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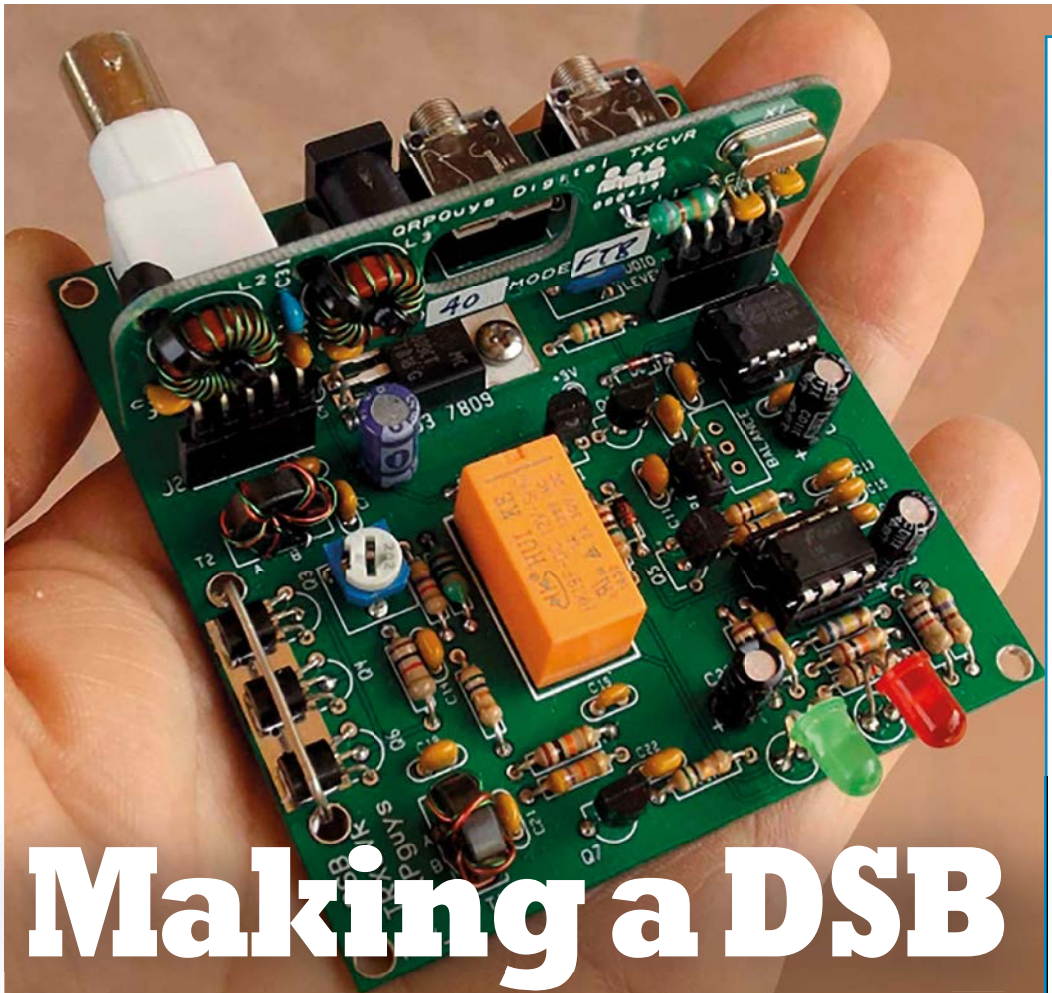
LOCKDOWN SOLUTIONS | How UK enthusiasts are fighting back

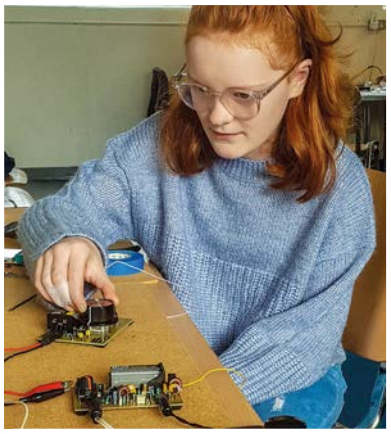


Making a DSB

Building your own digital transceiver kit for data modes

It's as easy as Pi

Full test of the MFJ-1234 RigPi Station Server



Start them young

Latest news on the crucial work of radio's RCF charity

All the latest new products from the UK's top dealers

Plus news from organisations and clubs in our packed news section

Update on PW's 144MHz Contest

Our 'fun' plans to get round the lockdown regulations in 2020

Exam prep!

