA TD LITE PORTABLE 1.8-54MHZ ANTENNA £159.95
The CHA TD LITE (Tactical Dipole -LITE) is a HF broadband antenna specially designed for portable HF communication where rapid deployment and simplicity of operation is essential but compactness is primordial.

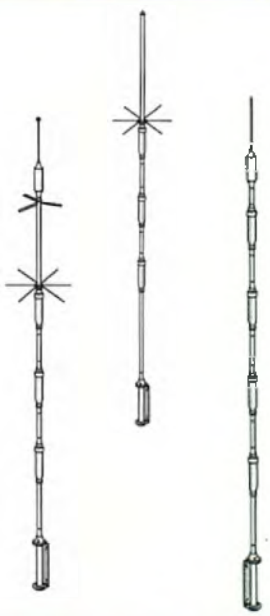
CHAMELEON CHA HYBRID MICRO PORTABLE HF ANTENNA BASE 1.8-54MHZ £229.95
The CHA HYBRID-MICRO is a lightweight highly portable broadband antenna system designed to offer maximum portability and performance. The antenna weights about 1 lb

Hustler Antennas

HUSTLER 6-BTV 6 Band 80-10m £279.95
Bandwidth at its broadest! VSWR 2:1 or better at band edges on 10-40 meters. Up to 100 kHz. on 75/80 meters. Solid one inch fiberglass trap forms for optimum electrical and mechanical stability. All sections 1.25" heavy wall, high strength aluminium. Extra heavy duty aluminium mounting bracket with low loss, high strength insulators. Easiest assembly and tuning of any multi-band vertical. Feed with any length 50 ohm coax.

HUSTLER 5-BTV 5 Band 80-10m £239.95
Full band coverage on 10-40 meters (1.6:1 at band edges typical). Solid one inch fiberglass trap forms for optimum mechanical stability. Heavy gauge aluminium with stainless steel hardware construction throughout. Feed with any length 50 ohm coax

HUSTLER 4-BTV 4 Band 40-10m £189.95
Exceptional mechanical construction with all sections of 1.25" high strength, corrosion resistant aluminium. Stainless steel clamps permit adjustment without damage to the aluminium tubing. The easiest to assemble multi-band vertical on the market. Full band coverage on 10-40 meters.



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An Experimental CFR Dipole

Steve Telenius-Lowe PJ4DX resurrects an antenna design that first saw the light of day almost 30 years ago but seems to have been largely forgotten since.

Since becoming active as PJ4DX I have been using vertical antennas on 40m. The first was a Butternut HF2V, followed by a pair of phased quarter-wave verticals with elevated radials (see *A Practical 40m Beam for the Small Garden*, *PW*, April 2015) and then (because I wanted omni-directional coverage) a single one of those verticals.

All these worked well but recently I decided to try a 40m horizontal dipole to see how it compared. What transpired was a result of my particular set of circumstances.

Putting it Together

I had been given an old and well-used W2AU-type 1:1 balun, **Fig. 1**, but the only suitable antenna support I had was a 12m Spiderbeam fibreglass pole. These are ideal for vertical antennas but the top section is too spindly to support the weight of horizontal wires. Even with the pole's top section removed, I didn't want to put the balun at the top because I felt its weight, added to that of the wires, would cause the pole to bend too much. Nor did I want to remove the pole's second section because I wanted the dipole to be as high as possible.

I felt the balun should be used because if a dipole is fed by coax without one, the feeder itself can also radiate, upsetting the dipole's figure-of-eight radiation pattern, **Fig. 2**. Although the precise radiation pattern wasn't important, a radiating feedline can potentially lead to EMC (electromagnetic compatibility) problems such as interference to televisions, computer monitors, internet routers, hi-fi systems and the like, particularly if using high power. I wanted to ensure I didn't cause interference either to my own equipment or to that of my neighbours.

Radiation from the feeder is not in itself a bad thing. What if you could control that radiation and have it only where you want it to be? I remembered the design of the Carolina Windom® [1], in which a 'line isolator' (presumably an RF choke) is placed some way down the coaxial feeder, creating a vertical coax section that is intended to radiate. The line isolator prevents radiation from the remainder of the coax to the station. In the 'Carolina Windom 80' this vertical section is 22ft (6.70m) long. I don't know why that length was chosen by the antenna's designers but I calculated that, on the 40m band, a quarter-wave of RG58 cable, when multiplied by its velocity factor of 0.66, is 23ft long. I happened to have a gash length of RG58 a little longer than that so, compromising, I cut it to 22ft 6in (6.85m). (And, rather than throw out the remainder, I put PL259 plugs on either end – you can never have too many patch leads!)

1

Fig. 1: The old W2AU-type 1:1 balun I had been given.

The W2AU balun was connected at the bottom of the length of RG58, **Fig. 3**, and, because this is a voltage-type balun, I added five large ferrite beads over the feeder below the balun to act as an RF choke. This resulted in a perfectly standard dipole except that the balun was connected 6.85m down the feeder, rather than at its feedpoint, **Fig. 4**.

Impedance Transformation

An electrical quarter-wave transmission line – which is what the vertical radiating element is – will also act as an impedance transformer. This means that the dipole's 73Ω impedance will be transformed to a different value at the balun. Would this be a problem, I wondered?

If 50Ω coax is used to feed a half-wave dipole in the centre, there will be a mismatch causing an SWR of 73 ÷ 50 = 1.46:1. As anyone who has ever done this will know, it's of little consequence. The antenna is able to accept power and radiates perfectly well (although the feeder may also radiate, as discussed earlier).

A quarter-wave transmission line transforms impedances according to the formula $Z_i = Z_0^2 \div Z_l$

where:

Z_i is the input impedance;

Z_0 is the characteristic impedance of the transmission line (in this case the RG58's 50Ω); and

Z_l is the load impedance (in this case the dipole's 73Ω).

Z_i (the impedance at the bottom of the RG58 vertical radiating section) should therefore be $50^2 = 2500$ divided by 73 = 34.2Ω. The SWR at the balun should therefore be 50 ÷ 34.2 = 1.46:1 and, sure enough, this was very close to the actual SWR measured on an antenna analyser (it's always good when practice confirms the theory!). A 1.46:1 SWR is the same as that expected if a dipole is fed with no matching transformer and is of no concern.

The Original CFR

There's nothing new under the sun! Having already put up my dipole with its electrical quarter-wave vertical section, a few days later I stumbled across an article called *Controlled feeder radiation* by **Bill Sykes G2HCG** in the May 1990 RSGB *Radio Communication*. Bill was the founder of the J-Beam antenna company and he coined the term CFR, also calling the coaxial cable vertical radiating part of the antenna system the *"CFR section"*.

While G2HCG stated his CFR section was a quarter-wave long, the length he actually used was 0.275λ, so it was rather longer than a quarter-wave, and he didn't take the cable's velocity factor into account. Sykes's CFR dipole was designed for 20m and his 0.275λ CFR section was 19ft (5.79m) so – if built to his specifications – my 40m antenna would have had a CFR section 11.54m (37ft 10in) long.

The balun used by G2HCG was a simple coaxial choke wound on a ferrite ring, **Fig. 5**. He said there should be a minimum of five turns on each side of the ferrite and that it should cover 10 to 20m; for 40m two ferrite rings should be used.

G2HCG claimed the particular length of CFR section he used transforms the 73Ω at the centre of the dipole to closer to 50Ω, thus providing a better match to the coax used for the remainder of the feeder. With the length I used, the impedance was transformed to around 35Ω.

In addition to the dipole, G2HCG described several other antennas in which the CFR technique could be used, including a half-square and a modified Bobtail array. It would be interesting to try some of these but that is for another day.

How Did the Antenna Work?

Actually, the antenna worked very well. The manufacturer of the Carolina Windom claims that the addition of the vertical radiating section can provide up to 10dB gain over a standard dipole under certain circumstances. Certainly, a low horizontal dipole radiates most of its power straight upwards (and anything under about 40m (130ft) can be considered 'low' on 80m) so for long-distance DX contacts on 80m this claim is not unreasonable.

I wondered if the vertical section of RG58 in my CFR dipole would radiate a low-angle signal and provide some gain, as claimed for the Carolina Windom? Unfortunately, I had no 'standard' 40m dipole with which to compare its performance although I did have a quarter-wave vertical (one half of the phased vertical array described in the April 2015 *PW* article). Over a period of several weeks I made numerous A/B comparisons between the two antennas. Details are provided in **Table 1** but can be summarised by saying that local and semi-local stations were stronger on the CFR dipole, sometimes by up to 20dB. No surprise there. The dipole is only just over a quarter-wavelength above ground so it would be expected to produce high-angle radiation favouring local and semi-local stations. More distant stations in Europe – from around 7,000 to 9,000km away – were generally stronger (and in one case 10dB stronger) on the vertical (although some reported no noticeable difference between the two antennas).

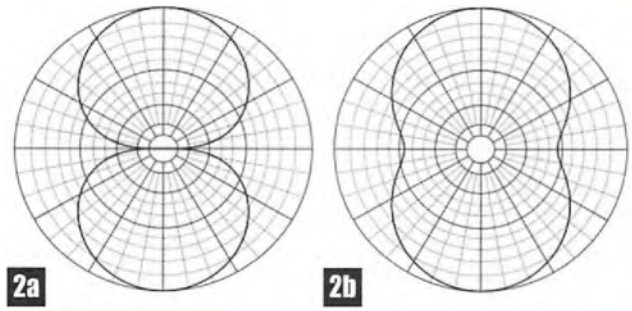


Fig. 2: (a) The classic, theoretical, figure-of-eight pattern of a standard dipole. (b) If the feeder radiates the pattern is more likely to be similar to this. Fig. 3: The W2AU balun connected at the lower end of the RG58 'CFR section'. The balun is secured to the Spiderbeam fibreglass pole with cable ties.

What surprised me, though, was that more distant stations (10,000km plus) were either as good, or better, on the CFR dipole. The vertical would be expected to perform best on very long-haul DX, yet long-path signals from Japan (26,000km away) were at least as good on the CFR dipole. I worked several Indonesian stations, located close to my antipodes 20,000km away, and there was either no difference or the CFR dipole was better, in one case by 2 S-units. In no case was the vertical better on long-path signals to Japan or Indonesia.

Another factor comes into play here. The CFR dipole was noticeably quieter on receive: band noise plus local noise was about 1 to 2 S-points lower on the CFR dipole. This is to be expected. Verticals are known to be noisy on receive even if they transmit good signals. Two DXpeditions to rare DXCC entities (6O6O in Somalia and E31A in Eritrea) active in January were inaudible on the vertical (below the noise level) but workable on the CFR dipole. As the old saying goes, *"you have to hear them to work them"*, and if I had only had the vertical I would not have been able to make a 40m QSO with 6O6O, who was about 449 on CW on the CFR dipole.

Due to space restrictions I can't put up a 'standard' dipole at the same time as the CFR dipole. I can't be certain that the vertical section of RG58 in the CFR dipole is providing low-angle radiation. Without an antenna range I can't prove that the CFR dipole has gain at any radiation angle, compared with a standard dipole. All I can say for sure is that I was surprised to find that the CFR dipole was as good as, or better than, the vertical on almost all signals except those in Europe. This was confirmed on transmission tests as well as on received signals.

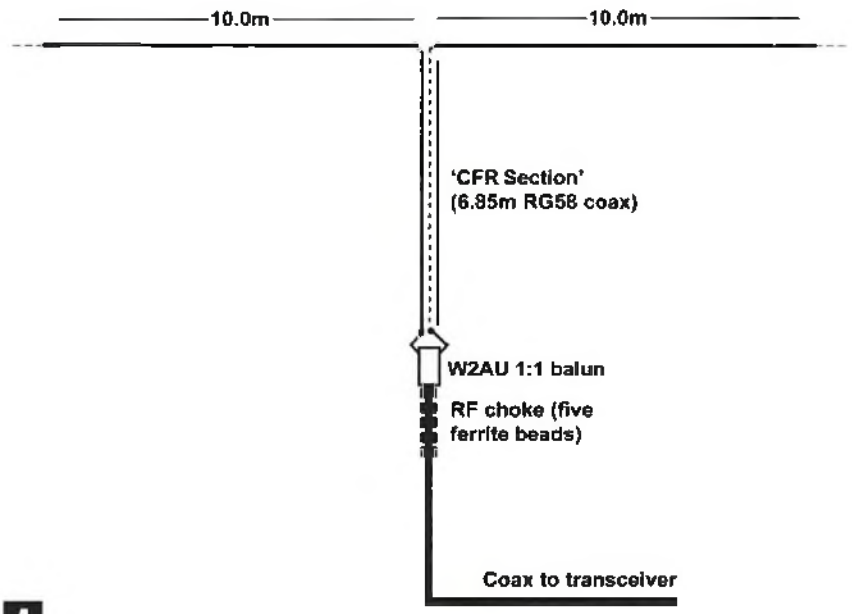
Further Tests

Although G2HCG wrote about controlled feeder radiation 28 years ago and the commercial Carolina Windom antennas have used the technique for many years, I have not seen any references to CFR in antenna books or in recent articles. If others have tried the CFR dipole I would be interested to hear:

a. If extending the CFR section to a physical 0.275λ helps to transform the impedance to close to 50Ω, rather than the 34 – 35Ω that occurs with an electrical quarter-wave CFR section;
b. If vertical radiation from the CFR section can be proved to exist;
c. If changing the length of the CFR section has any effect on the amount of vertical radiation;
d. What the optimum length of the CFR section is;
e. If a CFR dipole and a standard dipole at

Callsign	Location	Approx. Distance	CFR Dipole Better	Vertical Better	Notes
YV7RCV	Margarita I, Venezuela	500km	✔	-	10dB better
9Z4KAK	Trinidad	800km	✔	-	Huge 20dB difference, S9+10dB to S9+30dB
HH70A	Haiti	900km	✔	-	2 S-points
VP2ETE	Anguilla	900km	✔	-	2 S-points
6Y5IC	Jamaica	1200km	✔	-	10dB better
HK0RMR	San Andres I	1500km	✔	-	Huge 4 S-points better, S6 to S9+5dB
WA2VUY	New Jersey	3500km	✔	-	1-2 S-points
KD1KT	Indiana	3800km	✔	-	10dB better
VA2AM	Quebec	4500km	✔	-	Huge 20dB difference, S9 to S9+20dB
VE2LH	Quebec	4500km	✔	-	2 S-points
G3RAU	Lincolnshire	7300km	-	-	No difference
G4KNO	Bury St Edmunds	7300km	-	✔	*"Better"* on vertical
ON7TQ	Belgium	7500km	-	✔	Vertical 10dB better
F4FPG	Nr Lyon	7700km	-	✔	Vertical 1 S-point better
DL5LYM	Leipzig	8500km	-	✔	*"Better"* on vertical
ER4DX	Moldova	9500km	-	-	No difference
TA2LG	Asiatic Turkey	10,000km	✔	-	CFR 1 – 2 S-points better
TA4RC	Asiatic Turkey	10,000km	✔	-	56 on CFR, inaudible on vertical
ZS6CCY	Northern South Africa	11,100km	✔	-	5dB better, S9 to S9+5dB
E31A	Eritrea	11,500km	✔	-	56 on CFR, inaudible on vertical
HZ1TT	Saudi Arabia	11,500km	-	✔	1 S-point better on vertical
6O6O	Somalia	12,500km	✔	-	449 on CFR, inaudible on vertical
YB1AR	Jakarta	21,000km*	-	-	No difference
YB1DNF	Jakarta	21,000km*	✔	-	2 S-points, S7 to S9
YB3VO	Java, Indonesia	21,000km*	✔	-	1 S-point or less
YB0AR	Jakarta	21,000km*	✔	-	1-2 S-points (56 to 57 or 58)
JA1/JA3	Tokyo etc	26,000km*	✔	-	No difference or slightly better

Table 1: Summary of many A/B comparisons between the CFR dipole and a quarter-wave vertical (stations marked * were worked via long path, so distances are greater than 20,000km).



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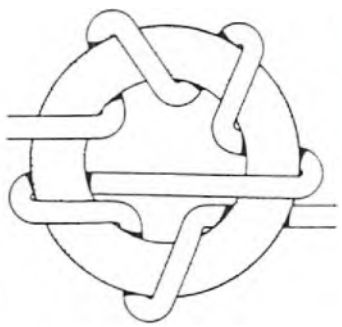

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Fig. 4: The 'CFR dipole' as made by PJ4DX. It would be interesting to discover what effect varying the length of the 'CFR section' has.
Fig. 5: Toroidal balun used on the original CFR dipole by G2HCG. He recommends at least five turns of coax on each side of the ferrite, and to use two ferrite rings for 40m.

the same height could be compared, is there any real difference in performance, particularly with long-haul signals (greater than about 12,000km)?

f. If it's possible to mount horizontal dipoles more than a half-wave above ground, is there any advantage in using a CFR dipole, or is the low-angle radiation from a high standard dipole as good as that from a CFR dipole?

g. To put the previous question the other way around: if it is only possible to mount dipoles relatively close to the ground, does the CFR dipole then have an advantage over a standard dipole?

As may be gathered, I'm slightly sceptical about whether the CFR dipole is really producing low-angle radiation. However, the proof of the pudding is in the eating and the one I made worked better than I expected for long-haul DX – so I'm not complaining!

Reference

[1] Carolina Windom® antennas are made in the USA by Radio Works (www.radioworks.com). Carolina Windom is a registered trademark and the designs of the various versions are protected by copyrights and trademarks owned by **Jim Thompson W4THU**. On the website W4THU states that he is now retiring and is no longer selling his products outside the USA.

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Unravelling Mysterious Signals

Tim Kirby G4VXE plays detective, finds a new solution for remote control of his rig and has the usual reader news.

On June 23rd, I received a message from Jim Lee G4AEH (Nuneaton) saying that he was hearing Spanish stations from the Madrid area on 145.500MHz and signals were strong. I was out and about at the time so couldn't listen myself but was a little curious because there hadn't been any Es activity to speak of earlier in the day and although not impossible, I was a little surprised that it had reached 2m so quickly! The signals vanished after about 10 minutes. Then, about 90 minutes later, Jim reported hearing signals again, this time with a Russian station calling CQ Satellite. Around then, I started to have a theory about what might be happening.

I'd read that the ISS crossband repeater was due to be active at the time in order to test some satellites. Normally, the crossband repeater uses 437.050MHz up and 145.800MHz down. What, I wondered, if the downlink had been moved to 145.500MHz. I suggested this to Jim and we listened with interest as the next ISS pass was due. Sure enough, the signals reappeared. It was good fun listening and working out what was happening. I posted a short video of a pass as received on my 2m handheld on Twitter, which was picked up by AMSAT and AMSAT-UK.

Quite why the repeater downlink was placed on 145.500MHz rather than 145.800MHz I'm not sure. Of course, there were those that complained and perhaps they had something of a point. However, more pragmatically, it's not as if 145.500MHz is very heavily used as a calling frequency and perhaps it enabled more amateurs to hear their first signals from space, even if they didn't recognise it at the time!

The ISS crossband repeater has now been switched off again but it was an interesting day or two. Thanks Jim for a fascinating report.

Remote Control

It always seems to be the case that as soon as you mention some software or system in print, something changes. It's the nature of things really. Last weekend, I started up TeamViewer on my Macbook to connect to the shack PC to see what was happening on the VHF bands and was greeted by a message saying that Teamviewer had detected 'Commercial Use' (which is forbidden under the terms of the free licence) and would close. Curiously, a Teamviewer client on my phone connected to the shack PC just fine. A number of other amateurs using Teamviewer for remote control of their stations reported the same thing. My guess is that the change was not intended and may be reversed at some time but, even so, it's rather annoying. If this has happened to you too and you're looking for another remote control program, I tried AnyDesk, which is free and seems to work in a very similar fashion to Teamviewer. It works from all the platforms I have tried so far, Windows, OS X and iOS.

Fig. 1: Jef ON8NT's 4m halo, supported by a broom handle on his balcony.

The 6m Band

It was good to hear from **Terry Martin M0CLH** (Wantage). Terry is a regular contributor to **Steve's** *HF Highlights* column but we don't often tempt him onto the VHF bands. Terry runs an Icom IC-7610 into a Cushcraft R8 vertical on the 6m (50MHz) band. I was rather pleased to be Terry's first contact of the season on April 27th. However, his contacts got a bit more distant and interesting after that. Some of the highlights from Terry's log are May 11th: S01WS, EA6SX; May 22nd: EI7BMB, EI9HQ; June 3rd: ZB2GI; June 4th: 5B4AAB; June 17th: CO8LY and ZF1EJ, with the majority being on FT8.

Dave Hobro G4IDF (Worcester) writes, *"Taking a break from drawing up some family trees, during the first two weeks of June I managed to catch some Sporadic E on 6m into Europe with the following stations worked: EA3EVL (JN00), IK4ZHH (JN64), F1SA (JN23), IS0BSR/IM0 (JM49) and F6EAY (JN04). New squares 'bagged' were EA1AQO (IN73), EA2XR (IN86) and EA7KP (IM97) but the crowning glory so far this year on 6m must be S01WS (IL46) for a new square, DXCC and continent".*

It was nice to see Dave and a number of other amateurs, including **Sam Jewell G4DDK**, albeit at a very sad occasion recently, the funeral of **Meg Robinson M0FRE**. I'd had the great pleasure of knowing Meg since she met **Dave Robinson G4FRE** in the 1980s. She was a wonderful, vivacious woman and will be much missed by everyone who knew her. Deepest sympathies to Dave and the rest of her family.

Jef Van Raepenbush ON8NT (Aalter) was not the only contributor to start his e-mail with the words *"What a great month"*. The highlights of Jef's log are as follows: June 2 SX2IMA/P (KN10), SX2K (KN00), SZ4KRD (KM09), 4O6AH (KN92); June 3rd CN8KD (IM63), SV1ENG (KM18), S01WS (IL46); June 4th EA9ABC (IM75), MD0CCE (IO74), ZA/OG2M; June 5th MM5DWW (IO89); June 9th SV2DSJ (KN10), SV2JAO (KN10); June 17th 9H1TX (KM75), June 27th SV2/RW3AL (KN18); June 28th IS0/HB9FAP (JN41) and on June 29th, Jef heard the GB3UM repeater on 50.740MHz at 5/5, a distance of some 370km, which is an interesting path on FM. Jef's other contacts were split between CW and SSB.

Kevin Hewitt ZB2GI (Gibraltar) has been busy on the band, with the highlights being C31KC (JN02), CU2AP (HM77), EA9CD (IM75), EA8TR (IL18), EB8AC (IL28), EI4KP (IO53), K1TO (EL87) and VY2ZM (FN86), all worked on FT8.

Mark Marment CT1FJC (Algarve) sends a very interesting log, with highlights being: June 1st SV4FFK (KM19); June 2nd TZ4AM (IK87), 9K2MU (LL49); June 4th K7BV (FM04), VO1SO (GN37), K6EID (EM73), K3XT (EL99), VE1SKY (FN74); June 5th KX4R (EM73), VE1JF (FN74); June 7th VO1HP (GN37), AA7A (DM43); June 11th WP4JCF (FK68); June 14th KN5O (EM40), K5RK (EL29); June 15th CM2XN (EL83); June 16th A71AM (LL55); June 17th A45XR (LL93), SU1SK (KM50), with TZ4AM worked on CW and the rest on FT8.

Peter Taylor G8BCG (Liskeard) has had a good month too. On July 4th he worked Z68M on CW for DXCC entity 243 on the band, which was confirmed on Logbook of the World (LoTW) within two hours.

Paul Bowen M0PNN (Newport, Shropshire) sent a nice log, with the highlights being HI8JSG, HI8PLE, WP4G, NP3DM, HI3T (CW), KP4EIT (SSB), PV8DX and VP2ETE all worked on June 12th. ZF1EJ was worked on June 18th and EK7DX on June 26th, all on FT8 unless otherwise noted.

Here at **G4VXE**, my list of stations heard and not worked has expanded! The best DX received on the vertical was BH4IGO on FT8.

The 4m Band

Dave Thorpe G4FKI operates mobile on the 4m (70MHz) band and his best DX was S51DI on June 26th.

Jef ON8NT (Aalter) has a Moonraker halo antenna (600mm square) mounted on his wife's brush stalk on the balcony (I hope not too much sweeping is required!), **Fig. 1**, and made some nice contacts, including: June 4th EA6SA (JM19), HA6ZB (KN07) and G3MXH (JO02). On June 28th, Jef worked EA6SA (JM19).

Derek G8ECI has made some nice contacts on the band, with the highlight being EA8DBM (IL18) using FT8 on July 4th at a distance of 3097km. Derek has also made some interesting tropo contacts to the Netherlands, again on FT8, including PA7MM (JO23), PE1CUL (JO22), PH0TR (JO22) on June 25th. On June 26th, there was Es, when Derek worked HA, YO and OZ. Derek is using his TS-2000X on the band with a single 4CX250B amplifier.

Simon Evans G6AHX (Twyning) says he has found the Es season much better this season than last, with 27 squares worked outside the UK so far this year. The latest contacts were S57LM and SQ8AQX on June 28th with EA5/G0KSC worked on June 5th, all on SSB.

Mark CT1FJC has heard plenty of FT8 activity on 70.154MHz but has been unable to make contacts as the frequency is out of the CT bandplan. Mark says that he has tried to call in the Portuguese bandplan but with no luck so far.

Robert van der Zaal PA9RZ made some nice contacts on June 3rd, working 9H1TX and CR4D and then EA6SA on June 28th. Robert has replaced his three-element HB9CVs for 50 and 70MHz with a seven-element log periodic for 45-73MHz, **Fig. 2**, a kit made by the German manufacturer AnJo.

The 2m band

Lyn Leach GW8JLY (Cardiff) just missed the last deadline but sent details of several 2m (144MHz) Es openings in May. Lyn writes, *"On May 28th between 1713 and 1732UTC, I completed QSOs with the following Italian stations: IW0AIJ (JN61), IW0FFK (JN61), IK0SMG (JN61), IZ5ILX (JN54), IZ0TTG (JN62), IK8BIZ (JN70), IK0IXO (JN61) and IK0BZY (JN61). A few days later, on June 1st, there was almost an exact repeat of the earlier opening. In this opening, between 1755 and 1908, I worked IK0SMG (JN61), IK0RMR (JN61), I0YLI (JN61), IK0BZY (JN61), IW0AIJ (JN61) and IK0WGF (JN52). Again a few days later, on June 4th, in the afternoon between 1515 and 1520 I completed QSOs with Spanish stations EA7ITL (IM6K) and EA4CYQ (IM78). IM78 was a new locator for me. I missed the greatest part of this opening because I was away from home. The same evening the band opened once more and I was able to complete QSOs with SP3YM (JO91), SP7TEE (JO91), YO6OBK (KN26) and YO5OHY (KN17). KN26 and KN17 were new locators for me"*. This will be Lyn's last report from his Cardiff QTH because he has now moved across the border to Bromsgrove in Worcestershire. I hope you and your family will be very happy in your new home, Lyn.

Fig. 2: A nice shot of PA9RZ's new log periodic antenna for 45-73MHz.

Dave G4FKI has been operating FT8 on the band with some good results. Dave says that he worked several German stations and was heard in Scotland. Dave notes that with the increase of FT8 activity he hears less on SSB or CW.

Here at G4VXE, one of my morning visits to the band was rewarded on July 4th, when conditions were excellent towards the Netherlands and northern Germany. I worked PA3CPS (JO32), PA0VHA (JO21) and DJ1AN (JO43). DJ1AN was my best DX on 2m FT8 so far, over 700km, which is not bad on a vertical antenna. The conditions were quite short-lived and faded after

Fig. 3: Bernard (Ben) Nock operating as SV4/G4BXD from Skiathos, using an Arrow 2m/70cm beam antenna, an FT-817ND and a UV-5RE handheld – AO-91 was used mostly, working among others, Russia, Italy, France and, of course, the UK.

an hour or two, which was reflected on the Hepburn tropo site as well as at the Mountainlake APRS site (below), both very useful sites for checking on any tropo conditions that may be in existence. F5BZU (JO11) has been a reliable signal and I've worked him several times. It's always interesting to see how the path varies over time. Average signals are around –15 but in good conditions, I've seen him as strong as –3. FT8 makes this sort of comparison very easy to do.

http://aprs.mountainlake.k12.mn.us

Peter Atkins G4DOL (Dorset) says that about 18 months ago, he moved to a new location on Portland on Dorset, which offers good take off to the south, through the west, up to the north, but is no good to the east. Peter caught an Es opening on June 11th, starting around 1624UTC, when he heard and worked CT1HZE while Peter was running 5W with the amplifier warming up! Using a 5-element Yagi, Peter worked CT1CAD, EA7MT, EA7BZ, EA7KB and EA7SL and at 1753 worked CN8LI followed at 1806 by CN8YZ. Peter says that CN8LI was his first Moroccan station on 2m and he has been waiting 40 years. Well done!

Simon G6AHX says that on June 17th, he'd left the beam facing south and found EA2TO (IN83) calling CQ on tropo. They were able to have a quick QSO, exchanging 5/3 reports, a distance of around 1000km.On July 3rd, Simon took part in the RSGB UK Activity Contest, making 20 contacts, with the best DX being MM0GPZ/P (IO85).

Jef ON8NT runs 25W from his FT-736 to his 5-element Yagi, with the highlights being June 2nd F0FJI/P (JN09), F6KRK (JN18), F5KMB/P (JN19), F6HJO/P (JN26); June 5th G4CLA (IO92), M0VXX/P (IO82), G4KUX (IO94), G8PNN/P (IO95), M0GHZ/P (IO81), G0EHV (IO84) and G8EEM/P (IO84).

Derek G8ECI enjoyed the tropo conditions on 2m with some nice FT8 contacts into the Netherlands, Germany and Denmark over the period June 25th to 29th.

Robert PA9RZ enjoyed the tropo during the July 2m activity contest, working into OZ and LA. Robert had to resort to his QRO (higher power) rig, the IC-910, rather than his preferred QRP IC-202.

The 70cm Band

Just two reports for the 70cm (432MHz) band. Jef ON8NT worked G3XDY (JO02) during the UK Activity Contest on June 12th while Derek G8ECI worked OZ6OL (JO65) on June 23rd.

The 23cm Band

Derek G8ECI worked SM6DVG (JO66) on the 23cm (1296MHz) band on June 26th, a very nice contact of 886km, followed by LA4YGA (JO48) and OZ9PZ (JO46) on June 27th.

Satellites

At G4VXE it was nice to get back on the NO-84 satellite on June 24th, allowing me to swap some APRS messages with **Dave Boult G7HCE** (IO80) and **Dave Ryan EI4HT** (IO61) at Rosslare Harbour. Various other stations were heard but no other two-way contacts completed. We were all using MFJ Long Ranger antennas, with G7HCE using a Kenwood TH-D74 transceiver and EI4HT and myself using the TH-D72.

Peter G4DOL included details of the most interesting stations in his satellite activity. Through AO-92, he worked 7X3WPL, IS0GRB, EA8HZ, OZ1ITM and OH1ON. Through AO-91 he worked UR5FRX, R3GY, SV2CPH, SV4/G4BXD (KM19, **Fig. 3**), RZ3ZR/P (LO02), SK0OQ, RA9FLW (LO88) and RA6FCX (KN95).

Jef ON8NT received several SSTV pictures from the ISS on June 7th. Jef also heard the ISS crossband repeater in operation on June 20th and 21st. On June 27th, he heard a school contact between **Alexander Gerst KF5ONO** and two schools in Germany, in the German language. There was more SSTV from the ISS between June 29th and July 1st, commemorating the various satellites that the ARISS team has hand deployed from the ISS, dating back to February 2006.

Kevin Hewitt reports that the Gibraltar club operated ZB2RAF with an FT-817 and a manually tracked 2m/70cm log periodic with the highlights being EA8CXN (IL18), EA8CUZ (IL18), EA8HB (IL18), G4DOL (IO80), OH5LK (KP34), UX0FF (KN45), G0ABI (IO80) and G4BXD (IO80) through AO-91. Through AO-92 Kev worked EA8DEC (IL18), MI6GTY (IO64) and EB5YF (IN80).

Kev reports, "*The ARISS team connected the Tanusha 3 and Tanusha 4 CubeSat satellites to the Service Module antennas on June 20th and 21st respectively. The CubeSat satellites transmitted greeting messages in several languages on 437.05MHz and retransmitted on 145.800MHz. Monitoring the downlink frequencies, I heard Russian messages and European stations calling through on Tanusha 4.*

"*The ARISS transmitted SSTV images on June 29th to July 1st to commemorate the satellites hand deployed from the ISS. Suitsat-1/Radioskaf-1 was the first satellite to be deployed in February 2006. PD120 was used to transmit the Series 10 images on 145.800MHz FM. I received 12 full images with two duplicates and nine partial images on passes varying from 17° to 52°. During two early morning passes I watched the ISS arc across the dark sky. I also heard the CW ID RS0ISS sent three times after receiving one of the images. My setup comprises a Yaesu FT-817 connected via a data interface to a Win7 Notebook PC running MMSSTV and a manually tracked 2m/70cm log periodic. ISS Detector Pro an Android App provided pass predications and the azimuth/elevation to point the Log Periodic*".

That's it for this month. Thanks for all your input and hopefully the good conditions will continue such that next month will be just as full. Enjoy the bands and enjoy the good weather!

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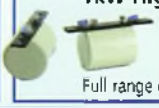

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Football, Sporadic E & FT8

Steve Telenius-Lowe PJ4DX reports on a heady combination of special event station activity, summer propagation and plenty of interest in FT8.

Special event station chasers were well catered for in June by the 'FIFA' and 'FWC' (Football World Cup) stations active from many countries. One major DXpedition came on the air at the end of the month and continued to be active into July – KH1/KH7Z from Baker Island in the central Pacific. This is a difficult part of the world to work from the UK, especially at this stage of the sunspot cycle, and only one correspondent reported a contact. The last time this DXCC entity was activated, in 2002, I was lucky enough to work K1B, **Fig. 1**, from Stevenage using 400W and a 15m dipole – but that was at the peak of cycle 23!

Readers' News

It was **Tim Beaumont M0URX**, **Fig. 2**, (who is also my QSL Manager) who worked Baker Island. He wrote, *"I started hearing KH1/KH7Z at 0700UTC on 14211kHz and listening up 5. Several G stations going through, but ohh then a fistful of French stations on the bounce, he is now working west Europe really well – I need to try hard with this one. 'Who is the M0 with Radio X-ray?' It took me several attempts to get my full callsign across but got there in the end. What a buzz! DXCC number 328 in the bag and I'm enjoying it just as much now as when I made my first DX QSO!"* Tim added that for all amateurs licensed since 2002 *"this DXpedition offered an excellent chance for an All Time New One. The opening on 20m, albeit short, gave three chances each day of a QSO: on FT8, CW and SSB. The team were especially aware of the difficult path to the UK and took significant steps in the short openings to call 'G only' and even when they were calling 'CQ EU' the team were still paying attention to the Gs calling."* I'd be interested to receive any reports of contacts made with KH1/KH7Z in July.

Having brought his 30m vertical back to resonance, as reported last month, **Victor Brand G3JNB** had QSOs with UE8OGS and UA9XF (Asiatic Russia), CU2DX (Azores) and FY5FY (French Guiana), checking that it was back on tune. *"But, for the first two weeks of June, HF DX pickings were sparse... I persevered and, among lively EU FIFA activities, I did find occasional 'DX-ish' stations of note, including J32FIFA (Grenada) and KP4TF (Puerto Rico) on 17m and, on 20m, ZD7BG (St Helena), OY1G (Faroe Islands), ZP6CW (Paraguay) and PR7AR (Brazil)."* Victor says that he agrees with the much-discussed view that

Fig. 1: QSL from the 2002 K1B operation from Baker Island.

the paucity of CW DX and reduction of CW operators in general may be linked to the phenomenal rise of FT8. To lend credence to this supposition, he says *"Along came the 'All Asian Contest' weekend and 20m exploded with signals. I worked a pile of very loud JAs who must have been running some serious 'welly' and, similarly, with the flood of UA9s from Asiatic Russia. The Thailand E2A and E21YDP signals were quite readable here but, sadly, they seemed unable to copy my 50W or many of the Europeans responding... Tuning around that weekend was a joy. Incidentally, with the use of the operator's age instead of location or a serial number in that contest, I became convinced that I was the most senior Old Timer on the band, since most reports seemed to indicate that the majority of contesters were in their 50s. Fortunately, that honour fell to another when I overheard a report of '59988'!"*

The June *HF Highlights* of **Kevin Hewitt ZB2GI** included operating as ZB2RAF/P from the top of the Rock using a 10W transceiver and working 11 special event stations. See the band reports for the best of Kevin's logs.

Carl Gorse 2E0HPI said, *"At the beginning of the month I had a mad thought, 'Why not head up to St Abb's Lighthouse, reference SCO-224 and WWFF reference GMFF-0059?' After two trains and two buses I arrived around 1300UTC with my camping equipment and all my radio gear. The views were amazing. I tried 40m first and managed to work around 20 or so but it was 20m that was in excellent shape with 148 contacts, running only 3W with the Elecraft KX2 and MFJ-1979 vertical antenna."* Carl also operated on 20m SSB using the Alex Loop antenna during a one-hour stop at St Mary's Island in Tyneside, **Fig. 3**, but *"my feet got a bit wet walking across the causeway with the warden when the tide was going out."* He obtained another Elecraft KX2 from a friend and added the side panels and PA heatsink from Pro Audio Engineering in the USA. *"It's made a massive difference because, previously, the radio would heat up and shut down. Overall,"* he says, *"the month has been great at the times I have been able to get out between hospital and physiotherapy appointments. But St Abb's is one place to visit to enjoy the scenery and play radio!"*

Etienne Vrebos OS8D/ON8DN *"again had some damage here due to lightning in the neighbourhood. The last weeks were very hot, 30°C and still going up. It always has to be paid for afterwards with heavy lightning and thunderstorms but no real expensive damage to the electric circuits in the house (I've good fuses!). I'm sure the [Brussels] airport and its concrete and steelworks attract lightning..."* Etienne reports

Fig. 2: Tim M0URX and Steve PJ4DX with Timorese kids during the 2011 4W6A DXpedition. Fig. 3: Carl 2E0HPI/P using the Alex Loop antenna at St Mary's Island in Tyneside.

he had another road trip: *"I bought myself a new motorcycle and travelled around the Alps, Austria, Switzerland and Italy, up to 3000m mountain passes still covered with snow,* **Fig. 4**, *nice scenery and a great trip of 5000km. It explains the poor activity on HF... I'll do my very best to be more active in July."*

Reg Williams G0OOF reports, *"I am now using a Butternut HF6V. Wanted to try it as a comparison to the Hustler 4BTV. It's early days yet and this time of the year and the solar minimum does not help. This antenna was not easy to tune but thanks to the amateur radio community I had good advice from a couple of friends, one of whom had an HF9V and who loaned me his MFJ antenna analyser. This made tuning easier. My band reports reflect stations I worked during June with the HF6V, other than those on 17m... The HF6V doesn't include this band and it is expensive to purchase a coil to adapt the antenna for 17m. Next best was to make up a single-band wire dipole... It has ended up as a sloper. First contact was during an opening on 17m late on June 28th. Managed to work Grenada so I was pleased with that... I enjoy reading your articles in* PW *and often refer to your book* HF SSB DX Basics." Thanks for the 'flowers', Reg! I used a Butternut HF6V for many years in several locations and found it always performed well provided I put down a good number of radials (see *Radials for Quarter-Wave Verticals – an Overview*, *PW*, July 2018).

The log from **Tony Usher G4HZW** shows what can be achieved using FT8, even on 10m at the bottom of the solar cycle. He wrote, *"I received my current call early in 1979 around the peak of sunspot cycle 21 and, due to living in a terraced cottage with no back garden and a front only 10ft x 10ft, decided that 28MHz was the only option on HF. A number of two-element cubical quads were employed over the next 18 or so years and with conditions so good I managed to work over 300 DXCC entities from that small patch using SSB and CW. Along with a near neighbour and great friend from Knutsford, SWL* ***Dave Coggins****, we even persisted with the band during the minimums – openings to Europe on Sporadic E during the summer with the occasional two-hop contacts with North America, but many weeks and months of only static. We were both anticipating similar conditions to prevail during this latest minimum but, of course, we hadn't reckoned with the appearance of FT8. A letter in another publication tells us the mode 'is of no real value for propagation studies'. On the contrary, I would suggest the results from the use of FT8 will require much tweaking of propagation programs and the rewriting of printed manuals! I've now worked 105 DXCC entities on 10m since September 2017, right at the bottom of cycle 24, due in no small part to FT8, an excellent Sporadic E season – and ignoring legacy propagation predictions."*

Terry Martin M0CLH reckoned that, *"Conditions this month have not been particularly conducive for DX."* However, Sporadic E on the higher bands allowed *"some useful slots to be filled in those difficult nearby entities unreachable by normal conditions."* Terry has been carrying out some experiments with a *"very small loaded vertical"* on 80m, which allowed him to work stations as far away as the Canary Islands and Cyprus (using FT8).

Martin Evans GW4TPG is another who used FT8 a lot this month. He says he has been *"concentrating on 10 and 12m to get my QSLs for both bands up. 12m in particular still needs five QSLs for 100 confirmed DXCC, so I am almost there. 10 and 12m Sporadic E has been fine into EU most days when I had time to look, with the occasional outside EU QSO."*

Steph Foster G4XKH from the Riviera ARC in Torquay reported on the GB100RAF special event station run by the club, **Fig. 5**. She says, *"We could not have asked for better weather. Blue skies, no cloud and gorgeous sun. Working conditions were an Icom IC-7300 through a fan dipole running full legal power. We also ran VHF/UHF. The bands were busy but with a lot of contest traffic. Our furthest contact was HB9, Switzerland. Anyone who worked us and seeking a QSL should send their card direct to G8FC, RAFARS HQ, RAF Cosford, Wolverhampton WV7 3EX, with SAE."*

Owen Williams G0PHY said, *"The month got off to a good start with contacts with 4X70E, S9ZZ and VP8LP, all on 14MHz. I also worked S9ZZ on 18MHz (the only contact on 18MHz this month). 28MHz was open to Europe on June 3rd and I worked AO18FWC,* **Fig. 6**, *one of the many football World Cup special event stations on in June and July... I worked two new IOTAs this month: F4FET/P on EU-074 and TE6DX on NA-155. TE6DX was on 14MHz at 2232UTC on June 8th and working by numbers... It was just as well I got him when I did because I broke my microphone the next day and had to wait till I returned from holiday*

to order a new one. Fortunately, I have recorded my callsign in one of the memories on the FT-2000 so I knew the transmitter was working, which meant it was easy to diagnose a faulty microphone. Although not rare, I also worked OJ0Y on Market Reef. Although conditions appear to be poor, I can usually hear signals from South America in the late evening. For example, last night CX8TC and LU8FE in Patagonia were both at a good strength."

Band Reports

From several locations Carl 2E0HPI/P/2M0HPI/P worked: 40m SSB: 7S18FCW, G5RV/P, MU0GSY/P (GUFF-0004). 20m SSB: DJ18FWC. 17m SSB: OE100DMA. 10m SSB: 9A4WY.

Kevin ZB2GI worked: 20m SSB: 4Z70IARC, 4X70L, AO18FWC, EA5/G4VZV/M (pedestrian mobile), G1TPA/MM, HB18FWC, J32FIFA, PD18VOR (Volvo Ocean Race), R18POL, PV8AL, SX18FIFA, TC179JAN, W2YP. 12m FT8: GW4TPG, JW4PUA, LU8HGI, PU5YDD, RZ1OA. Kevin also operated as ZB2RAF/P: 20m SSB: LX1FF, M0XLT, OD5YA. 12m FT8: 4Z4DX, AB1HL, K4EM, LU1HVK, PU2WSQ. 10m FT8: KC1FOX, PU2RDB, VA3WLD, WQ3X.