Useful tips on how to pass

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Peter Waters G3OJV

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Elecraft K3 SPECIALS

Elecraft K3S with extras Ref: XXWS-0429

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£2899.95

Elecraft K3 100W Transceiver Ref: XXWS-0427

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Elecraft K3S/100-K Brand New Kit

Our last kit form K3S 100W transceiver. Once its gone - its gone!
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2 Year Portsmouth UK Warranty

Available as kit or ready built and tested
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The AMAZING QRP Auto ATU

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Ideal for IC-705!

£249.95 in stock!

The T1's 7-inductor, 7-capacitor L-network provides a wide matching range and its re-tune time from memory is just 1 to 2 seconds. Equally important, the T1 always tries to achieve a 1.0:1 SWR - it doesn't stop at 1.5:1 or 2.0:1 like some tuners. You won't even need to change modes to tune. You can use SSB voice or a keyer as well as a constant carrier (AM, FM, CW, etc.).

The New AX1 Antenna System

The AX1 antenna was designed by Wayne N6KR, co-founder of Elecraft. Whilst designed with the KX2 and KX3 in mind, it will equally appeal to all QRP operators. Handling up to 30W and covering 20, 17 and 15m, this telescopic whip fits easily into a pocket. Each antenna also includes a counterpoise wire. Additional accessories are also available as below.

£109.95

- Bands: 20 - 17 - 15m
- Power: 30W
- Radial: 13ft counterpoise
- Build: Corrosion resistant
- Collapsed: 15cm
- Extended: 1.15cm
- Weight: 90gm

AXT1 Tripod Adaptor **£29.95**

AXB1 Desk Support Stand **£32.95**

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The AXE1 is a 40m add on coil that sits above the base of the AX1 and below the whip. This brings the system up to 4 bands, whilst retaining the pocket size of the system. The coil is 15cm long and because of its high'Q' an ATU is needed. (KXAT2 or KXAT3).

£62.95

The KX2 offers a LOT MORE!
2 Year Portsmouth UK Warranty

2 Year Warranty
Mic & paddle key are optional extras

- 12 Watts Out 80m-10m
- Fits into a coat pocket
- Has built-in microphone
- Variable selectivity
- CW audio filter
- On screen data decode
- Very low current drain
- PSK31 and RTTY send
- Backlight can be turned off
- Internal ATU option
- 2 Channel SSB Recorder
- 3 Channel CW Data Recorder

Elecraft KX3 160 - 6m, 15W

There is something very special about the KX3. It out-performs any similar transceiver and almost all of the base stations. You can run it at 100mW or increase to any power up to 15W (a bit less above 20m). You can add 2m or 4m, Add a narrow roofing filter or auto ATU. No other rig can match it.

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Antenna Time!

Hy-Gain AR-500X Rotator

This rotator comes complete with infrared hand controller. Requires 3-core cable. Ideal for smaller VHF antennas

£184.95

Diamond VHF UHF Yagis
from Japan's Exclusive UK Distributor

A502HBR 6m 2 Elements
6.3dBi Gain.....**£81.95**
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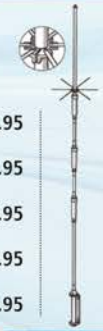
9dBi Gain Boom 0.95m.....**£49.95**
A144S10R 2m 10 E;ements
11.6dBi Gain Boom 2.13m.....**£79.95**
A430S10R 70cm 10 Elements
13.1dBi Gain Boom 1.19m.....**£49.95**
A430S15R 70cm 15 Elements
14.8dBi Gain Boom 2.24m.....**£64.95**



Hustler HF Verticals

These antennas are very rugged and great value. Ground mounting is fine. Radials recommended. Clamps for 1.5" mast.

4-BTV
40-20-15-10m 1kW SSB Handling
Height 6.52m.....**£189.95**
5-BTV
80-40-20-15-10m 1kW SSB Handling
Height 6.52m.....**£234.95**
6BTV
80-40-30-20-15-10m 1kW SSB Handling
Height 6.52m.....**£269.95**

ICOM TOP RADIOS

Each of these radios built from the ground up and featuring the very latest SDR technology. Now leading the design trends in Japanese Ham radio.