Etienne OS8D / ON8DN reports the following: 20m SSB: EP3SMH, OJ0Y, VY2NX, W6KH. 17m SSB: OJ0Y. 15m SSB: 4L8A. 12m: J3/G0VJG, S9ZZ. 10m SSB: *"a lot of Europeans"*.

Reg G0OOF worked: 80m SSB (a new band for him): 5Q8FWC, R18PAN, SX18FIFA, OH0/DL8JJ. 40m SSB: ER-18FIFA, LX18FIFA. 20m SSB: AO18FWC, J3/G0VJG, VE3YJ, YV5EED, ZD7DL. 17m SSB: J32FIFA. 15m SSB: II9FIFA, EA8BWL. 10m SSB: 4U29MAY, AO18FWC, EA6OM, EA9KB, HB0/HB3YDL.

The log of Tony G4HZW looks like it might have been made on 20m but is in fact all on 10m FT8: 4L1MA, 5A1AL, 5T5AI, 9Y4DA, CO3JA, EW2DZ, HB0WR, HC8AE, HZ1FI, IS0DCR, KE7B (Washington state), NP2Q, OG0C, P4/W1XP, RA2FAO, RA9LAN, T77C, YV7CX, YY1AJB, ZB2R, *"plus 24 Ws, 3 HB9, 2 SM, 4EA, S5, YO, 2 LX, 5 I, 2 TF, 2 F, 14 DL, 2 EU UAs, 9A, 2 VE, LZ, 6 PY, 4 ON."*

Terry M0CLH sent in a long log which had to be pruned significantly for reasons of space. 80m FT8: 5B4ALX, EA8ZT. 30m FT8: EA1DRL. 20m SSB: LZ430PPW. 20m CW: UP18FIFA. 20m FT8: 4L6QL, N2WK, XP3A. 17m CW: LZ430PPW. 17m FT8: AY0FWC, HS0ZIV, K1KD. 15m FT8: 7X2KF. 12m FT8: 5P1W. 10m CW: HG18FIFA. 10m FT8: 5B4VL, 9G5AR, PU1JSV, PY5IS, SV1GSP/8, W2WI, Z61DX and numerous other European stations.

Martin GW4TPG worked some good DX: 80m FT8: EA9CD, VE1GRC. 40m FT8: HI0RCD, RW9RT, TF5B, VK7AC. 30m FT8: BG7BDB, OG0C, SU9JG. 20m SSB: OJ0Y. 20m CW: 4J100K, HV0A. 20m FT8: S01WS, TA3D, V53DX. 17m FT8: 9X2AW, AP2AM, BD0AAI, DX3H, JH1QXL, KP3IV, NC4RY, YB0MWM, ZS6JES. 15m FT8: OD5SK, FR4OS. 12m CW: OG0C. 12m FT8: 5B4VL, 9K2HS, A92AA, BG7BDB, C31RP, EK1KE, FR4OO, LU8HGY, PU5YDD, TK5IH, ZB2GI, ZP4KFX. 10m CW: FY5KE. 10m FT8: 9H1AE, CE2/YV5IAL, EA9BO, PP5JR, PY4BL, S01WS, PP5JR, VU2CPL.

Fig. 4: Etienne OS8D/ON8DN in his motorcycle gear high up in the Alps. Fig. 5: Phill 2E0WZP, Ian M0IDP, Debs M6IXR, Ian G6TEQ, Steve G7AHP, John M0JNP and Roy M6XDV at the GB100RAF special event station. (Photo: Steph G4XKH) Fig. 6: One of the numerous special event stations active during the football World Cup.

Signing Off

Thanks to all contributors. Please send any input for this column to **teleniuslowe@gmail.com** by the first of the month (September 1st for the November issue, October 1st for the December edition). I would especially welcome suitable photographs for publication in the column. 73, Steve PJ4DX.

rect timing and rounds off the square wave to produce sinewaves ready for putting to the antenna (via a lowpass filter). It is this output tuning network that makes it a class E PA.

The Oscillator

The oscillator is fixed frequency at the frequency used for transmitting. Usually, a class E transmitter has an oscillator or

ficient AM transmitter is a modulator and a power supply. The frequency generator is on the left-hand side of the diagram and consists of an Arduino NANO Ver. 3. This controls, by means of I²C control lines, the next item, which is a clock oscillator type Si5351A, a chip manufactured by SiLab and. It can provide three simultaneous (independent 50Ω impedance) square wave outputs and can be anywhere between 8kHz and 160MHz. Clock 1 has been programmed to provide a frequency of 3.615MHz. This can easily be changed and the two other clock outputs can be used to provide any other frequency.

The output from the Si5351 is connected via a short coaxial lead that has an SMA plug to connect to the Si chip that I have soldered onto the pad. The other end is to be soldered to the pins on the PCB. I could have designed the PCB for the Si module to be permanently connected to clock one but having a 'flying lead' allows the choice of a second frequency to be used if required. The screen of the lead is connected to 0V and the inner conductor to a 100nF capacitor that is the signal to the input (pin 3) of the LT1016 IC. This is a comparator with complementary outputs. The comparator outputs are taken to the FET driver TC422A, which is a fairly conventional circuit, along with the pair of FETS (IRF640s) in parallel on both sides of the push-pull arrangement. The outputs to the transformer are taken via tabs connected to one each of the IRF640 FETs as shown in the diagram **Fig. 4.** The nut and bolt holding the FET in place on the aluminium strip must be isolated from the aluminium and hence the ground potential. For the two FETS that need to have the tabs connected to the drains and the nut and bolt, the insulated nylon bush is mounted from the underside of the PCB so that the nut and bolt is not in contact with the aluminium angle. See **Fig. 5** for the method of mounting the FETs and drivers to the PCB using the aluminium angle.

The Output Transformers

The transformer arrangement and winding details can be seen at **Fig. 6** and as a photo at **Fig. 7.** It may be better to look at this diagram along with reading the text here. Both transformers are the same and the former is a T200-2 toroid. This is an iron dust mix type suitable for the frequency we are using for this project. It is the same one used for 160, 80, 60 and 40m. The wire used is mains grey covered cable as used for house wiring and is 2.5mm², the thicker the better. Take about one metre of the live and neutral leads of the cable

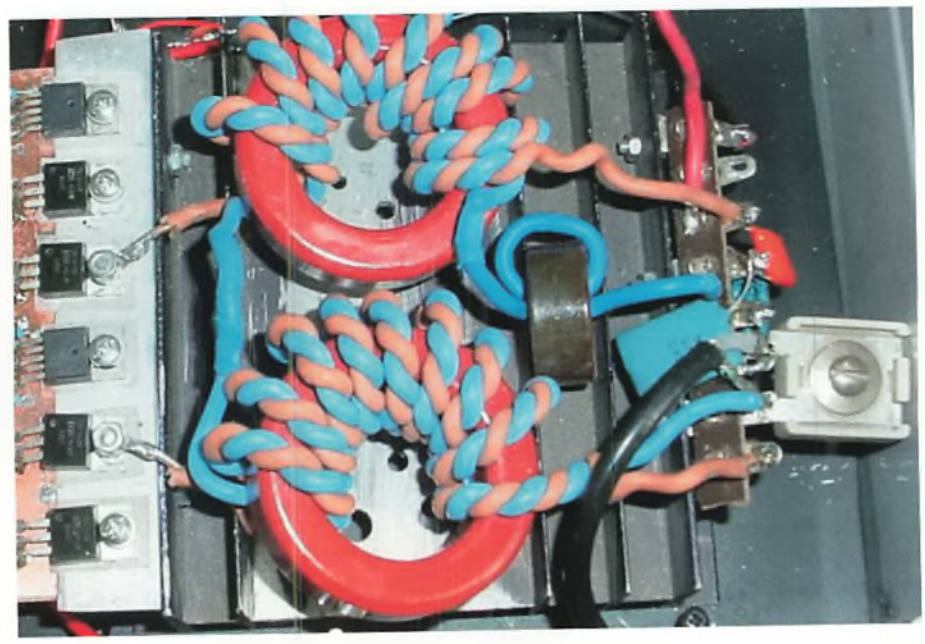


Fig. 7: A view of the toroids in the completed form.

and discard the bare earth wire. Place the two wires together and place in a vice or pair of pliers. The other end pair is fitted into a power drill. Switch on the drill gun setting to a slow speed and the wires will twist, forming a bifilar wind. Switch off and remove from the drill gun when the wire is twisted but not so tight that it cannot be separated! Repeat the operation with another pair of the same length.

Take one of the bifilar wires and feed through the large centre hole of the toroid. Make nine turns remembering that the first pass of the wire through the toroid is one turn. This is about 0.9µH. Repeat the process with the other bifilar wire and toroid. Take the brown wire and untwist from the blue one so that you have a free end at the toroid and repeat this for the second toroid. These we will call the start windings. Do the same at the other end (end winding) of both toroids so that you have two toroids with brown and blue open ends at both ends. Take the end blue wire of the first toroid and the start of the blue wire of the second toroid, connect together and insulate. The brown start wire on the first toroid and the end brown wire on the second toroid is connected to the drain tabs on two of the FETs as per the photo. The end brown wire on the first toroid is joined to the start brown wire on the second toroid and connected to the PA voltage. The start blue wire on the first toroid is connected to the variable capacitor and fixed parallel capacitors at the antenna connection.

What we have now are two transformers with the primary windings in parallel and the secondary windings in series to provide a transformation of about 5Ω

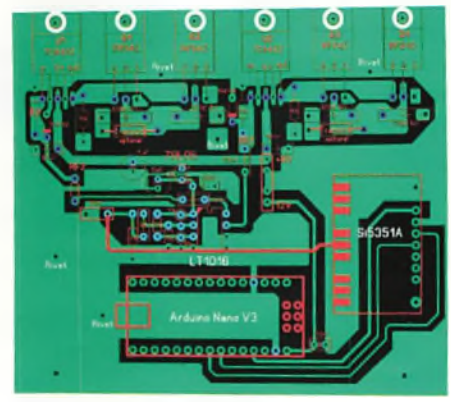


Fig. 8: The PCB (not to scale).

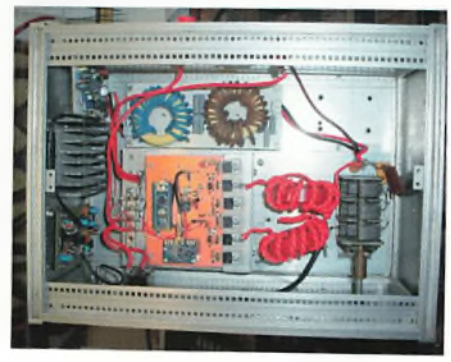


Fig. 9: Internal view of the completed project.

primary to 50Ω secondary. The photo, Fig. 7, shows the blue wire connecting to the antenna passing through a smaller toroid. This is called an 'L' match coil and is used to reduce the drain current if the power supply is near its limit. That will also mean increasing the drain voltage to get the same power output. This extra toroid, if used, is a T130-2 or similar size but must be a -2 type (red with grey/neutral underside). The variable and fixed capacitors are also connected at this point. I used a three-gang variable as found in older broadcast radios but any single- or twin-

ment takes care of
waveform. There are variations on this with class AB, AB1, AB2 and so on and class C, which relates to the amount or lack of biasing used. This project uses class E, which is similar to class D and F and it is the output tuning that decides the actual class and which differentiates it from class D and class F.

Square Waves

To get the most efficient system, the devices we are using in this design are FETS and the FET must be turned fully on

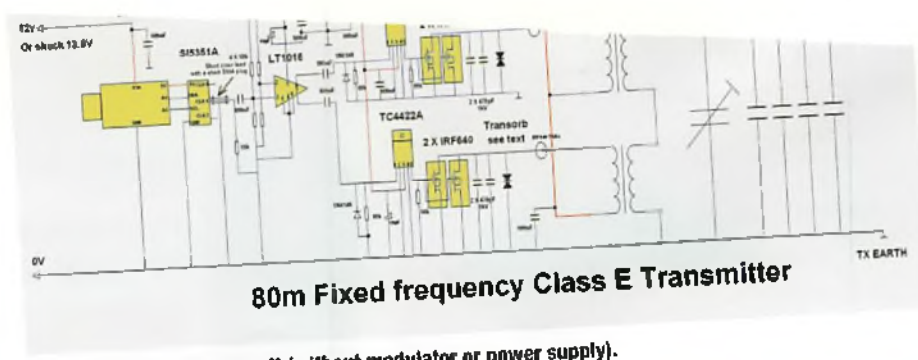


Fig. 3: The transmitter circuit (without modulator or power supply).

gang can be used or a large 'postage-stamp' type trimmer as I used in the PA shown in Fig. 7. There are fixed capacitors fitted in parallel with the variable and I use silver mica types made up to the value of approximately 2.5nF. It is prudent to use a lowpass filter for the band in use to remove or at least greatly attenuate the odd harmonics. The even harmonics are taken care of in the push-pull arrangement.

Choice of FETs

The IRF640 FETs are intended for switch-mode power supplies but work quite happily at frequencies up to 7MHz. However, it must be emphasised here that not all IRF640s will work at RF. It would be prudent to buy branded types and of the fifth generation. I use and supply International Rectifier types. NEC types have also been found to be useable at HF. These FETS have low R_{ds} (Resistance Drain to Source), which means a low voltage across the device when at maximum current through it. These were also chosen for their low cost, gate and drain capacitance and are readily available from UK sources. To fully turn on an FET it needs a square wave of sufficient amplitude and this is supplied by a TC4422A FET driver.

The PCB

The PCB is available from me either on its own or with a selected kit of parts. It is double-sided, **Fig. 8** (not to scale), and I will have fitted copper rivets where shown and soldered to connect both sides of the boards. Where the component leads are fed through the top to the bottom ground plane (such as the source pins on the FETs), these need to be soldered both sides. The transorbs can be omitted or added as a protection against a high voltage spike at the drains.

The Modulator

There are several types of modulator that can be used, connected in series with the PA voltage. There are some ideal modulators found on the website of **Dave GW-4GTE** (URL below). There you will find two analogue types and one digital modulator for which all parts are readily available. The two analogue modulators are for either medium- or high-power transmission. The digital modulator is a pulse width type (called PUWMA on Dave's site). This is a very efficient modulator and recommended for use with this transmitter to provide an all-round efficient AM transmitter.
www.S9plus.com

The completed inside view of the transmitter with a pulse width modulator fitted is shown at **Fig. 9.** This shows the toroids with red wire for the primary and secondary because that is what was to hand at the time. It would benefit from the twin brown/blue 2.5mm² wire as shown on the transformer of Fig. 7.

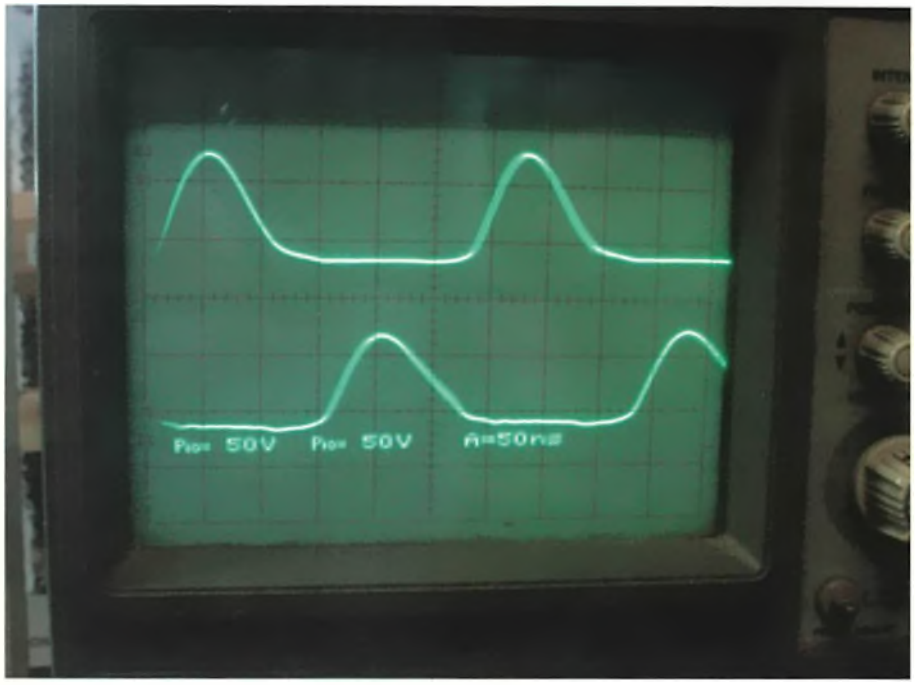


Fig. 10: Expected waveform across the drains (see text).

In Use

This transmitter can be tested without a modulator fitted. Apply the voltage for the oscillator, 12V (or 13.8V) and connect a pair of oscilloscope probes from an oscilloscope with a 'Y' response better than 20MHz, to the outputs of the comparator at pins 6 and 7. These waveforms should also be seen at the inputs (pin 1) of the TC442A FET drivers. The waveforms should look as in Fig. 1. Next is to connect the antenna socket to a suitable dummy load and power meter along with an analogue voltmeter (AVO) at the PA voltage input with an analogue ammeter in series with the PA voltage supply. Set the voltage, preferably from a variable voltage PSU and slowly increase from zero to 6V. The current seen on the ammeter will be quite low, less than 500mA. The wattmeter may read a few hundred milliwatts.

Now connect the oscilloscope probes to each of the drain connectors (use the tabs). With the oscillator and FET driver voltages already on, switch on the PA voltage and adjust the variable capacitor until the waveforms appear as shown in **Fig. 10**. If the waveform looks about right, you can gradually increase the PA voltage while watching the PA current and observing the waveform. You may need to adjust the variable capacitor again to get this waveform. If the waveform is not as in Fig. 10, you may have to increase or decrease the fixed capacitor values across the variable.

Observing the waveform as you adjust the variable capacitor will indicate whether you need to add or remove fixed capacitance. It must be borne in mind that the method of tuning the PA is not 'tune for maximum smoke' as in other types of PA but is a careful tuning of the charging rate of the coil/capacitance flywheel effect. If all looks well with the waveforms, you can increase the PA voltages and by observing the current and power output until, say, 150W is seen on the power meter. The PA voltage will be about 24V with 7.5A. If you divide this input power (24 × 7.5 = 180W) into the output power as seen on the power meter (150 ÷ 180) × 100 = 83.3%. This is a guide and I have achieved 95.7% on mine. The higher the output power, the better the efficiency. For a full explanation of Class E visit Dave GW4GTE's website as before and also look up the site of Steve Cloutier at:
www.classeradio.com

Is There a Kit?

I can supply the PCB and all the parts that are to be fitted on it. Send me an e-mail for the details of a picking list and you can decide what you need if not wanting all the parts from me. The parts off-board are not included in the picking list unless you have difficulty in obtaining any of them.

If you require a large version of the circuit diagram, I can send one by return of an email request.

• E-mail: practicalwireless@warnersgroup.co.uk

A Simple Paddle Keyer

Gary Andrews MOCWY builds a Morse keyer from just a couple of relays and three capacitors.

Back in the 1980s when I worked for British Telecom International as a young technician, I was always amazed by what the older guys could achieve with just a couple of relays. The circuits that they designed bordered on genius. Recently, some 30 years later, I decided to design a relay circuit to perform a simple task – to generate the dits and dahs of Morse code.

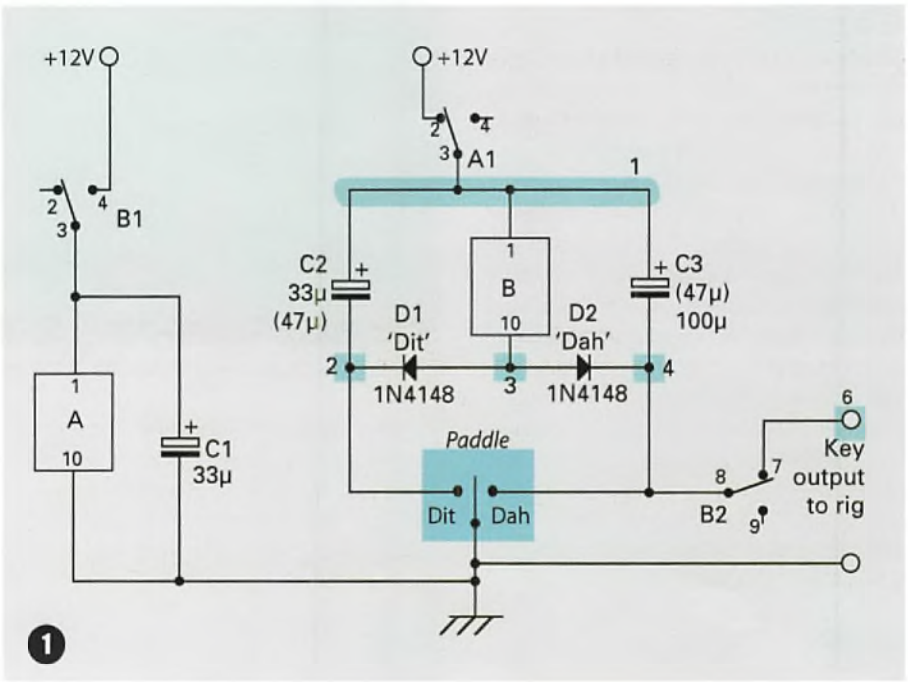
The circuit I developed is simple. It uses only two relays as shown in **Fig. 1**. The relays are Panasonic TQ2-12V low-power high-speed telecoms relays and they operate and release in about two milliseconds. Note that they have an integral diode wired across the coil to clamp the back EMF (Electro-Motive-Force). You must connect the coil as shown in the circuit diagram or it will not work. The coil resistance is 1024Ω. If you use relays with a different coil resistance, you will have to alter the capacitor values. Larger and slower power relays will not work in this circuit.

Capacitor C1 sets the space between the dits and dahs and is the same value as capacitor C2, which sets the dit length. Capacitor C3 sets the dah length and is three times the value of C1 and C2. Diodes D1 and D2 ensure that only C2 or C3, not both, are charged when the paddle operates.

When the paddle is in the centre position, the circuit is idle, both relays are released and the relay contacts are in the position shown in the diagram.

When the paddle is moved to one side or the other, C2 or C3 is charged, relay B operates, contact B1 closes, relay A operates and C1 charges, contact A1 opens and C2 or C3 discharge through the coil of relay B. After a dit or dah delay, relay B releases, contact B1 opens and C1 discharges through the coil of relay A. After a space delay, relay A releases and contact A1 closes. If the paddle is still operated at this time, the whole process repeats and another dit or dah and a following space is generated. If the paddle has changed sides, a dit becomes a dah or a dah becomes a dit. If the paddle has been released, the circuit returns to the idle state.

Contact B2 is used to key the transmitter.



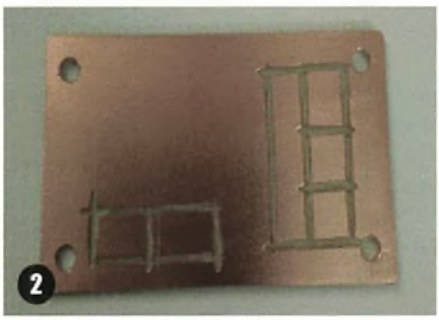
1

Construction

I built the entire unit onto a wooden base measuring 70 x 80 x 19mm. One of my favourite methods of construction for simple circuits, explained in my June article, is to produce a rough circuit board using a high-speed rotary tool fitted with a circular cutting wheel. I cut straight lines into the copper forming rectangular pads onto which I solder the component leads. If you do this, make sure you wear eye protection because a lot of dust is produced. The circuit board measures 70 by 40mm and the finished item is shown in **Fig. 2**.

Next, I assembled the circuit board. I mounted the relays upside down and fixed them into place using a drop of super glue. I wired the capacitors and diodes between the relay pins and the pads, or the ground plane, according to the circuit diagram.

With the circuit board complete, I screwed it to the wooden base and glued the connectors at the rear. I fixed rubber feet in the corners of the bottom to stop the unit from sliding around on the desk.



2

Fig. 1: Keyer circuit diagram. Fig. 2: The simple circuit board. Fig. 3: The finished keyer.

I completed the job by wiring the connectors to the circuit board. The finished unit is shown in **Fig. 3**.

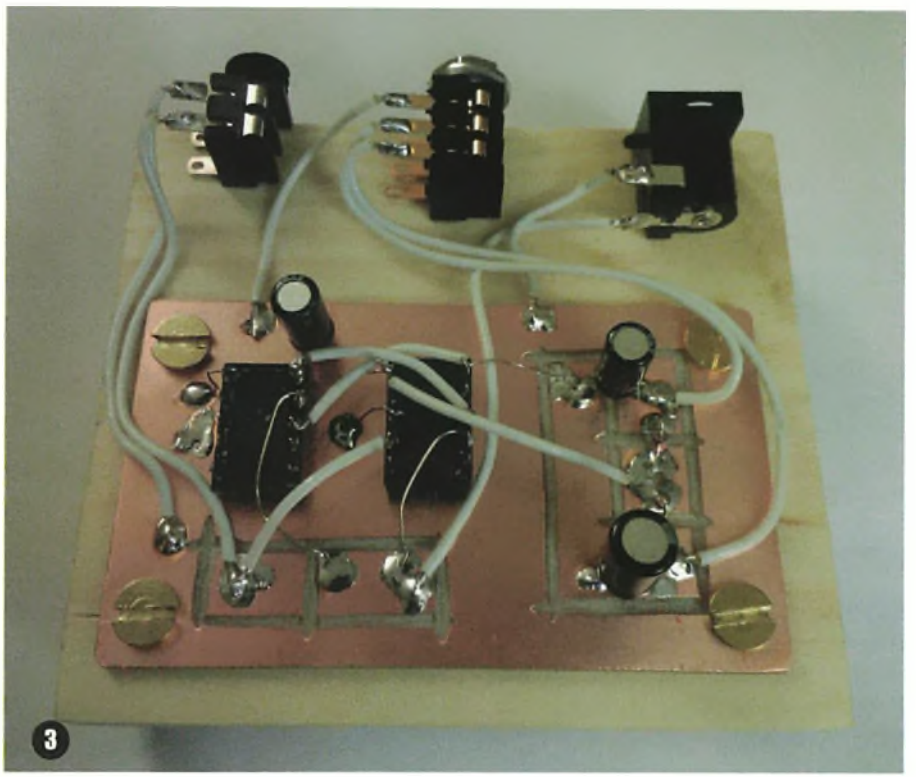
If you wish, you could add an audio oscillator, making a nice self-contained Morse practice unit, and then it could also be used with simple transmitters and transceivers that do not have sidetone.

Operation

Operation is simple. Connect power, plug in a paddle and connect the unit to the transmitter. When the paddle is moved side to side, strings of dits or dahs sepa-

rated by suitable spaces will be produced. If the relative lengths of dits, dahs and spaces are not in the correct ratio of 1:3 or, if you prefer, some other ratio, you can pad the capacitors with additional parallel capacitance to increase the length or add parallel resistance to shorten it. The values shown in Fig. 1 result in a speed of about 23WPM (words per minute). I prefer a more leisurely pace so I changed C1 and C2 to 47µF and added 47µF in parallel with C3 to give a speed of about 15WPM.

The best thing about this keyer is the clattering sound of the relays as you send your message. In fact, with the noise of the relays you don't need sidetone! Anyway, I hope you are as impressed as I was all those years ago with what can be accomplished using just a couple of relays!


3

Carrying on the Practical Way by Chris Brown G4CLB

• E-mail: practicalwireless@warnersgroup.co.uk

Mobile Headset for Wouxun Transceiver

Chris Brown G4CLB solves a requirement for a safe mobile headset to work with his Wouxun transceiver.

Having installed a Wouxun quad-band transceiver in my car I found that using the supplied fist microphone was ungainly. It's not to be recommended when true mobile either although strictly speaking its use is within the bounds of *The Road Vehicle (Construction & Use) (Amendment) (No.4) Regulations 2003.* However, I sought to use a hands-free option to be safe. There seems to be no commercial or proprietary headset compatible with the Wouxun kit so I had to build one from scratch.

Design

An internet search revealed a couple of sources for the wiring connections from the microphone/controller to the radio. The microphone includes a small loudspeaker and multiple control buttons. It appeared that placing an interface (I/F) box between the microphone and radio to pick up the microphone and PTT connections was the simplest solution. That way the speaker and control buttons would still be available on the fist microphone.

Circuit Description

The break out I/F simply redirects microphone and PTT lines and allows the other control lines to pass through. The electret microphone insert does require a voltage bias and coupling capacitor. The circuit diagram appears as **Fig. 1** and there is a parts list in the sidebar.

Construction – Headset

I used a cheap pair of headphones for the headset because they provide a comfy and simple head-worn support for the boom microphone. I originally experimented with various wire headbands but they provided torture rather than comfort! The earphones are not connected – I prefer

to use the speaker in the fist microphone rather than 'isolate' myself from external sounds while in the car. A short length (approximately 250mm) of 14swg enamelled wire (or similar) was shaped to use as the microphone boom. The electret microphone insert sits on the end and the wires run along the boom. The microphone boom/wiring are secured in black heatshrink sleeving. The boom itself is cable-tied to the headphone headband. Suitable headphones can be purchased for a few pounds by searching on line for 'in-flight entertainment headphones'.

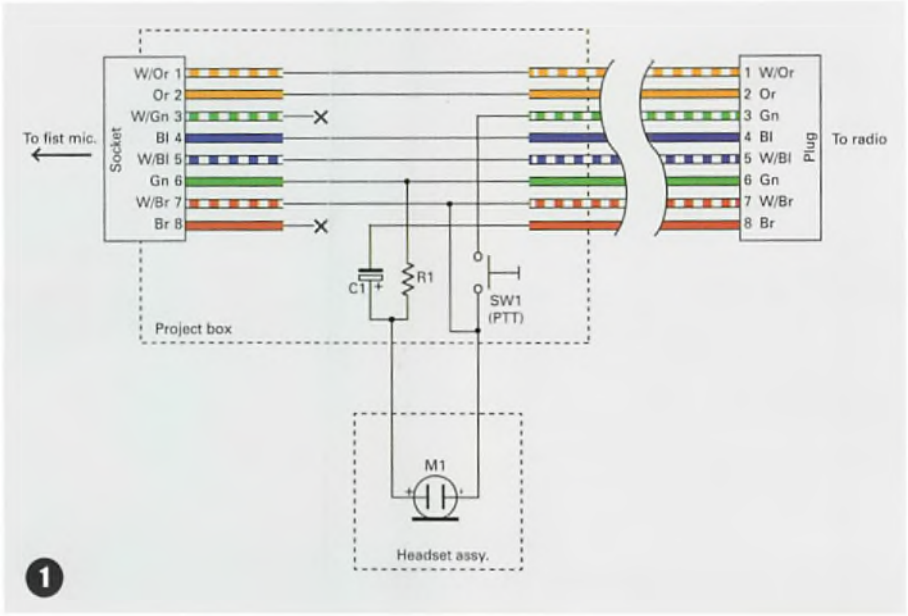
Construction – I/F box

The interface box is shown as **Fig. 2**. Most parts were obtained locally from Maplins, which has since sadly gone, but all parts are readily available from the usual internet auction sites. A small plastic project box houses a latching push-button for the PTT and a microphone socket together with breakout wiring and components for driving the electret microphone insert.

A plug-to-socket RJ45 extension lead simplifies connection to the fist microphone and the radio. This cable is run through the project box and cut within it to pick up the control, audio and PTT lines. Note that some lines are cut and isolated, some are just routed straight through and some are 'tee-ed' off. Double check all connections before powering up to protect your microphone and radio! Internal connections were heatshrink sleeved for insulation and protection. The existing fist microphone is plugged into the I/F box socket and the free plug out of the I/F is plugged into the radio.

Summary

In use the headset has proved a convenient method of maintaining comms while underway. Audio quality has been commented upon as 'good and balanced'. The two prototypes both worked first time and the speaker-microphone control buttons are still handily available for channel changing, volume control and so on. Upon reflection, a longer RJ45 lead would have made construction a little easier and mounting more flexible in the car. Please take care that the kit, including your mobile radio, is mounted securely and safely so as not to impede your control of the car when driving. The photos, **Figs. 3** and **4**, show the completed unit and as I have it fitted in my car.



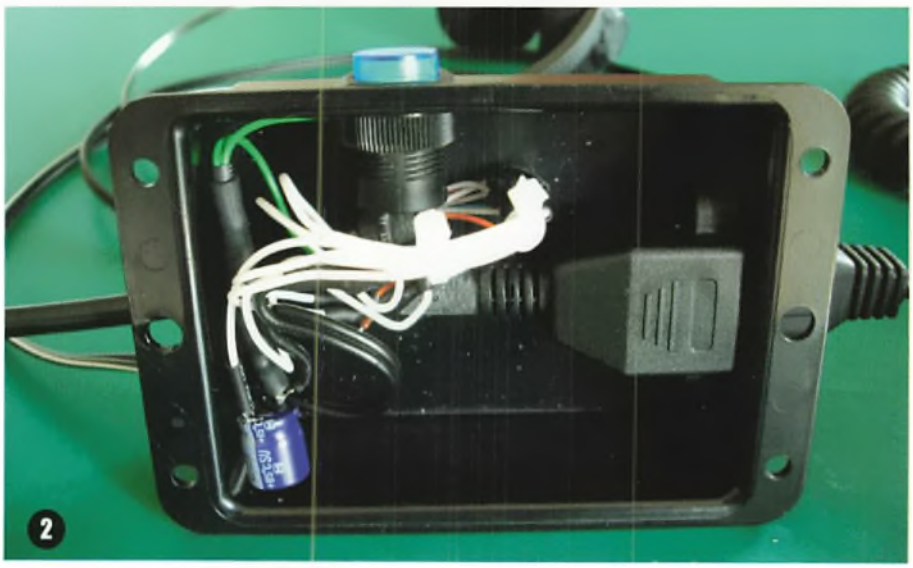


Fig. 1: Wiring diagram for the headset. Fig. 2: The interface box. Fig. 3: The assembled unit. Fig. 4: As fitted in the author's car.

Parts List

- Black plastic project box 70 x 120 x 40mm approx. To suit your vehicle.
- CAB1 RJ45 M/F cable assembly 300m (see text).
- M1 electret microphone insert two-pin 10 x 4mm.
- C1 100µF@25V electrolytic.
- R1 47kΩ 1/4W.
- SW1 Latching min. push button 15mm dia.
- HS1 Headset – modified stereo headphones (see text)
- Hook up wire 7/0.2 as req'd.
- 14swg enamelled wire 250mm approx.
- Heatshrink sleeve 10mm dia. as req'd.
- Heatshrink sleeve 3mm dia. as req'd.

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Radio in the European Air War

Michael Marinaro WN1M makes a welcome return, with an overview of the major radio systems used in WWII aircraft and, later, often found on the surplus market and pressed into amateur radio service.

Fig. 1: The B017 Flying Fortress.

World War II brought an unprecedented need for military radio in the air, at sea and on the ground everywhere but particularly so in the European air war theatre. The Royal Air Force (RAF), the Royal Canadian Air Force (RCAF) and the American Army Air Forces required reliable and efficient ground-to-air and air-to-air communications for their fighters and bombers. The demand was enormous and crucial to the accomplishment of the missions of the Allied air forces – the achievement of air supremacy. The stakes were high and the responsibility staggering.

Technology met these exceptional challenges with innovative and versatile equipment designs. The equipment that emerged operated CW, Modulated CW, AM phone and, in central systems, teletype. It covered short or long ranges and, importantly, was intended for use by more than one Service. The electronics designers and the radiomen and wireless operators became significant contributors to the ultimate success of the Allies.

Typical American System

I present here a characteristic 'American' system of the era, which met the rigorous needs of the US Army Air Force and was also used by the Allies on specific missions. This system was used in the B-17 (Flying Fortress, **Fig. 1**), B-24 (Liberator) and B-29 (Superfortress) bombers.

Generically known as Command Sets, AN/ARC-5 was the overall designation applied to the system of units used by the US Navy in their aircraft for LF, MF and HF communications and navigation. The Army Air Force and Signal Corps adopted SCR-274-N for their parallel system of components.

Although similar in many respects, the Navy and Air Force systems were not interchangeable. Individual components within each system were identified with unique model numbers pertaining to their function, service and application. **Table 1** details the various units and their designations.

The systems were customised and assembled into modules for specific service in various aircraft utilising:

- Rack mounts
- Adapters
- Control boxes
- Dynamotors
- Relays
- Antenna switches

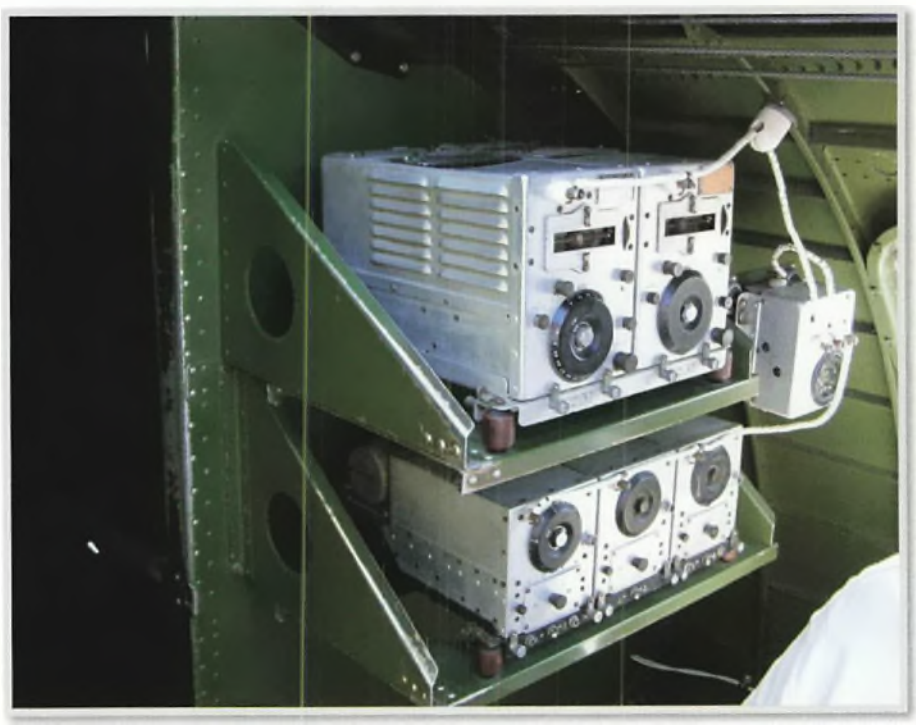

Fig. 2: Typical Command set installation.

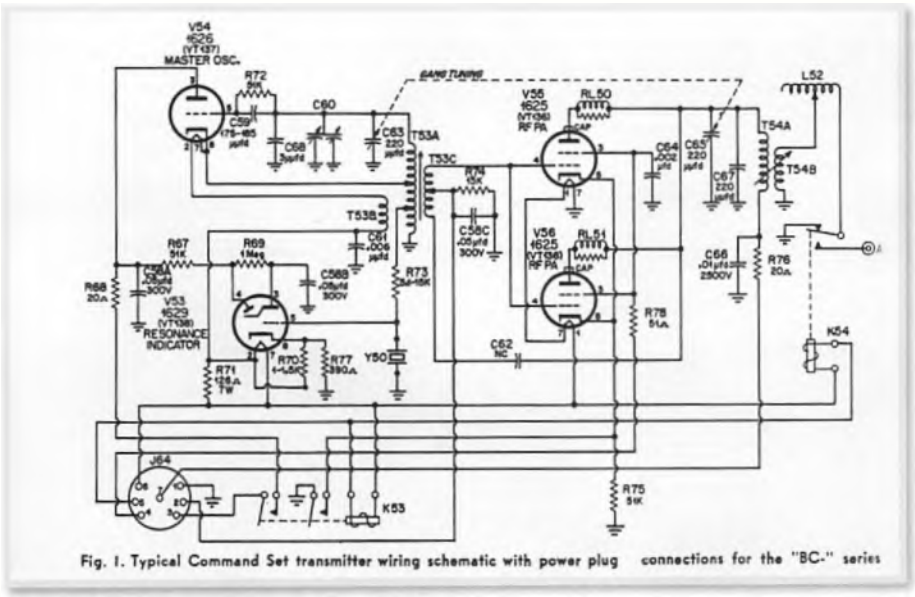

Fig. 3: Circuit of typical Command set transmitter.

Fig. 4: Radio operator position in Lancaster bomber.

Command Sets

The components comprising a SCR-274-N system installation aboard an aircraft varied by the requirements of the theatre commanders. Major considerations included inter-squadron and air-to-ground communications, form of navigation; and frequencies and modes employed. Satisfying these variables resulted in a number of different combinations of basic components. Generally, the result would be a rack of three receivers along with a rack of two transmitters and accessory components for interconnection, **Fig. 2**. The core units could be augmented with additional racks and other specialised units. The circuit diagram, **Fig. 3**, is of a typical Command set transmitter.

Model	Description	Frequency (MHz)
BC-946	Receiver	0.52-1.5
BC-454	Receiver	1.5-3.0
BC-454	Receiver	3.0-6.0
BC-455	Receiver	6.0-9.1
BC-696A	Transmitter	3.0-4.0
BC-459A	Transmitter	7.0-9.1
BC-456	Modulator	

Table 1: Typical SCR-274-N System Aircraft Installation

Fig. 5: A view of the R1155/T1154 installation.

RAF Radio System

In parallel, RAF Bomber Command adopted standardised radio systems for their bombers. The photos, **Figs. 4** and **5**, show the arrangement available to the Avro Lancaster and other multi-engine craft, while **Table 2** lists the equipment types. The R1155 and T1154 will be very familiar to many *PW* readers. The components were assembled into packages for integration into various aircraft using power supplies, mounts, antenna switches and so on. Standardisation was an important objective in order to simplify the role of the radio/wireless operator who often also served as a gunner.

Fighter Installations

Consistency was also sought for the pilots who flew the Defiant, Hurricane, Spitfire and other fighters. These aircraft used the RAF series TR-1143, a VHF single-case system, based on the American SCR-522-A system. The radio systems and the installations were identical, avoiding the necessity of retraining every time the pilot flew a different aircraft type.

The relative merits and deficiencies of the various systems are debatable but all contributed significantly to Allied success. The designers as well as the wireless/radio operators distinguished themselves and earned a special niche in the annals of the conflict.

The units were manufactured by the hundreds of thousands and, post-war, presented a bonanza to radio amateurs in Britain, the US and elsewhere. Inexpensive, new and used units were creatively converted for every band and most modes of operation. Intensively in the 1950s and 60s, and reducing later, the units renewed their mission. If you listen carefully to the activity on the CW portion of the bands today, you may hear a proudly restored unit still celebrating its resurrection.

Model	Description	Frequency (MHz)	Power
R-1155	Receiver	Five Ranges (0.20 to 18.5)	
T1154 (A through D)	Transmitter	Ten Ranges 0.20 to 30.0	40 to 70W

Table 2: Aircraft MF/HF System-MCW, CW & R/T as used in Avro Lancaster

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Older Accessories

To complement last month's look at second-hand transceivers, Colin Redwood G6MXL looks at how you can start to equip your shack from second-hand sources.

Last month I looked at some of the considerations when buying older transceivers. This month I am moving on to look at other equipment that makes up a typical amateur radio station. As I'll show, some items are a much safer choice to buy second-hand than others.