IC-7300

The IC-7300 has quickly become a piece of ham radio history. A marker by which the competition is judged. The fastest selling radio of 2017 and still going strong, replacing all those old radios that many hams gave clung to for years. It's a great performer and great value. 160m - 4m. 100W Max. **£1195.95**

IC-7610

The new IC-7610 transceiver is now a reality. Few can fail to be impressed with the advanced technical promises. And nobody should be disappointed once their new radio arrives. We have good orders in for this radio and so will be happy to bring your dreams to reality. And if you need any additional items to go with your new radio then we are sure that we can delight you. 160m - 6m. 100W **£2999.95**

IC-9700

The IC-9700 brings together the three popular VHF bands and puts them into one very high tech. box. The large screen, packed with information, will be a welcome addition and copies their HF range in presentation and flexibility. Top of the feature list is SDR employed on both 2m and 70cms, with all the benefits that go with this. And there is no extra charge for the 23cms down converter which will be the icing on the cake for many. The recent trade demonstration showed us just what a great radio this is. Call us today for a quote. **£1795.95**

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D-51E Plus
22m & 70cm

- 5W Dual Band
- FM and D-Star
- Free Downloads
- GPS Receiver
- Access Mode
- Terminal Mode
- AM & FM Receive

The Icom ID-51E Plus 2 is Icom's latest and mpst advanced handy transceiver. It has a host of features that will keep you in touch locally and world wide! **£379.95**

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Here we have the feature packed mobile that delivers 50W of dual band power. Offering both FM and D-Star with programmable features that enable worldwide communication. **£574.95**

IC-2730E

This radio is a rugged workhorse. 50W of FM on 2m and 70cm. Keypad mic. and remote head. It has AM and FM receive for out of band reception such as airband and marine. **£299.95**

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FT-3DE Digital Handheld

The Yaesu 3D is one of our top sellers. The touch screen makes it so much easier to get up and program. Its a smart phone performance for ham radio!
High resolution screen with bandscope display. Digital and analogue operation on 2m & 70cms. Features wide band receive and has GPS reception. A great travel radio. **£399.95**

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The FT-DX3000 owes a lot of its features from the FT-DX500, a class leader DXers and Contesters love it - so will you!.....**Call Sales for a deal! £1399.95**

FT-DX5000 HF - 6m 200W + ATU

This radio needs little introduction. It's the current Flag Ship of the Yaesu HF range. 200W is 3dB gain on all bands.....**£2999.95**

FT-991A HF - 70cms 100W max

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.....**£1239.95**

Yaesu FT-dx101D

Now top of the Sherwood list for SDR HF Technology. When you buy from us you also get a 3-Year Yaesu UK warranty. The new Yaesu FT-DX101D embraces SDR in an interesting way. You have full SDR technology but they have added a selectable superhet front end to provide optimum dynamic range and front end selectivity. The full colour touch screen offers variable bandwidth up to 1MHz, with clever screen presentation options and a rear panel HDMI output for an external display.

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Peter Waters G3OJV, operates the first FT-dx101 to come into the UK.

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FTdx-101D	£90 CASHBACK
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FT-991A	£70 CASHBACK
FT-818ND	£105 CASHBACK
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AOR AR-8600 MkII

- 100kHz - 3GHz
- SSB, CW, AM, FM, WFM
- Airband 8.33kHz
- 2000 Memories, 40 Banks
- Card Slots
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AOR Receivers Japan

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Multimode digital demodulation receiver featuring wideband reception, D-STAR, Yaesu Fusion, DMR and much more.

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9kHz - 3.7GHz Multi-Mode, Digital Video Out, I/Q Out professional communications receiver that offers a level of versatility and capability, beyond that of any similar receiver. See our website for full spec!

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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.

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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.

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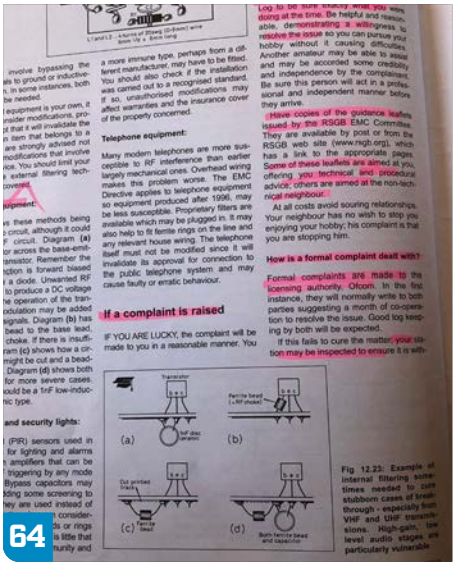


Life continues under Coronavirus restrictions and it seems that there really has been an upsurge of interest in the hobby, with existing amateurs dusting off elderly transceivers or buying new ones, and new entrants coming in to the hobby. Somewhat unrelated, insofar as she was going to do it anyway, but my nine-year old granddaughter has been studying for her Foundation exam during this period of lockdown. I had originally intended to sit down with her and work through the course but that hasn't been possible, in physical terms. However, she signed up for the Essex Ham online learning and I have been able to follow it with her by using Zoom – a remarkable 'app', which allows us to see each other and for her to share her desktop with me. The exam (again, to be taken online during lock-down) is still some way off because demand for taking them is so high at the moment! Still, at least that gives her plenty of time for revision.Incidentally, if any of you are, like her, studying for one of the amateur radio exams, take a look at this month's article on exam preparation.And, for things to do during the Pandemic, check out **Colin Redwood G6MXL's** *What Next* column.

Rallies

Not surprisingly, most rallies are being cancelled at the moment. The latest we have been notified of are the York Radio Rally (August 9th) and the Wiltshire Radio Rally & Boot Sale (July 26th). So, we have simply omitted the *Rallies* page this month because it had very much become a work of fiction. Such a pity but there are more important issues at stake.

Signing /NHS

Apropos of which, it's interesting that Ofcom are allowing UK amateurs to append /NHS to their callsigns. This is unprecedented. Unlike some countries, which seem to allow pretty much anything, the UK regulator has never authorised the use of suffixes other than the usual /P, /A, /M and /MM. While amateurs elsewhere happily add /QRP (low power), /LH (lighthouse) and the like, anything of the sort has been frowned on here in the UK. That said, the use of

/NHS has apparently resulted in great confusion among a number of overseas stations, for whom the letters are totally meaningless. You can't win!

The PW 144MHz Contest

We have had a number of enquiries as to how we will be playing this year's *PW* 144MHz Contest. We didn't want to cancel but the normal running, encouraging portable operations, just wasn't feasible. However, the contest will go ahead as a Fixed Station fun event – check out the rules in this month's issue.

This Month's Issue

Also, this month, I am pleased to have an article on base-loaded vertical antennas from **Steve PJ4DX**. This ties in nicely with my introductory article last month.

We have a couple of very different product reviews that I trust you will find interesting.