Power Supplies

I think buying power supplies untested is highly risky. Regardless of type, the first thing to establish is their output voltage and the continuous current they can deliver. At one time, 5V output power supplies were very common at rallies, although these days they are less common. Before parting with your money, have a look to see if there are any fuses that can be accessed without taking off the cover. If so, remove the fuse and see if it appears to be intact. Likewise, if you can, check the fuse in the mains plug. If any fuse appears blown, then proceed with extra caution.

With the cheap ex-CB type, you need to consider that even if working, they rarely give their claimed current for prolonged use. In most cases they were designed to handle transceivers running a few watts and not the 100W typical of most modern amateur transceivers. Personally, I've seen too many of them for sale with their lids off and components missing to confidently recommend them to readers. However, you may find some of the hardware useful for homebrew projects.

I think you are on somewhat safer ground with power supplies from the major 'black box' manufacturers. At least these will have been designed to provide their stated current for amateur radio use. You occasionally see power supplies from BNOS, **Fig. 1**, at rallies. These were mainly traditional power supplies and, provided they have been looked after, are likely to provide good service into the future and contain mainly replaceable components.

Finally, we come to switch-mode power supplies. Apart from those designed for non-amateur purposes (such as computers), these are still relatively uncommon at rallies. If you do buy one, you'll no doubt appreciate its relatively light weight when carrying it home!

Fig. 1: A BNOS 25A power supply.

Whatever type you buy, you really need to test it carefully before letting it loose on your valuable transceiver. I suggest that after carefully inspecting the mains lead and the plug wiring (if accessible), check the voltage setting (if provided) for your local mains supply. Without connecting any load, switch on the power supply and measure the output voltage. If the voltage is approximately as expected, then switch off and connect a well-rated resistor that will cause about one Amp to be drawn. Switch on and again measure the voltage. If the power supply has an option to vary the voltage, check that this works and that any voltage meter included provides a reasonably accurate indication. Likewise, check that any current meter shows a plausible value.

Transverters

The first challenge with any transverter is to clearly establish its driver and output frequencies. If you are not certain, then ask for any supporting documentation the seller has. The popular Microwave Modules range of transverters, **Fig. 2**, from the mid-1980s were generally designed to

work with either a 10m or 2m transceiver. They usually needed drive levels of a few milliwatts. Microwave Modules even supplied attenuators to help you keep to the correct drive level. Transverters from other manufacturers generally need low levels of drive, typically less than 5W. Using excess drive will lead to distorted signals and, quite possibly, complete failure of the transverter.

The other aspect of transverters to establish is the switching arrangements. These should be clearly stated in any supplied documentation. The common ones are RF-sensed switching, hard switching, usually by grounding a pin on a socket for transmit, and, finally, by sending a DC voltage up the IF coaxial lead on transmit. Similar options will also be encountered with linear amplifiers and preamplifiers.

In my experience the main risk involved with buying second-hand transverters is that they may have been over-driven in their past life. I encountered one not so many years ago where the input attenuating resistors looked cooked. Once I had contacted the original manufacturer of the transverter to confirm the correct values of the resistors, I was able to replace the cooked ones with suitably rated new non-inductive ones. I was then able to carry out some tests. I discovered that the output was a small fraction of the correct amount. I then carefully retuned the transmit chain and managed to get the output almost to specification. I suspect the previous owner had increased the input power to the transverter from the driving transceiver in the hope of getting more power out.

Fig. 2: A Microwave Modules transverter from the 1980s.

Fig. 3: A Czech Morse key.

Microphones

There are a few things to watch out for if buying second-hand microphones. Apart from cosmetic considerations, I would particularly check the wiring between the microphone body and the microphone connector. Also check to see if there are signs that the connector has been tampered with during its life.

Perhaps someone has rewired it to suit a different transceiver? Some desk microphones incorporate a battery. For these, I would check the condition of the battery compartment looking for signs of corrosion. You also need to be sure that the microphone type and impedance match the transceiver you intend to use it with although some modern transceivers (such as the Elecraft K3) allow you to swap between dynamic and electret microphones via a menu setting.

Loudspeakers & Headphones

The main issue to watch for with external loudspeakers is the lead and connector. It is also a good idea to check that the impedance of the loudspeaker is suited to the audio output stage of your transceiver. A loudspeaker impedance greater than required by the receiver shouldn't be a problem but be careful not to choose a loudspeaker with an impedance below that specified in the receiver's documentation. Other less obvious things to check are whether the cone itself is intact and whether the loudspeaker has been overdriven in the past. Both of these can result in distorted audio.

Morse Keys

With over 100 years of history behind them, Morse keys can frequently be found on the second-hand market. Some are real collectors' items, fetching very high prices. For the average operator, the important things to check are that it operates as expected and adjustments such as the gap and tension can be made to suit your preferences. I would also suggest checking that contacts don't show signs of damage from sparks. You may need to fit a suitable connector to enable the key to be plugged into your transceiver. A few years ago, some ex-Czech military keys were readily available at reasonable prices, **Fig. 3**. These had been stored unused for many years and were in varying condition and priced accordingly.

Antennas

If you know what you are doing, buying second-hand antennas at a rally can be a good option. I'll start by considering wire antennas. There is not a lot to go wrong

with lengths of wire. As long as you are sure that the wire is long enough for your needs, then I think wire antennas are a low-risk purchase, provided you are able to buy them cheaply enough. At the very least, you should be able to re-use the insulators on the end. If you check the feedpoint is not corroded, then you should be able to re-use them.

Turning to VHF/UHF Yagi antennas, the first task is to identify the specific antenna. Once you are satisfied which band it is designed for, then the next step is to establish whether it is complete. Check that all the fixings are present and in good condition. I've found the best bargains can often come from incomplete or damaged antennas, which can often be purchased very cheaply to provide a stock of spares for an existing antenna or to provide parts to build your own.

With HF antennas, many of which incorporate traps, you start to get into more risky territory. It is probably best to assume that at least some traps will need to be repaired or replaced, particularly if you suspect moisture has got into them. You may be able to use one side of a trapped dipole as a vertical, if you lay out some radials of suitable length for the relevant bands.

Provided they aren't rusty, some antenna brackets and clamps can often be found at rallies at reduced prices, **Fig. 4**. Apart from checking that the nuts fit the threads, there is little else to go wrong, so I'd class these as low risk purchases.

Because antennas are used outdoors and subject to deterioration from the weather, second-hand prices tend to be a fraction of new prices, unlike transceivers, which usually hold their value well after any initial depreciation.

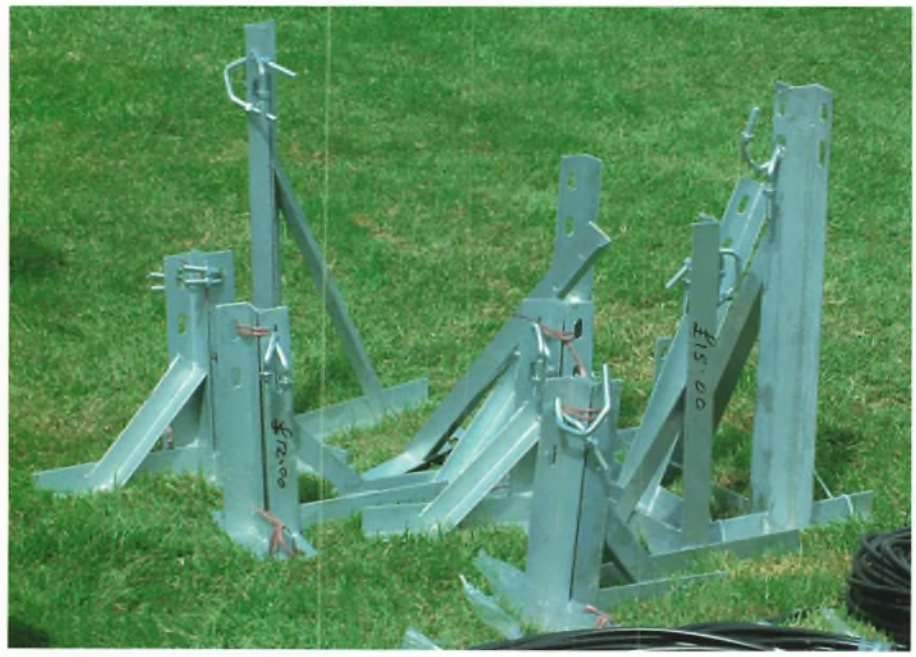

Fig. 4: Some antenna pole brackets for sale at a rally.

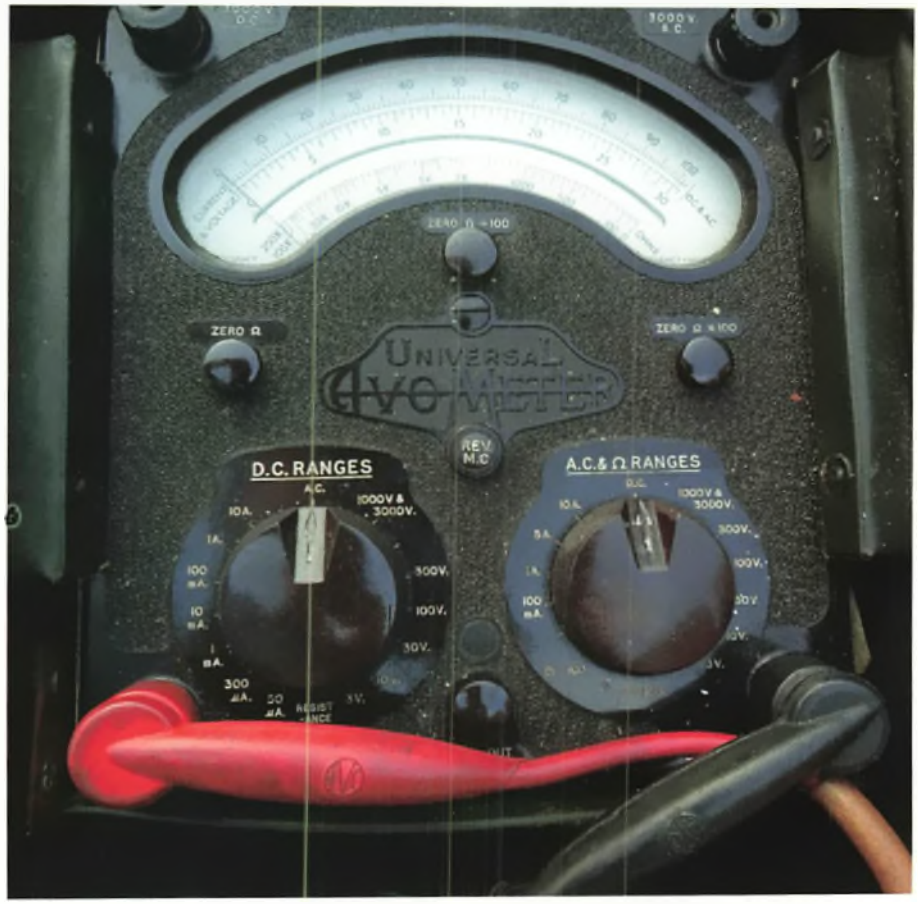

Fig. 5: A second-hand AVO multimeter bought at a rally in 1996 and still giving good service.

Feeder

Buying second-hand feeder is risky. A lot of coax of 75Ω and other non-50Ω impedances can be seen at rallies. It isn't always easy to establish from a quick visual inspection what impedance coax feeder is, especially if there are no markings on the outer jacket. In most cases 75Ω coax has a thinner centre than 50Ω coax of the same outer diameter. Water and moisture ingress is the second thing to check. If both ends don't have either good seals or shiny copper sheath and centre, I wouldn't risk purchasing. However, quite often established traders will sell offcuts of new coax from the ends of rolls with a worthwhile discount. Another way to buy safely is to bulk-buy a new full 100m drum and split it between some friendly local amateurs.

RF Connectors

I've had very mixed fortunes with RF connectors bought at rallies. Generally, I've found second-hand chassis-mounted sockets and back-to-back connectors to be a safe buy. Don't be put off by black tarnishing of silver-plated connectors – these are, generally speaking, the better-quality connectors. For plugs and in-line sockets, you need to be absolutely certain that they are the correct size for the feeder you are proposing to use them with.

Test Equipment

Test equipment is frequently seen at rallies. If you know what you are buying, there are often bargains to be had. I am always a bit wary about buying second-hand equipment on whose accuracy I am going to rely. For many amateur applications, it is relative values that we are more interested in, so absolute accuracy may not be essential.

SWR meters can often be found at rallies. The ones aimed at the CB market can be picked up very cheaply and if working, can provide a useful indication of power and SWR, but remember they are normally designed for a few watts around 27MHz. Moving upmarket, the Bird range of meters are generally considered good quality. Remember, though, that you'll need to add the cost of the plug-in elements of a suitable power rating for the band(s) you want to measure.

If you are looking for a cheap digital or analogue multimeter, then I think it is better to buy a new one from a reputable supplier rather than risking buying second-hand at rallies. Used AVO analogue multimeters,

Fig. 6: Spanners for tightening BNC and N connectors.

Fig. 5, can often be found at rallies at reasonable prices from traders who specialise in them. While a lot heavier and bigger than many modern analogue versions, they really are built to last and, I think, are well worth investing in although replacement batteries can be a challenge to source nowadays. Many are ex-military and will often have some label indicating when they are last calibrated. With all multimeters, I would suggest carefully checking the quality of the test leads, especially if you plan to use them at more than a few tens of volts (for example to check mains voltages).

From a quick visual inspection, it is difficult to establish the condition of older more complex test equipment such as oscilloscopes. A recent professional calibration certificate can help build some confidence but is certainly no guarantee. I would also suggest making sure that you can obtain spares from the second-hand market. Getting 'official' spares will generally be impossible for older equipment and if available, is likely to be priced for 'professional' use, making what might seem a bargain piece of equipment actually very much more expensive.

Tools

I think hand tools are one of the safest things you can buy at rallies. In most cases it is very clear from a quick visual inspection whether they are in good enough condition to be useful or not. Keep an eye open for the spanners designed for tightening BNC and N connectors, **Fig. 6**, if you don't already have a pair. These can sometimes be found in odds-and-ends boxes on the floors under the tables. You may need to sharpen some tools before using them.

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Knots & Ropes for Amateur Radio

Tom Morgan ZS1AFS/ZT1T brings his sailing experience to bear, explaining the twists and turns of using knots and ropes in your antenna installations.

My wife, Susan, and I came into amateur radio in preparation for blue-water sailing. After many enjoyable years, amateur radio saved us when we were rescued in the South Atlantic. Since then, amateur radio in the cruising world has shrunk with the 'marina trek' and the dreaded 'exclusionist' rallies. With so-called progress, many yachts have satellite phones like Iridium.

When we came ashore we decided to build a new station in South Africa. We started with a multiband vertical on a corrugated metal roof. The station has since developed into what we have now – two towers with beams from 40m up to 10m. We brought to amateur radio our sailing experience of rigging as well as the use of ropes and knots. For the purists out there, I have not distinguished between hitches and bends.

With the development of Susan's flower garden I have to trapeze antennas from one tower to the other. Of course, Susan is the ground crew. But that's for another time.

Useful Knots

You don't want knots that slip so which ones are useful to radio amateurs? Most amateurs need to raise antennas. So, if you have a high fixing point on a wall, you need at least one pulley and a line (rope) running freely through it. If the point is on a tower, you need at least one at the top.

I added cleats to both of my towers so that the permanently rigged ropes would be secure, **Fig. 1**. Also, we have a cleat board, **Fig. 2**, that can be placed wherever it is needed. You can get 'bolt-on' cleats if you don't have a friendly welder. Failing that, the rolling hitch (later) can always be pressed into service. But what about the knots?

Bowline

For lifting any items with a becket (a loop of rope or similar device for securing loose items on a ship) or a hole at the top (like a tool bag or bucket with a handle) a loop made with a bowline is good. If you need to tie a line to an insulator, the bowline is just the one. Susan always leaves a long tail on the bowline so I can tie it to the tower at whatever height I'm working. (Some readers may remember the bowline from Scouting days – it's the one where 'the rabbit went through the hole'.) The sequence, **Figs. 3a** through **3d**, is shown because it's easy to forget if you only use it a few times. Susan and I have had to tie these, on deck and in the dark, many times! The photos, **Figs. 4** and **5** show the bowline in use to hold a bucket and to secure an antenna insulator.

Clove Hitch & Derivatives

Then we have the question, *"But what if I want to tie a rope to a rung or an upright?"* The easiest choice is the clove hitch. It should only be temporary unless backed up. I use a clove hitch on a rung for my trapeze line and secure the excess with a rolling hitch on a vertical under tension, to avoid any movement. You could add a half hitch to the clove hitch: that makes a midshipman's hitch. But it will still creep. Temporarily, I use a slip hitch, as in **Fig. 6**. The slip hitch is handy because it can be released while the knot is under tension – unlike the dreaded overhand knot. So, you want to stop the clove hitch from moving? Then the choice is the rolling hitch or the camel hitch. Both are variants of the clove hitch. See **Fig. 7**. The rolling hitch is a clove hitch but is started with two turns on the side where the pressure will come. It won't move in that direction under tension. Tip: the easiest way to use this knot is lay it up on the rigid support and then pull it along to tension it into position, rather than trying to do two turns with the rope under already-applied pressure.

I can hear some old salts and 'experts' questioning, *"What's a camel hitch?"* Well, it's a clove hitch with two turns on either side. It's an ancient knot developed in Arab countries for tethering camels to a ground line. They couldn't move in either direction. As you can see from Fig. 7, the

Fig. 1: Rope secured to a cleat.

Fig. 2: Cleat board.

Fig. 3: The stages of tying a bowline.

standing part and the loose tail come out near the middle. A neat way to make it more permanent is a cable tie fixing both parts. This knot in 10mm plaited rope will be able to take the weight of a couple of radio amateurs. Of course, a proper harness should be worn.

Sheet Bend & Double Sheet Bend

What if the lengths you could buy were not long enough? You can join them. No, you should never use a reef knot because it works on equal tension from both sides. And, of course, we all know the granny knot is useless. So, what should we use? The Sheet Bend or the Double Sheet Bend is best. These can be used with ropes of differing or the same thickness. Always make the 'loop' from the thickest. I know there are other knots but these will do. Sheet bends are so-called because they were developed to hold the corners of sails (sheets) that were inaccessible when the sail was filled with wind. Only when the sail was furled to the boom could the clew (corner) of the sail be reached (think square riggers). From the photo, **Fig. 8**, it is obvious how both knots are made. But do remember to have a long tail (loose end). One tip is to keep hold of the 'loop' because this will avoid the sheet bend from collapsing until you can pull the tail alongside the thinner rope.

For security, and if the join sits at a normally inaccessible point, we use a double sheet bend. This is the knot for flag halliards that tightens under strain in wind and vibration and will not creep.

Ropes

Before dealing with suitability of types of rope, one factor is paramount - the 'Safe Working Load'. Bridon Fibre Ropes give the breaking strain of 12mm plaited diameter DYNAMICA (Dyneema) as 17800kg. Working on a generous 50% safety factor gives a safe working load (SWL) of 8900kg. Knots can also reduce SWL. But that should be well within the SWL needed by most radio amateurs.

Traditionally, most rope for general purpose was laid up clockwise in three strands, hence laid rope. Modern rope is plaited and called braided rope. Usually, there is an inner core and an outer plaited sheath that is hardwearing and resistant to chafe. Hence, we have braided rope. DYNAMICA ropes are coated to increase abrasion resistance. These ropes are ten times as strong as steel wire of the same diameter!

Storing Ropes

The photo of the coiled ropes lined up on the security gate, **Fig. 9**, shows how they can be stored. I keep them in a Waitrose trolley bag with all the tower equipment. Coiled this way, see **Figs. 10a** through **c**, they can be laid out to uncoil as the antenna crosses the flower garden without knotting.

On board, we used to make up the skeins and then throw them into the stern locker. We disbanded the hook idea, for hanging, because they rubbed and wore with the movement of the yacht. If it is a really long braided rope, snaking it down into a bucket is tidiest. I know many cruising yachties who used pouches or solid containers to stow their longest warps. But these were over 12mm in diameter. Nowadays I have a couple of cloakroom hooks on the back of the radio room door to take thicker ropes, **Fig. 11**.

Where to Find Ropes

Now comes the important question,

Fig. 4: A bowline securing a bucket.

Fig. 5: A bowline to secure a rope to an antenna insulator.

Fig. 6: Slip hitch.

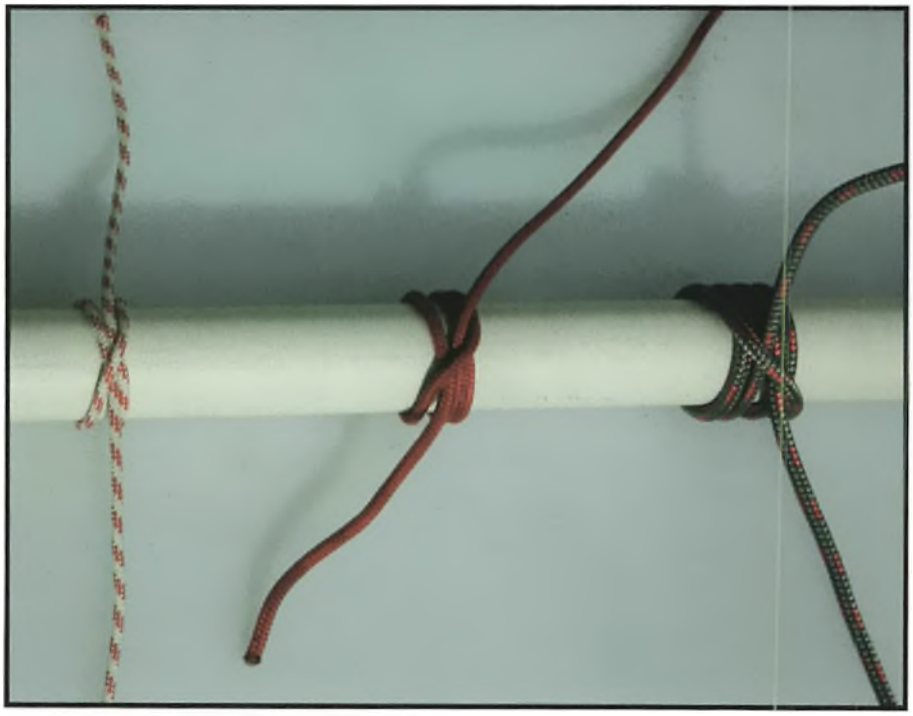

Fig. 7: Clove hitch, rolling hitch and camel hitch.