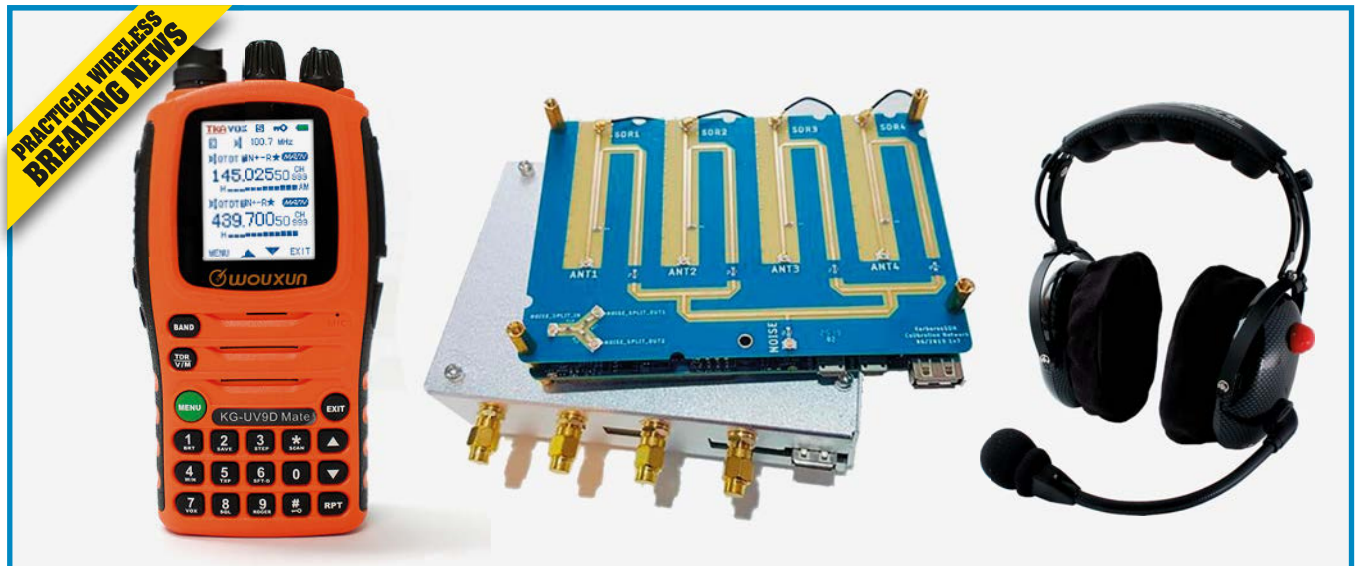
And **Daimon Tilley G4USI** takes his first steps with satellites – maybe something new to try while we have time on our hands.

There are all your usual columns, of course, and I seem to have received a lot of *Letters* recently, some of which have had to be held over until next month. However, your feedback is always appreciated and I will run as many *Letters* as I can each month.

Don Field
Editor, *Practical Wireless Magazine*

Newsdesk

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



From Martin Lynch & Sons

Martin Lynch & Sons have told us of several new products:The Wouxun 8W Dual-Band Handie KG-UV9D Mate has selectable 8W, 5W and 1W, includes a bright colour screen, Dual RX, Duplex work on A&B areas and voice announcement. In stock now priced at £139.95 For further information see:
HamRadio.co.uk/KGUV9DMate

The KerberosSDR 4-Channel Coherent RTL-SDR is an ultra-compact RTL-SDR with four channels and has been designed for direction finding, passive radar, beam forming or just four RTL-SDRs. This low-cost device has already caused great interest from the commercial and military world and Kerberos has developed custom software that shows off direction finding and passive radar capabilities. The package includes 4 x RTL-SDRs and a USB Hub so only one USB connection is required. It is enclosed in a metal case.

ML&S's Gary Spiers M0TIG released a video introduction on ML&S TV (www.MLandS.TV) demonstrating its use and features.

Available from ML&S, at an Introduction price of £169.95.

For further information see:
HamRadio.co.uk/Kerberos

The RadioSport RS60CF Deluxe Dream Anniversary Edition Headset is a new luxury headset from RadioSport in the USA. It supports Dual-Watch/Dual Receive rigs, 24dB external noise suppression with flexible mic. boom and interchangeable microphones. Enclosed in a carbon fibre look shell, these headsets are built to last.

In stock at £239.95 with a 10% discount offer on your required interface cable. For further information see:
HamRadio.co.uk/RS60CFAnniversary

Last but by no means least, Martin wants to thank his customers for the tremendous support they are showing throughout this dreadful Covid-19 situation. At the time of writing, the majority of his staff are working at home, taking calls, and keeping the business going. They have just three personnel in the warehouse and despatch area picking and shipping your products throughout the week.

Radio News

SPAIN GRANTS SPECIAL AUTHORISATION:

Spain's national amateur radio society URE has talked to their regulator and obtained permission for unlicensed people to use amateur stations during the Coronavirus lockdown

Their statements says, "After the publication of Royal Decree 463/2020, of March 14th 2020, declaring the state of alarm for the management of the situation of health crisis caused by the coronavirus (COVID-19), for this purpose, and in order to accompany radio amateurs in the exceptional situation caused by the spread of COVID-19, the URE, in its commitment to collaborate and help to cope with the complicated situation we are currently experiencing in our country, presented to the Secretary of State for Telecommunications and Digital Infrastructures a request for a special authorization.

"Today, the Secretary of State for Telecommunications and Digital Infrastructures has issued a resolution granting temporary authorization for the use, under certain conditions, of radio amateur stations by people who do not have the required administrative authorization under the supervision of authorized radio amateurs, while the validity of the state of alarm and its corresponding mandatory measures of confinement. "That the use of the aforementioned radio amateur stations will be carried out under the responsibility and direct and face-to-face supervision of the radio amateur and under the conditions established in the Regulations for the use of the radioelectric public domain by radio amateurs".

https://tinyurl.com/SpainURE

Radio News

TOPBAND IN JAPAN: Japan is making some changes to their 160 and 80m operations, expanding the band plan. Currently, Japanese amateurs can use 1810-1825kHz for CW and 1907.5-1912.5kHz for CW and data. The new system will allow any mode on 1800-1810kHz and 1825-1875kHz. It could be data and phone as well, no need to split on FT8 anymore.

CANCELLATIONS: The annual HAM RADIO show in Friedrichshafen, Germany, has decided to cancel its 2020 show due to the COVID-19 pandemic. According to the announcement, HAM RADIO acted in accordance with an April 15th decision by federal and state authorities that no major events are to take place until August 31st. HAM RADIO 2020 was set for June 26 to 28th. The event is Europe's major amateur radio show, attracting some 15,000 visitors from around the world each summer. This year's show would have been the 45th HAM RADIO. On the HAM RADIO website, exhibitors, including DARC, will instead offer a virtual show. The Cockenzie and Port Seton Amateur Radio Club have put their August fund-raising annual mini-rally into a 'pending lockdown' state.

ESSEX HAM NEWS: Just ahead of the official UK lockdown, Essex Ham held a very unusual Field Day, and possibly the last one for a while. The group had prearranged to use the callsign GB4CCD (Common Courtesy Day) from their preferred location of Galleywood Common near Chelmsford. To be responsible, the event wasn't promoted in advance, and had just two members present, both strictly observing the 2m social distancing rules running separate stations across the field. Essex Ham is a virtual club, and the idea of holding a Field Day with virtually no one there was a little different. Regardless, some good contacts were made and the event also served to support the county-wide Essex 2m Activity Day. To see a video of the event, go to:
sxham.uk/gb4ccd

Keeping the Club spirit going....

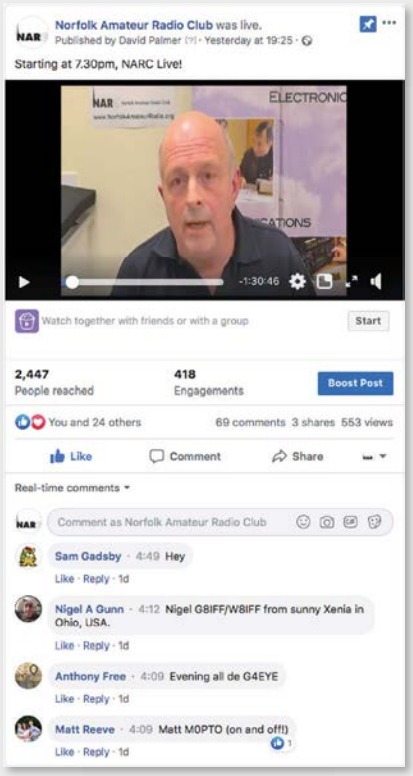
During these difficult days of complete social isolation because of the Coronavirus, at Norfolk Amateur Radio Club they feel it is more important than ever to keep the spirit of the club going embracing technology to stay in touch, especially as many club members are older, at higher risk and maybe on their own.

NARC has already been embracing modern streaming technologies such as Skype to bring speakers from all over the world into their physical club meetings and with a bit of thought and equipment they are planning to bring an online meeting to members every week, plus round up and encourage new on-air nets and training such as CW.

The first NARC Live! event was streamed out to the club's Facebook page as a live video (re-streaming part to YouTube by Sonny M0SYW), and after some club notices with details of local nets and radio activities by club chairman David G7URP they introduced Jon G4ABQ and Andy Carpenter of SDRplay who gave an excellent presentation of their SDR products and software. At the end of the talk there was an interactive question and answer session with David reading posts to Jon and Andy, which viewers entered on Facebook and Youtube pages. The chairman's wife Tammy M0TC became director and vision mixer for the event so that they could sit together without any additional virus risk. From feedback received it was engaging, fun and most importantly brought the club together and will continue to do so over these difficult times.