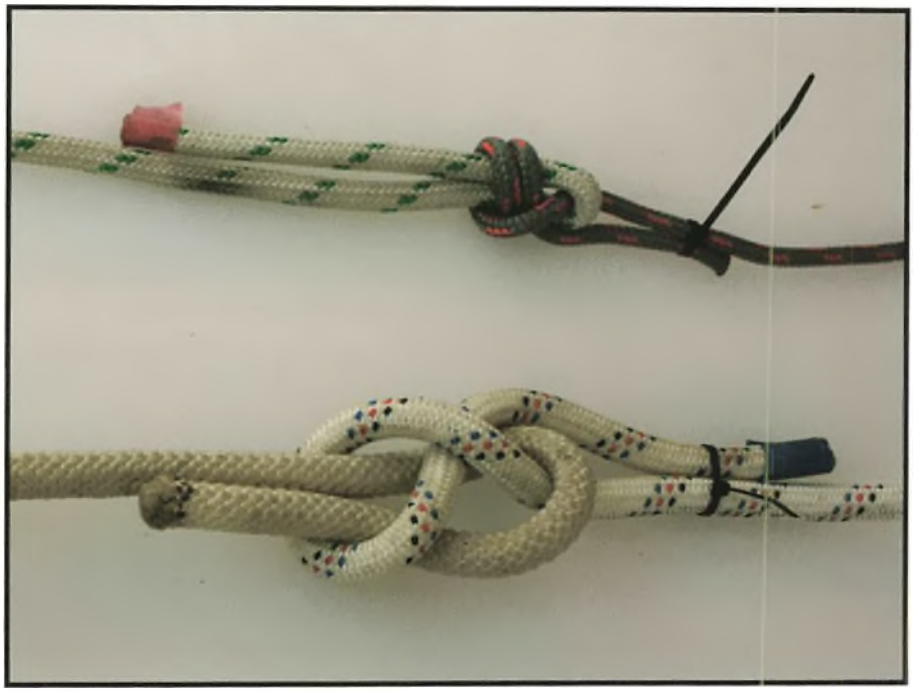

Fig. 8: Sheet bends – the double sheet bend is on top.

"Where is the best place to obtain ropes?" Those with sailing friends could have a constant source as ropes are replaced. Keen racing types will discard some ropes yearly! And for those near the sea there is the round of boat jumbles. If a friend is going to a boat show, ask him or her to pick up a bight for you. There are always traders selling suitable lengths cheaply. They come in lengths from 10m to 30m. As a rule of thumb, 8mm diameter is as thin as elderly amateurs can pull – 10mm is better. As described above, the strength of modern synthetic braided/plaited ropes is huge compared with the traditional three-strand laid rope.

Two aspects of rope that still need to be considered are stretch and UV-resistance. Rope made of polypropylene should be avoided because it fails on both counts. That's the blue, or orange, stuff that goes hairy and white in no time. That leaves you with nylon (and its derivatives) or a synthetic such as Terylene/Dacron

Fig. 9: Ropes stored on gate.

or Dyneema. Nylon has some stretch and can absorb shocks – that's why it is used for small boat anchor warps. But for ropes that are resistant to stretch from constant wind on wire antennas and the like, the latter two may be preferred because they are harder wearing over a block (pulley). Manufacturers' advice on blocks is to use pulleys that are at least ten times the rope's diameter. This figure is related to sailing and the constant running of ropes over the pulley wheel under tension. For hoisting purposes this can be reduced by 50%. So, for a 10mm rope, a pulley with a wheel diameter of 50 to 60mm should be fine. But for permanent placement a larger block is recommended.

Why use Plaited Ropes?

Plaited rope should not kink. Yes, I know laid ropes are regularly available in the hardware store but they are often with little body and strength. Also, unlike when using plaited rope, knots have to take account of the lay of the strands. Unless it's a job lot from an unusual source, the laid rope will be clockwise. Being left-handed I have a natural tendency to tie knots as if the rope is laid counter clockwise.

We use a variety of ropes but for out-in-the-sun and strength we use Dyneema. This is expensive but our radio station is in a valley where it can reach 40°C+ during the summer and winds can get up to over gale force in the winter.

The photo, **Fig. 12**, of the Mosley

Fig. 10: Stages of rope coiling.

Fig. 11: Ropes stored on the back of the shack door.

TA-34XL with 40m extensions shows the 6mm Dyneema ropes (breaking strain 4000kg) that have been up five years. When lowered and inspected before Christmas 2017, the double sheet bends on the boom had not moved or worn. The ropes on the support rings are held up by bowline loops on thimbles and the tails (loose ends) are clamped to the standing parts using black (UV-resistant) cable ties.

Plaited ropes can be sealed with heat, cut straight across and the covering layers are hard and durable. All synthetic ropes for sailing are suitable for antenna work and they don't rot. The local boating or camping shop is another source.

When we needed to wash ropes, one tip came in handy. Before you put them in the washing machine, make sure they are made up in skeins. We put them in an old pillowcase, tied to avoid a tangle with the other washing.

Seizing an eye can avoid a big lump on the rope but, for brevity, this has not been covered in this article. The reader will have guessed the ubiquitous cable tie is an essential part of knots and ropes. Any questions? Please drop me an e-mail or see me at the National Hamfest in Lincoln (where rope can be bought).

And finally, just to show that it works, **Fig. 13** shows the author suspended by a rope. The top knot, **Fig. 14**, is a camel hitch on a vertical leg of his second tower. It will not slip. The homemade harness is attached with a loop tied with a bowline. Normally, I have multiple attachments when working on the tower. But that's another story ...

Fig. 12: The author's Mosley TA-34XL antenna with 6mm ropes to provide rigidity.

Fig. 13: The author suspended in a fruit tree!

Fig. 14: The rope holding the author in the previous photo – a camel hitch around the leg of the second tower.

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Autumn Propagation

Steve White G3ZVW looks at what the HF bands can be expected to be like this autumn.

Around the period of the equinoxes – both spring and autumn – the High Frequency (HF) bands are usually in their best shape of the year. That will be as true this year as it is any year but we are now approaching a Solar Minimum so how are they actually likely to be performing this autumn?

Solar Cycle

Solar activity and sunspot numbers are the drivers of the Solar Flux. The greater the activity, the higher the number and the better the propagation is likely to be on the upper HF bands.

On average a solar cycle lasts 11 years, during which time the highest frequency on which long-distance HF propagation can be expected to take place with any degree of reliability will go up and then down. The 'up' part of the cycle is usually relatively fast (a few years), while the 'down' part is relatively slow (several years).

We are now approaching the end of Solar Cycle 24. Scientists tell us it was the weakest Cycle in 100 years so it was certainly an inauspicious one. At the time of writing the Sun had been 'spotless' for about 50% of the days of 2018. By the end of the year I expect the percentage to be even higher. The graph, **Fig. 1**, shows the Sunspot Numbers over the past 18 years. On the left of the illustration you can see the peak of Solar Cycle 23. Cycle 24 started in 2008 and HF conditions were most recently at their peak around 2012-2014 but the peak was nowhere near as big as it had been in previous cycles so the amount to DX worked was less. While Solar Cycle 24 certainly had its moments, those of us who have experienced previous cycles were not impressed with it. Now we are in the doldrums and, unfortunately, I think we are going to be there for at least another two years, so let nobody hold their breath in anticipation of a sudden and sustained improvement.

The general pattern of sunspots is that, as a Cycle progresses, they occur closer and closer to the Sun's equator, although very rarely on it. Recent sunspots have certainly been near the Sun's equator. When Cycle 25 begins it is likely to be with a small sunspot group at a latitude of about 30°.

Seasonal Cycle

The Earth is tilted on its axis. When it's mid-winter in the Northern hemisphere the North Pole is tilted away from the Sun by 23.5°. This means less energy from the Sun is received by the Northern hemisphere, resulting in shorter hours of daylight and lower temperatures. The opposite conditions exist in mid-summer. The North Pole is tilted towards the Sun by 23.5° so daylight hours are longer and temperatures are higher.

Unlike the magnetic field of a bar magnet, Earth's magnetic field is a complex shape but with the poles close to the geographic North and South Poles it is tilted by a similar amount. It is the coupling between Earth's magnetic field and the Sun that leads to more favourable HF propagation in the periods when the axis is neither tilted towards or away from the Sun – spring and autumn.

Daily Cycle

The basic daily pattern is that after it gets light in the morning, signals on the upper HF bands will start to propagate. Distant stations to the East will be heard first because it will have been daylight to the East for longer so ionisation (and from it, radio propagation) will have had time to build up. Later in the day ionisation to the East will start to drop because the Sun will be at an increasingly lower angle above the horizon. While this is taking place, ionisation to the West will improve because the Sun will be at an increasingly higher angle above the horizon. After it gets dark, long-distance propagation on the upper HF bands can definitely be expected to take a dive. At this point in the Solar Cycle the dive can even be before it gets dark locally.

Day-to-Day Changes

There are always short-term changes to the Sun's output so one day's propagation is never going to be the same as the previous or the next. Coronal Holes are commonplace and the passage of one across the surface of the Sun is always going to lead to changes in the Solar Wind, which in turn couples to Earth's magnetic field and leads to changes in HF propagation.

This Autumn

So, what can we expect from propagation on the HF bands this autumn? The first thing I need to say is that we should not expect great things on the upper bands. The Solar Flux just won't be high enough for the F-layer of the ionosphere – the layer that results in the longest distance propagation – to be sufficiently ionised to support refraction.

Starting at the upper end of the HF bands, I expect **28MHz** will be very quiet indeed. If there is any activity it will be during daylight hours – and it will need to be daylight along the entire length of the path that the signals take. At times there could be many days in a row when there is nothing at all to be heard on the band.

Moving down to **21MHz**, there should be openings but they may be short. As regards long distance (beyond Europe) working, paths to South America and Africa are likely to be the favoured ones. Signals will often be weak so if you hear faint stations chatting in Spanish during the evening, they are likely to be in South America. You shouldn't expect any activity overnight.

14MHz will be the carrier of most DX. Some paths might remain open after it gets dark but not every day. Once it closes, even this band – widely regarded as the most reliable for long distance communication – will remain closed until daylight the next day.

As regards long distance working, **10MHz** could be quite an interesting band to operate on, especially at night. Remember, though, that because the band is only 50kHz wide, we are restricted to the use

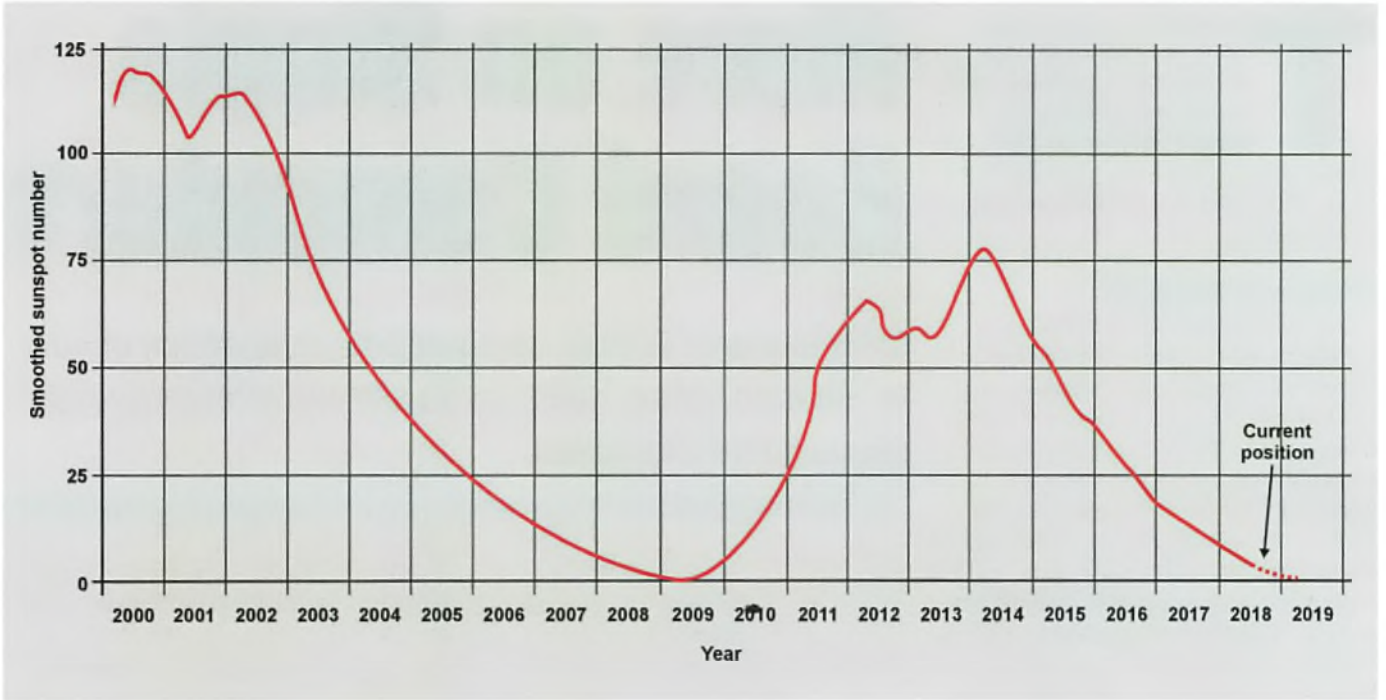

Fig. 1: Smoothed Sunspot numbers from the year 2000 to date.

of narrowband modes such as Morse and RTTY (no telephony or similar modes).

7MHz should be a good band for DX but only at night. Paths to the East should be open around sunset, making DX contacts to the Far East possible. Paths to the West – North America, for example – should be open in the early hours of the morning. Although paths to the West are likely to peak shortly before sunrise, they might remain open for a while after it gets light. During daylight hours the Critical Frequency is likely to be below 7MHz so expect short-skip paths to be difficult. During the time that it isn't possible to work stations around the UK, longer distance single-hop refractions to continental Europe might well remain good.

During daylight hours the Critical Frequency is likely to be above **3.5MHz** so this band should be good for contacts up to a few hundred miles. At night the band will open for longer distance contacts. Multiple-hop refractions will become possible so the opportunities for DX working should be good at times.

Irrespective of the time of year, **1.8MHz** will be closed during daylight hours because of absorption by the D Region of the ionosphere. This being so, you shouldn't expect to hear anything beyond the range of Ground Wave propagation (tens of miles). As darkness falls and the D Region dissipates, the band will undoubtedly open up for skywave contacts. Single-hop refractions via the E Layer are likely to yield stations up to about 1300 miles away (so all of Europe). At times, longer distance contacts should be possible overnight.

Summing-Up

To summarise, while the HF bands are likely to be at their best during autumn, this year the best is unlikely to be good.

If you want to make the most of the meagre conditions we are likely to experience on many of the HF bands, narrowband modes are likely to yield better results. This is because they offer a better signal-to-noise ratio than modes that require greater bandwidth.

Traditionally this would mean using Morse rather than telephony but modern data modes are easy to get going on and many can be detected by a computer when a signal is too weak for a human operator to hear. PSK is a prime example of such a mode but **Joe Taylor K1JT** has over the years developed a suite of software offering a number of data modes optimised for different propagation types and paths. His recent development, FT8, is currently all the rage.

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More on Single Board Computers

Mike Richards G4WNC continues his explanation of how to run data modes software on any one of three popular single board computers.

This month I'm continuing my look at SBCs (Single Board Computers) for data modes by covering the fastest of them all, the Odroid XU4. I'll also show you how to add CAT control to your SBC-based data modes system.

WSJT-X on the Odroid XU4

You will have seen from last month that the Odroid XU4 is a very powerful SBC featuring twin quad-core processors with fast memory and GPU. The combination provides two USB 3.0 ports along with full Gigabit ethernet, making it one of the fastest SBCs around. The manufacturer's support for this board is also good and I found that their Ubuntu Mate 16.04.4 LTS distribution worked well with data modes software. I did try the later Ubuntu 18.04 but ran into several tricky dependency problems so decided to stick with v16.04. You can find the latest OS distributions via their Wiki at:

https://tinyurl.com/y7ujop9y

1. From the Wiki download URL, select Linux, then the Upstream Release and choose the most recent full release (avoid the minimal options). You will be presented with a long list of OS image files that are ordered by date with the oldest at the bottom. Scroll down to the bottom and you're looking for **mate-odroid-ux4** in the name and you want the file ending in img.xz (not img.xz.md5sum).
2. Once you have the file downloaded on your PC, use Etcher (URL below) to burn an 8GB or 16GB class 10 microSD card. NB: You don't need to unzip the file because Etcher does that for you behind the scenes.

https://etcher.io

3. When the microSD card has been written and verified by Etcher, you can install it in your Odroid XU4. The card location is a bit tricky but be sure to insert it with the contacts down towards the PCB, **Fig. 1**.
4. Connect a monitor, keyboard, mouse and power up the XU4.
5. You will see a logon screen and it will shut-down. Press the reset button to reboot and when the login screen appears again, sign in with odroid/odroid.
6. When you are logged in, the first job is to get the latest updates. Go to the Applications menu and select System Tools – MATE Terminal and enter the following command:

sudo apt update && sudo apt -y upgrade

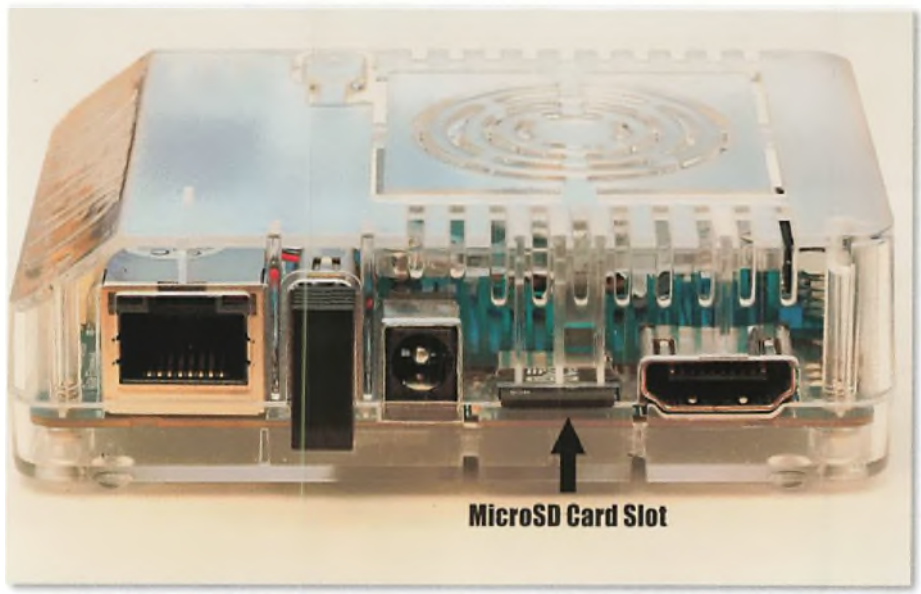


Fig. 1: Odroid XU4 microSD card insertion.

If you get a lock error, just reboot the XU4 and try again.

7. his will take a while and may complete with a warning that boot.ini has changed – just press Enter to confirm and the upgrade will conclude.
8. At this point it's worth running a few of the pre-installed programs to make sure everything's working correctly.

Installing WSJT-X is now very simple as follows:

1. Begin by entering the following into a terminal session to install the WSJT-X prerequisites:

a. **sudo apt install libqt5multimedia5-plugins libqt5serialport5 libfftw3-single3**

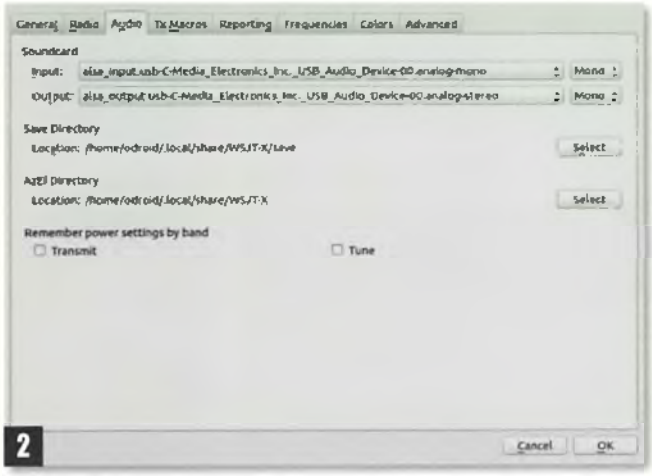
2. Next, download the WSJT-X ARM v6 binary file from the bottom of this page: https://physics.princeton.edu/pulsar/k1jt/wsjtx.html
3. When the download completes, change to the Downloads directory by entering:

a. cd ~/Downloads

4. To install WSJT-X enter the following:

a. sudo dpkg -i wsjtx_1.9.1_armhf.deb (**NB:** Change the revision number to match the downloaded version)

5. On completion, you will find WSJT-X in the Applications menu under Sound & Video.
6. Connect your USB soundcard and open WSJT-X.
7. Go to the File menu – Settings – General tab and enter your callsign/locator.
8. Go to the Audio tab and select the entries that begin: alsa_input.usb and alsa_output.usb, Fig. 2.
9. You will need to be able to control the input and output levels and the simplest method is to put a link to the alsa sound controls on the desktop. To create the



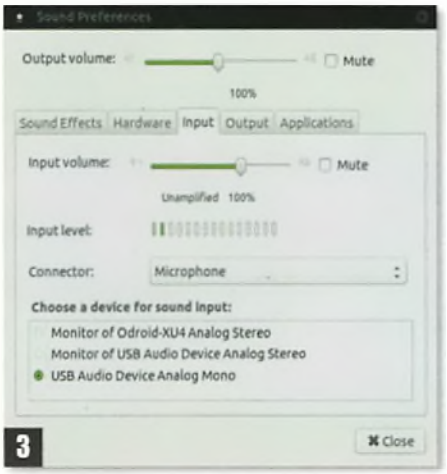
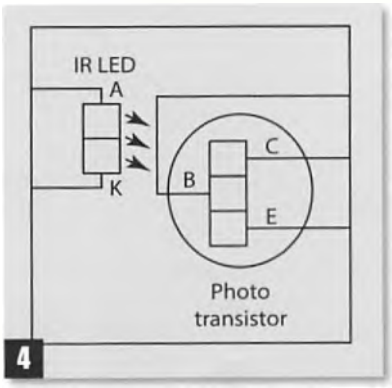


Fig. 2: WSJT-X – Sound card selection for Odroid XU4. Fig. 3: Odroid XU4 running Ubuntu Mate – audio level settings.



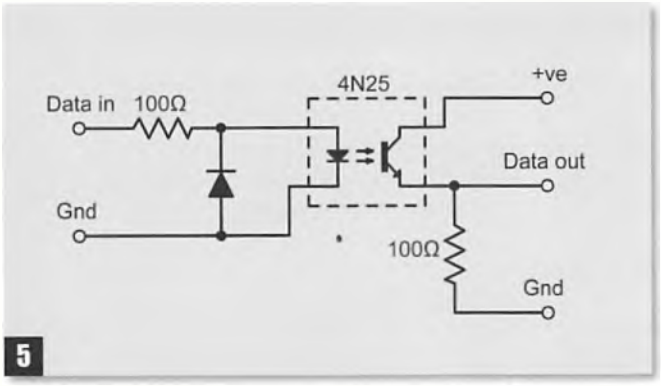


Fig. 4: Opto-Isolator illustration. Fig. 5: Data line isolator using 4N25.

link, go to the menu System – Control Centre, find the Sound icon and left click/hold and drag the icon to the desktop and release the mouse. Now you can use this shortcut to quickly access the audio levels.

10.To configure the sound in the volume control, click the Input tab and select USB Audio Device Analog Mono. Move to the Output tab and select USB Audio Device Analog Stereo, **Fig. 3.**

That completes WSJT-X installation for the Odroid XU-4 SBC and, once the audio levels are set and you've entered your personal details, you should be able to get on the air. Please remember that the WSJT modes are primarily weak signal modes so you should always use the minimum power necessary to make the contact. I normally operate at 5W into my Butternut HF9V multiband vertical antenna.

Adding Computer Aided Transceiver (CAT) Support

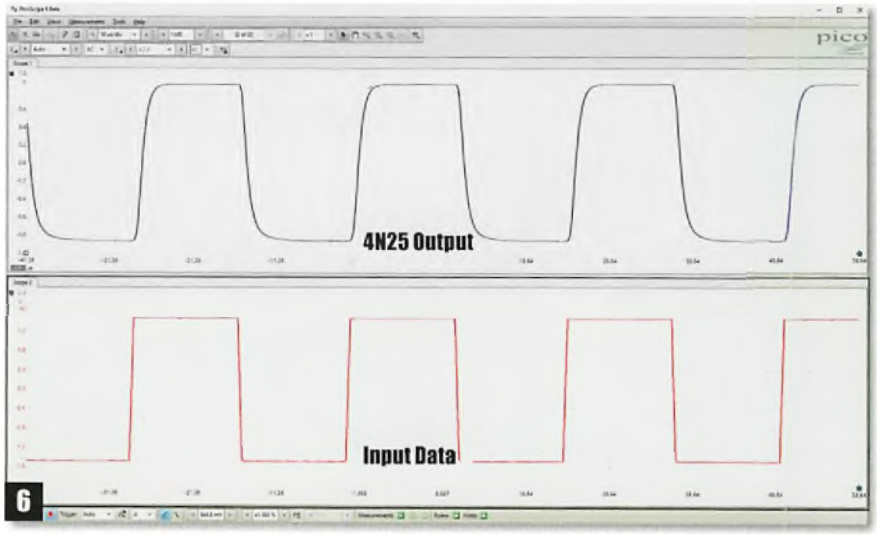
While it's quite possible to operate many data modes using only audio in/out connections and VOX, linking your computer to the rig brings some useful benefits. The most obvious comes from linking the frequency setting in the data modes software with the rig's tuning. This enables you to control your operating frequency from your data modes software. Most systems also allow simultaneous frequency setting on both the rig and the data modes software. I find this particularly useful because you can do most of the frequency selection in software but still use the rig's rotary control for fine tuning. The CAT control software regularly polls the receiver to keep the rig and software settings in sync. Another important benefit from CAT control is that any associated logging program automatically receives the correct operating frequency.

Making the Connection

The first step in CAT control is making the communication link between your rig and the computer and the simplest solution is to use a commercial USB rig interface unit. There are plenty of these on the market and the RIGblaster range is a popular choice. Some rigs, notably the Elad FDM-DUO, have a dedicated USB port for CAT control. In that case, you only need a standard USB cable to connect the CAT port to the SBC's USB port. However, it's quite easy to make your own interface because most rigs employ a simple serial interface with just three lines: transmit and receive data plus ground. The communications link is loosely based on the old RS-232 serial communications standard. The main variations are in the voltage levels and format of the transmitted data. As a result, you need an interface that's specific to your rig model.

In addition to providing the appropriate plugs for connecting to your rig, the interface unit or cable usually needs some form of level translation circuitry and a USB chip to format the data for transmission over USB. Once in the computer we want the USB data from the rig to look like a standard serial COM port. This conversion is done using a dedicated USB interface chip, which is often mounted inside the USB plug and takes its power from the USB socket. The FTDI manufactured chipset is by far the most common and uses standard Windows and Linux drivers that are automatically loaded when the interface is plugged in.

It's perfectly feasible to make your own CAT cable and a good starting point is one of the many ready-made USB-to-serial adapter cables that are available from most component suppliers for around £15. These come in many formats, some with a standard D connector or just wire ends but those using the FTDI chipset are the easiest to interface. You will also find that some provide extra control lines but, for a simple interface, you only need the



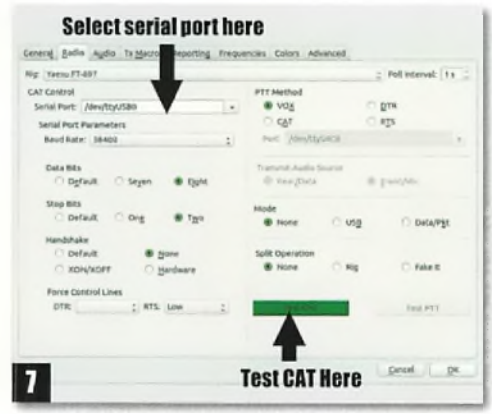


Fig. 6: Comparison of input and output data from 4N25 isolator. Fig. 7: Selecting the CAT serial port in WSJT-X.

Txd (Transmit Data), Rxd (Receive data) and ground connections. The original RS-232 standard used signalling voltages of up to ±25V, although the highest signalling voltage you are likely to see from your rig is the 13.8V supply. Choosing the right lead is simply a case of knowing the signal levels used by your rig.

The FTDI USB to serial cables are available in three basic formats: RS232 to USB, TTL-232 to USB and 3.3v-232 to USB. As you can probably guess by the names, the working voltage is the main difference between the models. The RS232 to USB model is the more expensive because it can handle full RS-232 signalling voltages of ±25V, whereas the other two models are limited to 5V (TTL) and 3.3V respectively. When using an FTDI cable, the interface can be as simple as wiring the USB cable to the appropriate pin on your rig's connector but it's worth Googling CAT control for your rig so you can see what others have done.

The most common modification from the basic lead I've described is to add electrical isolation between the rig and the SBC to reduce the transfer of computer noise. To see the full benefit of isolation you will also need to isolate the audio lines. The simplest way to do this is with miniature line transformers. A good example is the SM-LP-5001E device from Bourns because it has a flat response from 200Hz to 4kHz, 2dB insertion loss and costs around £2 each in small quantities. Isolating the data connection is slightly more complex and often done using an opto-isolator device such as the 4N25. These opto-isolators have an IR photo diode on the input side and an IR sensitive photo-transistor on the output, **Fig. 4**. I've shown a typical circuit for isolating a data line in **Fig. 5**. The 4N25 in this circuit is good for baud rates up to 38,400 but at higher speeds, the distortion increases rapidly, **Fig. 6**. If you want to control the PTT line of your rig, you will need a serial converter cable that includes the RTS and DTR lines. An example of this can be seen in RS Components part No. 741-7076.

Configuring Data Modes Software for CAT

All three of the SBCs I've covered in this article use Linux as the OS (Operating System), so the configuration is similar. When a serial-to-USB converter is plugged into the SBC, the device is automatically enumerated as a tty (serial) device. To set up your data modes software for CAT control, you need to enter the tty device name. That name is easily found by entering the following command in a terminal session: **ls /dev/ttyUSB***. If you have a single USB serial device connected, the result will be: **/dev/ttyUSB0**. For WXJT-X, setting up the CAT interface is simple because the Hamlib control software is installed automatically. To set the CAT control, first plug in the serial cable before you open WSJT-X. This is necessary because the software reads the list of available devices during start-up and doesn't refresh the list if a device is added later.

1. Open File – Settings – Radio and select your rig, **Fig. 7**.
2. In the CAT control section under Serial Port, select your serial port, for example / dev/ttyUSB0
3. Set the baud rate, data bits, stop bits, handshake and control lines to match the requirements of your rig.
4. Press the Test CAT button. This tests the communication link and will turn green if all is well.

That completes the configuration and you should find that you have control of your rig from within WSJT-X. If you want to include hardware PTT switching you will need to use a serial lead that gives access to the DTR and RTS line. You will also need to configure their action in the Settings – Radio section of WSJT-X.

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Building some Basic Test Equipment

Lee Aldridge G4EJB builds some basic test equipment for his receivers and in readiness for his first transmitter.

So now I had two receivers but I realised that if I was going to get 'on the air', I needed some basic test equipment. How could I calibrate my receivers or prove my transmit frequency? Well, for the receivers, a calibrator would be built. As a member of the G-QRP Club, I took advantage of the very useful component sales and excellent service. I found some stripboard on eBay from JabDog, bought a pack of resistors and capacitors from many miles away and looked for a simple 10MHz oscillator design. I found one of many online: https://tinyurl.com/yalhjapd

My intention was to build the oscillator, then find some old divide-by-ten ICs to give 1MHz and 100kHz outputs. Rather an old-fashioned approach but it still works. I built the oscillator and buffer successfully although my layout skills with a smaller piece of stripboard were a little rusty (just don't ask – how come I didn't follow the layout shown?). The shortwave receiver was used to find the 10MHz WWV signal. For further details see: https://tinyurl.com/yb9zm6b6

I switched on the 10MHz oscillator and there was sufficient output for it to be heard in the vicinity of WWV in the afternoon. That is to say, it was heterodyning with the signal. The trimmer was used to zero-beat with the standard. And that is as far as that has progressed until I have bought some dividers.

While trawling the internet trying to catch up with developments in the hobby, I had seen these extremely cheap 50MHz frequency counters and thought it was worth a try building one. Little did I know at that time of the history of the design and just how popular the SIC based boards have been. For further reading, see: https://tinyurl.com/huvkf

What had spurred me on was the Howes 20m CW transceiver that has a VFO output buffer that I thought I should hook up to a counter once I had got that working along with any other transmitter I was likely to construct.

The frequency counter kit arrived in due course. The PCB was of good quality and the silk-screen printing was very clear. It seemed straightforward to build except for one thing – I found my Antex iron too hot. The solder would bubble immediately – blow holes, I believe, is the proper terminology. So out came the temperature-controlled supermarket iron to try to lessen the chances of this. Well, the soldering iron bit didn't last too long because I was using lead-free solder but I managed to tidy up my soldering.

The other issue was that the plated-through hole size on the board and the lead size of components can exaggerate this soldering condition (well, that's the excuse for my soldering prowess). Once built and checked over for any component errors and soldering issues (missed joints and solder bridges), it was time to apply power. It was specified to work with 5 to 9V applied. With my DVM connected in series to measure current, I powered it up with a less-than-new 9V battery. The LED display flashed into life, then set itself to zero and I measured a current in the order of 40mA (a no-smoke current). How could I test it as a counter? Use the inbuilt crystal oscillator. I held a 10MHz crystal in place on the test socket and 10.000 was shown on the display. Quick, switch off, it's working.

Lack of Audio

Away from test equipment, something else that I had thought about was the lack of audio from the Howes receiver to drive a speaker a little more easily. I started to look at what I could build but soon ran across an old Harry Moss car speaker amplifier with graphic controls that my mother-in-law had given me and started wondering whether it would be of use. I also had an old Maxon 12V 10A power supply with a speaker in it.

You've guessed the rest. The little handbook that was still with the Harry Moss amplifier showed me how to connect it up. I made an adaptor lead for the 3.5mm jack on the Howes DC receiver and with the aid of some choc-block, the setup was ready

Maxon power supply and graphic equaliser.

to test. Yet again, I double-checked my wiring, particularly the supply side of things. I checked the voltage output of the Maxon supply. Switched on the Harry Moss amplifier, nothing appeared to be wrong – smoke check again. Switched on the Howes receiver and turned up the volume. Lo and behold, amplified output from the receiver was coming out of the speaker. I could even adjust the audio response to suit radio communications a little better. This was a very pleasant bonus – to have radio signals through a speaker even though the Howes receiver had a bit of an oscillator drift problem and on occasions, a little AM broadcast breakthrough.

At least I could listen to a few different things, refreshing my knowledge a little about HF conditions, seasonal variations and the way radio amateurs are operating these days.

Now I felt I was making a little progress towards being able to make use of my licence. About time to start looking at the old Howes 20m CW transceiver.

• E-mail: practicalwireless@warnersgroup.co.uk

Book Reviews

Don G3XTT takes a look at two new books from the RSGB.

While at the Friedrichshafen Ham Radio show, I spotted a couple of interesting new books on the RSGB stand. Both are project based – one on antennas and one with lots of simple shack projects. Just what *PW* readers are interested in, I thought, so here are my reviews. Both books are available from the RadioEnthusiast website (below) or, of course, from the RSGB.
www.radioenthusiast.co.uk

60 Antennas you will want to build!

Collections of antenna designs are always popular. Indeed, I claim some 'previous' here – the RSGB's *HF Antenna Collection*, published in 1991 and bringing together a wide range of antenna articles previously published in *RadCom*, came about at my urging and has been followed by several similar publications.

60 Antennas you will want to build! follows very much the same tried and tested format but its editor, **Giles Read G1MFG**, who is also a member of the *RadCom* editorial team, has taken the opportunity to make a few editorial changes along the way, for example adding metric dimensions to older articles or drawing on additional source material. Most of the designs started as *RadCom* articles although some are drawn from other publications. Several of the authors will be familiar to *PW* readers because we have published articles by them too – **Steve Ireland VK6VZ/G3ZZD, Andy Choraffa G3PKW, Vince Lear G3TKN** and **Rob Dancy G3JRD** are just a few examples.

The book divides into six sections: Mostly Verticals, Mostly Horizontal, Directional Antennas, Loop Antennas, Stealthy Antennas and VHF and Up. There are designs for all bands from VLF (136kHz) through to microwaves (10GHz). Many are novel, some are classic, including the original **Louis Varney G5RV** article and the Windom (recommended in recent *Letter to the Editor* here in *PW*).

While there is no substitute for one of the heavyweight antenna books on your radio bookshelf, collections such as this one always make for fascinating reading and may contain just the design that works for you, whether because of your location, the combination of bands you like to work or even because of the materials you happen to have access to.

60 Antennas you will want to build! is priced at £14.99 (£13.99 to *PW* subscibers)

50 Projects for Radio Amateurs

50 Projects for Radio Amateurs is very much in the same vein – a number of previously-published projects collected and edited in this case by **Mike Browne G3DIH**. The section headings are Measurement and Filter Projects, Morse Projects, Antenna Projects, Miscellaneous Projects and Reference. Projects range from simple to relatively complex (an 80m transceiver and a 70cm handheld). They also vary from simple circuits built on perfboard or Veroboard to projects that pull together readily-available modules (such as a USB sound card, in one case, as part of a data modes interface). There's an Arduino-based SWR analyser but, equally, a Morse paddle that is purely a mechanical project.

There is a handy parts list at the end of each project and, in the preface, the editor says that he has, as far as possible, checked that the parts are available from sources such as RS Components and Maplin. Sadly, of course, the latter is no longer with us but I didn't spot any projects that were likely to suffer as a result.

The projects have been taken from several RSGB sources, both books and magazines. Most indicate where they were first published and who the author was (again, some names appear that are familiar to *PW* readers – **Martin Waller G0PJO** and Geoff **Theasby G8BMI**, for example). It's a pity in my view, though not important, that several projects lack this information. It doesn't detract from the projects themselves and it may well be that details of the original authors are lost in the mists of time. I suppose I'm just the curious type!

50 Projects for Radio Amateurs is priced at £14.99 (£13.99 to *PW* subscibers)

Either of these books would make a handy addition to your amateur radio bookshelf and nicely complement the various projects that we feature here in the pages of *PW*.

These books can both be purchased from our Book Store on page 27

• E-mail: geofftheasby@gmail.com

PSU and Metering Box

Geoff Theasby G8BMI continues his series of articles using cheap modules and kits bought off the internet. This time a switch-mode PSU plus metering, all for £15.

This time, we are just wiring blocks together, needing little knowledge, but generating powerful current, and one of them needing mains voltages, 230V AC, so do be sure to take care.

If we run a transistor transceiver, it will often need 12V at several amps. If used from home, a mains power supply is preferable. These can cause audible or electrical noise. To this end, many people use a linear power supply unit (PSU), meaning they incorporate a transformer capable of supplying the full rated current. These are therefore very heavy, although silent in use. Another method is to use a switch-mode PSU, which has no power transformer (see Technical for the Terrified, *February 2018* – ***ed.***). **Horowitz & Hill** in *The Art of Electronics* recommend using an LDO (Low Dropout Voltage) regulator on the output or a high current lowpass filter if the PSU generates noise. Many users, however, say they experience no noise at all from this device. I checked on the 40 and 80m bands but detected nothing extra upon switching on. The retail cost of such a PSU is about £100 for either type. If the attractive case and meters can be dispensed with, then a switch-mode PSU module can be obtained for about £15 *(£16.99 on eBay just prior to publication* – ***ed.***). I used an S-360-12 or HG5856. It is protected against over voltage and over current and is short-circuit proof. The voltage out can be set to between about 10 and 14V.

The case may not be isolated but sits at half of the mains voltage, at high impedance. This should be 'non-lethal' if touched but you will still get a shock. To avoid contact, isolate in a ventilated plastic case and use nylon screws. I checked mine carefully with the meter set to 500V AC and DC as well as for resistance between case and Earth. Nothing, so it appears to be isolated.

To ensure that no residual voltage remains on the connections after switch-off, use a bleeder resistor of about 2kΩ so that it dies away within seconds. This may already be fitted and can be checked by monitoring the voltages when switching off. In my example, the 12V dies away to zero over about ten seconds.

Fig. 1: The switch-mode PSU module.

Connect the Earth terminal to the mains Earth pin. Do not connect Earth to negative. Check with a multimeter – there should be no connection between Earth and negative.

Ventilate the plastic case (this will need to be 210 x 115 x 40mm or bigger) so as to equal the area of fan outlet holes, drilled along the sides near the base. The fan is thermostatically controlled, but the area of the box ventilation should equal or exceed that of the fan outlet, this being about 1050mm², 55 holes or more, 5mm diameter (19mm² each) should do it. Cover the fan outlet area on the box top with mesh, making it larger to allow for the reduced area/flow resistance of the mesh itself, **Fig. 1**.

PSU Monitor

The concept for this next one, which allows you to meter the previous PSU module or any other, combines analogue and digital displays in a logical manner. It requires some metalwork, or the same in a plastic project box, and is otherwise a simple wiring exercise. The hardest part

Fig. 2: Voltage and current readouts.

was cutting out the rectangular hole for the voltmeter. It was becoming tedious, even after 'chain drilling' to remove most of the plastic, until I remembered my 12V minidrill. A tiny circular saw, and a burr quickly shaped the hole, which was then smoothed off with a file. A digital voltmeter is used because the voltage does not change long term from that preset, alongside an analogue ammeter with a range to suit the current drawn by the equipment. In my case it will be monitoring a Ten-Tec Argosy II requiring up to 10A at 12V. This demands suitably-sized wire to conduct it. Single-core wire is inconvenient and stiff; flexible, stranded wire is better. Don't ask me how I know! So that it may be quickly disconnected and used with other equipment, it is supplied via blue crimp terminals, which are rated at 27A. Of course, the ammeter is wired in series with the equipment and the voltmeter across it, **Fig. 2**. The ammeter was £4 from Amazon, the voltmeter £1 from a rally.

Rallies

Send all your rally info to Georg Wiessalaat: wiessala@hotmail.com

Plan your rally visits with our comprehensive list of forthcoming events. RadioUser will be attending events marked with an asterisk* – come along to our stand for great deals on subscriptions to *Practical Wireless* and *RadioUser*. Club Secretaries and Event Organisers: please send us details of your events if you would like them to be mentioned here.

AUGUST

August 25th and 26th (Saturday and Sunday) (24th for Visiting Dignitaries)
Montrose Amateur Radio & Aviation Enthusiasts Rally
(see also our *Airshow Guide*)
The Montrose Rally will take place at the Montrose Air Station Heritage Museum, Waldron Road, Montrose DD10 9BD. It is primarily aimed at radio amateurs and those interested in aviation.
Andy Burns MM0CXA
07720 321 824
rm2@rsgb.org.uk

August 26th (Sunday)
Milton Keynes Radio Rally
The Milton Keynes ARS 60th Anniversary Radio Rally will take place at the MK Irish Centre, Manor Fields, Watling Street, Bletchley MK2 2HX. NGR SP885337. Site entrance (decimal): 51.9959, -0.7096 Open 9am. Admission is £3, including parking. Traders/boot sellers are located in the field and also indoors, in the hall.
Francis 2E0FMK
07866 673 192
rally@mkars.org.uk
http://mkars.org.uk/rally

August 26th (Sunday)
Torbay ARS Annual Communications Fair
The Torbay ARS Annual Communications Fair will take place at The Racecourse, Newton Road, Newton Abbot, Devon TQ12 3AF. This indoor event offers free parking and facilities for the disabled. It is accessible by public transport. There will be a bring & buy, catering, an RSGB bookstall, special interest groups, trade stands and a prize draw & raffle.
Mike G1TUU
01803 557 941
rally@tars.org.uk

August 27th (Monday)
Huntingdonshire ARS Annual Rally
The Huntingdonshire ARS Rally will take place at the Ernulf Academy, Barford Rd, St Neots, PE19 2SH. Talk-in with GX0HSR on 145.550MHz, free parking, admission £3, doors open 9am (traders 7am), hot meals and drinks on site, ice cream van, RSGB bookstall, and a bring & buy; fine weather has been booked!
Malcolm Hirst M0OLG
01480 214 282
events@hunts-hams.co.uk
https://tinyurl.com/ydhsh7xy

SEPTEMBER

September 1st (Saturday)
Telford G-QRP Club 'Buildathon'
The Telford G-QRP Club, Buildathon, Mini-Convention and HamFest take place at the Park Inn Hotel, Telford TF3 4NA. Steve Hartley G0FUW will lead the Bath style Buildathon. This year, it will feature a design by Heather M0HMO described as an 'HF Swiss Army Knife'. This is a small, digital (portable) device, which measures VSWR, RF power, DC voltage, resistance, continuity, HF frequency, GPS (Lat/long, Maidenhead and OS grid reference) and more for around £20. The venue opens from 7pm. We recommend pre-booking with Heather for the project. Bookings for a concessionary overnight stay can be made directly to the Park Inn Hotel. Please book asap, mentioning the GQRP radio event.
Heather M0HMO
07802 548 938
Martyn G3UKV
01952 255 416
Park Inn: 01952 429988
heather@myorangedragon.com
www.telfordhamfest.org.uk

September 2nd (Sunday)
Telford & District ARS Telford HamFest
The annual HamFest takes place at its usual venue of Enginuity in Coalbrookdale, Telford, Shropshire TF8 7DQ. Numerous trader and exhibitor stands have been booked; a variety of presentations will be available from guest speakers in the adjacent historic Darby Boardroom.
New, improved, car parking facilities are available. Admission is £4.50 (accompanied under-16s free) from 10am. There will be an RSGB bookstall and on-site catering.
Martyn G3UKV
01952 255416
hamfest@ukv.me.uk
www.telfordhamfest.org.uk

September 8th (Saturday)
Caister Lifeboat Radio Rally
The Caister Lifeboat Radio Rally is at Tan Lane, Caister on Sea NR30 5DH. The event is open from 9am to 3pm (from 8am for sellers). Indoor tables are £10 each, outside stalls cost £5 each. There will be a raffle, onsite café, disabled access and talk-in on S22.
Zane M1BFI
07711 214 790
m1bfidx@ntlworld.com

September 15th (Saturday)
Fog on the Tyne Rally
The Fog on the Tyne Rally of the Angel of the North ARC is taking place at the Whitehall Road Methodist Church Hall, Bensham Road, Gateshead NE8 4LH. Open from 10.30am. Entrance is £2. This includes an entry for the raffle. Bacon butty and cup of tea or coffee available for only £2.50. There will be a bring & buy junk table and RSGB bookstall as well as many traders. Car parking is available. Enrolment for *Foundation*, *Intermediate* and *Advanced* Examination courses and Morse code class: OS X 425375 OS Y 562088 Lat (WGS84) N54:57:10 (54.952798) Long (WGS84) W1:36:19 (-1.605327). Club callsign: MX0GGP.
Nancy Bone G7UUR 217 Bensham Road, Gateshead NE8 1US
07990 760 920
nancybone2001@yahoo.co.uk
http://anarc.net/our-rally

September 15th and 16th (Saturday and Sunday)
BATC Convention (CAT18)
The British Amateur Television Club's 2018 Convention for Amateur Television is at the Midland Air Museum.
https://batc.org.uk/events
https://tinyurl.com/y7g5m9z6

September 16th (Sunday)
Weston super Mare Radio Society Rally
This radio and electronics rally will be held, from 10am until 3pm, at The Campus Community Centre, Highlands Lane, Weston super Mare BS24 7DX. Public entry is £3 and under 16s go free. Any help you can give us will be much appreciated. For stand hire enquiries and other matters please contact:
Mike M0VLN
01278 786 684
mjones129@btinternet.com
https://tinyurl.com/yaxnzrfm

September 21st (Friday)
Horndean & District Amateur Radio Club
Rob MØRZF will be giving a talk on *The History of Transistors*.
The club meets on the 1st and 3rd Friday at 7.30pm, at Deverell Hall, 84 London Road, Purbrook, Waterlooville, PO7 5JU. Visitors are welcome, and membership is available.
https://tinyurl.com/y9wdtpfo

September 22nd and 23rd (Saturday and Sunday)
Horndean & District Amateur Radio Club
The club will be at Medstead & Four Marks Railway Station on The Watercress Line, running special event radio station GB4MHR, for the *Railways-on-the-Air* weekend. The club meets on the 1st and 3rd Friday at 7.30pm, at Deverell Hall, 84 London Road, Purbrook, Waterlooville, PO7 5JU. Visitors are welcome, and membership is available.
https://tinyurl.com/y9wdtpfo

September 28th and 29th (Friday and Saturday) *
National Hamfest
The National Hamfest will take place at the Newark & Nottinghamshire Showground, Lincoln Road, Winthorpe, Newark, Nottinghamshire NG24 2NY. *RadioUser* and *Practical Wireless* will be in attendance. There will be free car parking, disabled facilities, trade stands, a bring & buy, a car-boot sale area, flea market, special interest groups, and an RSGB bookstall. There will also be representatives from the RSGB's services and committees. Morse code proficiency tests will be available. The venue has catering outlets and a seating area.
www.nationalhamfest.org.uk

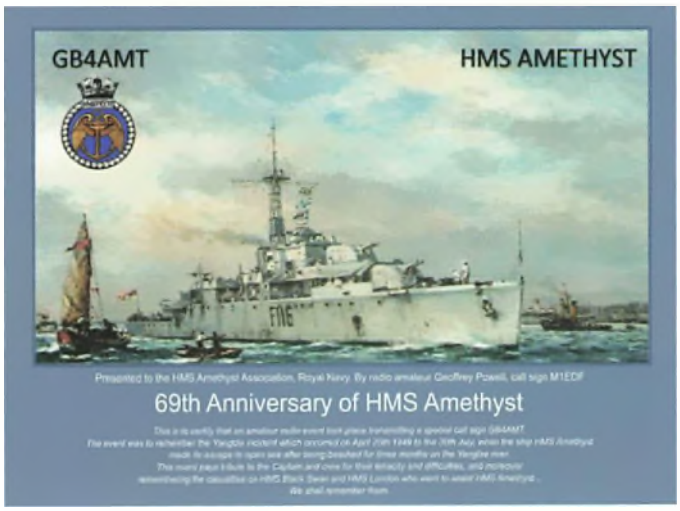
OCTOBER

October 7th (Sunday)
Hack Green Bunker Rally.
The rally will take place at the Hack Green Secret Nuclear Bunker, French Lane; Hack Green, Nr. Nantwich, Cheshire, CW5 8AL. There will be a sale of electronic equipment, amateur gear, components, military radio items and vehicle spares. Doors are open at 10am and there will be refreshments available.
01270 623 353
coldwar@hackgreen.co.uk
www.hackgreen.co.uk

October 7th (Sunday)
Welsh Radio Rally
The 45th WRR is at Rougemont School, Malpas Road, Newport, South Wales NP20 6QB. Doors are open from 10am and admittance is £2.50. There will be a bring & buy, lectures, an RSGB bookstall, trade stands, special interest groups and a raffle.
Michael Rackham, GW4JKV
01495 226 149
rackhamone@aol.com

Letters

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



HMS Amethyst

Dear Don,

I am writing to tell you I have finished the GB4AMT special event activity (see May *Newsdesk*). On my own I made 580 QSOs, not as many as hoped for. I attach a picture of the *Amethyst* as a reminder while the event is still in people's minds. I will send the original poster to the *HMS Amethyst* association. However, I was disappointed that I only had 12 G QSOs and one GM. I know it was a CW only event and, fortuitously, the first contact was GM0HCQ/MM in the South Atlantic, which was synonymous with CW being used on the Amethyst and I wonder how many would have been interested. I had some operators waiting to be answered who gave up because a lot of stations were telling me of setup, their weather and suchlike and wasting time. The most QSOs I had were with Slovakia, Ukraine and, to top it, DL-land with 183 contacts. I also worked two VK stations and three US ones.

I have made some enquiries about running a special event operation for the *Graf Spee*, scuttled at Montevideo in December 1939. After all, the Captain, **Capt Langsdorf**, never sank a merchant ship without taking the crew off first and was a humanitarian. I am in touch with a fellow in Germany to see if it would be too sensitive. I would welcome advice on whether this might be the case.

Geoffrey Powell M1EDF
Tamworth, Staffs

Network Radio

Dear Don,

Thank you for having the grace to publish my controversial article in the July *PW*. I am not entirely sure how appropriate (or otherwise) it is for a *PW* contributor to make a comment but, writing as a reader, I felt I had to note your friend's lighthearted comment (*Keylines*, July) about you editing *Practical Internet*! I do get the joke but I wonder if it is slightly misplaced?

If your friend reads the article, then surely the 'correct' jibe would have been to suggest you actually edit *Practical Ionosphere*. One of my main points was that, for Network Radio, the internet is just a medium of propagation for signals.

Network Radios (last time I looked) don't have any wires connected to them so by the strictest definition surely must be wireless devices. So, to my way of thinking, they fit very nicely into a magazine entitled *Practical Wireless*.

And on that note, I wonder how many people have picked the magazine up on the shelves of WH Smith or similar and wondered if it would give them advice about how to set up a wireless network? How definitions of words have changed!

Chris Rolinson G7DDN
Solihull

Dear Don,

Yes, network radio is growing and growing. Well, no surprise. It's new! The new kid on the block. Everybody wants one or so it seems. However, I'm not sure whether I want to join the party, just yet. It's tempting, I know, but there comes a time when technology can crowd out common sense, right?

Of course, Don is correct, when he points out (*Keylines*, July) that the likes of D-STAR, FT8 and Network Radio can have unintended consequences, such as taking traffic from our bands. I recall that happened when FM first came on the scene and lots of dedicated HF'ers migrated to 2m almost overnight. It didn't last and once the novelty wore off, many of those same HF'ers returned to their huge antennas on towers or wire dipoles and carried on regardless, continuing to inform all and sundry what the weather was like in their neck of the woods. Of course, those people on D-STAR or Echolink can do exactly the same thing nowadays and without a tower or a huge Yagi beam.

And yes, we do have a habit of reinventing ourselves. The problem is, in so doing, the mantra of 'the end of amateur radio as we know it' pops up with an amazing regularity. The good news is this: if we carry on reinventing ourselves – reinventing our future – and embrace it communications-wise, our hobby will continue to exist and more importantly, it will become more accessible and attractive for many more people. The bad news, however, is this: if we don't grow with technology and bend it to transform our hobby, as sure as eggs are eggs, amateur radio will eventually become a footnote in history. Forgotten. We don't want that, do we?

So, let's give Network Radio a go. See how it pans out as we did with SSB, FM, RTTY and as we are doing with all that other digital stuff. You never know, we may love it, including me. I hated avocados once upon a time. Now, I can't get enough of them! Ditto, oysters.

Ray Howes
G4OWY/G6AUW
Weymouth, Dorset

Dear Don,

What an excellent two articles on Network Radio by **Chris Rolinson G7DDN** and **Tim Kirby G4VXE** in the July edition of *PW* written in such an easy read form. I am sure I am not the only older amateur who finds modern technology difficult to get to grips with and find articles like these so helpful. While not intending to reopen the debate about 'real' radio, I can see Network Radio appealing to younger people who like to use their mobile phones so much and it could be a way into our hobby.

Can we have more articles like these please, for instance, on Internet Protocol (IP) based networks such as D-STAR.

John Sones M0AAO
Ipswich

Please note: The opinions expressed in any letter published in PW are those of the named correspondent whose letter has been published and they don't necessarily reflect the opinions of the editorial staff or Warners Group. **Editor**

Letters

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West Street, Bourne, Lincs PE10 9PH
E-mail: practicalwireless@warnersgroup.co.uk

Dear Don,
A natter on Topband (160m) is amateur radio. In comparison, Network Radio is a commercial communications facility (with optional onward link to amateur radio). Why is this not opinion but objective fact? Two reasons. First, amateur radio is free-to-air. There is no charge for transmitting. The initial access segment of Network Radio is over the internet and such connections attract a cost, often sold/billed according to quantity of data sent. Second, we radio amateurs (Full licensees) have the unique privilege of being permitted to put transmitters of our own design and/or construction on the air with no requirement to meet type approval or any similar regulatory stipulation. Homebrewing or modifying Network Radio equipment (such as Wi-Fi or Bluetooth) is forbidden. As we embrace new technology, let us never lose sight of the fundamental Amateur Service with the two privileges that I've described. Always be clear as to what part of a communications link lies outside the Amateur definition and hence enhances the Amateur Service while remaining constrained by the requirements of commercial systems. If we give the impression that the pre-existing Amateur Service can be replaced by such as Network Radio, then we create an argument for loss of our hard-won band allocations.
Godfrey Manning G4GLM
Edgware, Middlesex

Editor's comment: *I anticipated feedback as a result of our Network Radio coverage but hadn't expected that it would be mostly positive (the RSGB's* RadCom *has received quite a flurry of negative reaction regarding their coverage of the same topic). My thanks for these various* Letters. *I would make just one point in answer to* ***Chris G7DDN*** *– while we have Wireless in our title, PW focuses on amateur radio as generally understood, with other matters wireless being covered by our sister magazine* RadioUser. *It's editor,* ***Georg****, and I are currently discussing which of us should cover Network Radio in future if it continues to appeal to and interest our readership. I do sympathise with the points made by* ***Godfrey****. One of our 'selling points' nowadays is that amateur radio has a role in emergency communications because it doesn't rely on fixed infrastructure such as the internet (amateur radio played a major role after 9/11 because most emergency services' comms networks used repeaters on the top of the twin towers). See also my* In Focus *piece in this issue regarding the place of amateur radio in the Philippines. We must always be careful not to throw out the baby with the bathwater (if that's the correct metaphor!).*

Mike Coles 2E1GZZ uses IRN to operate from a cruise ship.

Maritime Mobile with UK Intermediate Licence

Dear Don,
Having a UK Intermediate Licence, I cannot normally operate outside the UK (the CEPT licence arrangements only apply to those with a Full licence) but even with a Full licence, the majority of cruise ships won't allow the use of RF. I have been on a number of cruise ships in recent years, mostly with RCCL. On my latest cruise, I wanted to do a spot of radio. Echolink doesn't want to work, probably because it requires certain UDP ports to be open, which the ship's internet won't allow. Come in IRN, the International Radio Network (URL below).
www.internationalradionetwork.co.uk

I downloaded the software and set it up on my laptop, (or I could have used a Smartphone) in our 'stateroom' (the cruise ship word for cabin). The ship's 24/7 internet speed for passengers hovers around 3.5 to 4Mb/s download and just under 1Mb/s up, somewhat slow. The cruise company advertise their internet as 'the fastest at sea'. What's slow like?! I mustn't complain, though, because at least we had a connection, albeit with occasional dropouts. It all worked fine and I had several QSOs, including Texas, the UK and Lanzarote. But, yes, there was indeed a wireless (RF) link – via the ship's WiFi. Then through the ship's satellite dish via the O3b satellite constellation, orbiting 4,970 miles above earth.

The question that could be asked is whether it is legal? Yes, absolutely, because there is no amateur bands RF. It's all done by VoIP (Voice over Internet Protocol), no different to other VoIP services on the net such as

Please note: The opinions expressed in any letter published in PW are those of the named correspondent whose letter has been published and they don't necessarily reflect the opinions of the editorial staff or Warners Group. **Editor**

£20 STAR LETTER

SDR

Dear Don,
Steve Ireland VK6VZ's *A Brief History of SDR* (August *PW*) was well written and fascinating. But perhaps the writing on the diagrams was a little small. A large magnifying glass did solve the problem. Although....there is an exquisite irony in using a **Sherlock Holmes** magnifying glass to read a technical article on cutting-edge radio. It's even a bit camp.

Grey and blue background to petite black writing does not help contrast. If the pointless component board photos had been shrunk so the diagrams could be made bigger, it would make for a more decipherable format. Form should follow function, particularly in a technical article. Still, it's your magazine. And the magnifying glass solves most problems.

Except, even with the magnifying glass, I cannot see any 3D in Fig. 1. And one of the three dimensions mentioned is missing. The Y axis is amplitude in dB. The x axis is time in 24hr format. Or is it frequency in kHz, GHz or THz? Either way, one or other is missing. And for 3D on a two-dimensional surface, I wonder if you need a z axis. No doubt my ignorance is to blame for failing to understand what three dimensions Fig 1 is supposed to show and how it does it.

Politicians' and advertisers' graphs are notorious. They often do not show axis units or axis scales. That's how they can prove they 'wash whiter than white'. Or anything else. Said to be the best statistical graph ever drawn, **Minard's** *Napoleon's March to Moscow* has many variables shown on a two-dimensional surface – army size, auxiliary movements, casualties, river crossings, direction, location, date, time, temperature and others. Note that these are described as variables, not dimensions. Perhaps semantics are the answer to Fig. 1.

Ignoring all the picky, petty prattling above, the article wonderfully explains the evolution of SDR over two decades. I have been re-reading the article whenever needing something to chew on, for example at dentists, bus stops and train stations. The evolutionary leap-frogging going on is surprising.

First you have a holy grail of ADC (analogue-to digital-conversion) at the antenna but the hardware cannot do it. Then you have hardware developed, which not only achieves the holy grail but drowns the next stage with too much data. So, 90% of the holy grail is thrown away so that you can 'drink from a firehose'. And then, glory of glories, the clever amateurs use analogue (analogue? really? with FPGAs? wow) techniques to deal with this digital verbosity. The *Final Thoughts* paragraph was inspirational. Experiment is at the heart of this diverse interest of ours. Wonderful. A great (hi) story, well told.

Good luck with the brickbats and bouquets – an editor's lot is never a happy one. And thanks for a most welcome magazine.
Giles de Bertodano G0AJC
Leiston, Suffolk

Editor's comment: *Good to hear from you* ***Giles****. Screenshots are a perennial challenge. Even blowing them up to larger size doesn't necessarily help because the software used to 'grab' them often has limited resolution. Our authors do the best they can and, for the most part, screenshots are illustrative, rather than intended to be studied in detail. We do our best (most of the time!). Anyway, I'm glad you enjoyed the article, overall.*

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

Skype. But IRN operates within all the Licence requirements so with my Intermediate Licence I'm 'Maritime Mobile!' Thank you IRN.
Mike Coles 2E1GZZ
Exeter

Editor's comment: *Thanks Mike. There is little I can add here to what I have said in these* Letters *pages about Network Radio. Your solution allows you to stay in touch with fellow radio amateurs, just as Echolink, IRN and similar can be helpful to others who, for whatever reason, cannot put up an antenna and/or use RF, whether from an office, a holiday home or, in some cases, a Care Home. Is it amateur radio? Well, your voice often comes out on an amateur frequency at the other end so you do, indeed, need an amateur licence to use the service.*

Simple Starter Gear

Dear Don,
I started out with a Codar AT5 and an ex-service receiver. Now, at the other end of my radio hobby, intent on downsizing but keeping one foot in the water and not now adept enough for homebrew, I would dearly love to see a simple, low-power transceiver covering topband (160m) and 80m. If it could run on batteries, so being [trans]portable, so much the better. Is it the case that everyone now wants all bands (DC to blue light) all modes (usually Japanese) black boxes?

Does no one want, does no manufacturer want to make, the simple rigs many of us started with. I am sure it would help beginners get on the air and provide we wrinklies with a way to keep going, especially as we may look forward to OAP residences without the shacks we may now have. Come back Rowley Shears G8KW and the like!
Alan Gordon, G3XOI
Shoreham-by-Sea

Editor's comment: *Many thanks,* ***Alan****, for your post on the* Radio Enthusiast *website. I sympathise 100%. I, too, started with a Codar AT5 transmitter (and a Lafayette KT-340 receiver). I am always on the lookout for good constructional articles but they are very difficult to source. However, I plan to keep trying! Your suggestion is certainly a good one. If any readers have such a design up their sleeves, I hope they will be in touch. That said, if you are prepared to pick up your soldering iron, there are some excellent kits available nowadays, some of them advertised in this magazine.*

Sziklai

Dear Don,
The June edition of *PW* carries an article by **Tony Jones G7ETW** on pp.44-45. entitled *Szlikai and Darlington.* The name of **George Szikłai** is misspelled. This is a Hungarian name. I know the correct spelling (Sziklai) being Hungarian, too.
Alpar Cseley HA8KT
Hungary

Editor's comment: *Thanks,* ***Alpar****. I do try to check such spellings, especially where names are concerned, but this obviously slipped through the net. For more information on Sziklai, there is a short entry on Wikipedia.*

Classified Adverts

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