For those interested in the technical aspects of the event, Jon and Andy were in Bedfordshire and Kent and were in a Skype group meeting with the club chairman on one computer, the output of which was fed to a video and sound mixer that could also select pictures from two camcorders in the makeshift studio and mix in caption slides and notices from another computer. A third computer streamed the output of the final mix to Facebook video where questions and comments could also be posted and read to the speakers.

Although the picture shows a lot of equipment, mainly because they are fortunate to have access to because one of their members is keen on Amateur Television, it can be done in a much more modest way, the simplest being just a single computer running a Skype or Zoom group meeting with club members sharing.



Radio News

NEW 5 MHZ NEWSLETTER: The latest edition of The 5 MHz Newsletter (No 24 – Winter/Spring 2020) is now available as a free pdf. This edition includes 5MHz news from seven countries, GB3WES Beacon Closedown, a 5MHz Controlled Feeder Radiation Dipole, plus the latest World of 5MHz Map and an article on two Blue Ham Exercises Download from the 'External Links' section of the Wikipedia 60m Band page: https://tinyurl.com/yan4xv52

THE GLOBAL AMATEUR RADIO NETWORK: SRAL, the Finnish Amateur Radio League, invites us all to join the 'global amateur radio network as you stay home'. The event runs through July 8th at 2359UTC.

The organisers note that in the worldwide amateur radio community, social distancing is not an issue. We have 'signals flying high and wide, across all borders near and far'. Amateur radio operators are known as communicators during the happy days but also during times of crisis, with the physical worldwide open to us. SRAL encourages us to keep these channels open and skills sharp for global messaging if needed, and at the same time grow (virtually) closer in 'social distance of our minds and hearts'. ('Social closeness' or 'social unity' perhaps.)

The Finnish Amateur Radio League, supported by the Finnish Communication Agency, SRAL and TRAFICOM, are working together on this, to pull together the three million member global amateur radio community to stay in touch and keep up this global network.

CW, SSB and FT8/4 are all encouraged with core activity suggested between 14250-14270 and 14050-14060, 3740-3760 and 3530-3540kHz.

The SRAL stations will try to be active between 12-16UTC and beyond. The new Q signal, QSH for 'stay happy and healthy' is encouraged. Others are using it for 'stay home'. N3ADF is also suggesting QWH for 'wash hands'.

'Messenger stations' for the above event will be on, OH0 through OH9 with STAYHOME suffixes, such as OH5STAYHOME. 'STAYHOME' or 'STAYHOM' stations around the world qualify as special participants too, ones like 9KSTAYHOME, VE*STAYHOM and E25STAYHOME expected to be on.

There will be an award for contacting 100 or more countries, including at least five of the 'messenger' (stay home) stations. This is called the GMA, Global Messenger Award. The SHA, Stayhome Award, is for contacting at least five OH*STAYHOME stations and as many other countries' STAYHOME suffix stations too. The highest total and everyone within three of that mark will get this SHA award.

OH2BAD is handling QSLs and OH2BH is handling the awards. Others on the team supporting this activity are OH1NX, OH2KI, OH2KM and OH4UI. They say, "OHs are a serious bunch".

SPECIAL ARRANGEMENTS FOR FOUNDATION EXAMS: Since March 20th 2020, the RSGB has stopped accepting new exam bookings as part of its response to the government's guidance concerning coronavirus. The Society has been exploring ways in which it can use the online exams platform to enable new people to access amateur radio and obtain their licence. Following rigorous tests, the RSGB is now able to offer remote invigilation for online Foundation examinations. Further information, including an update on practical assessments, is at: https://tinyurl.com/y9q5grbv

The RSGB has also published an FAQ about the new process for candidates and tutors at: https://tinyurl.com/y9sfz5xz

MFJ-1234 RigPi

Don G3XTT takes a look at an intriguing accessory from MFJ.

Don Field G3XTT
practicalwireless@warnersgroup.co.uk

I ran across the MFJ-1234 some time ago (I believe it was launched at Dayton in 2019) and was very keen to get my hands on one, so I was delighted when Moonraker offered me one for review. What is it? Actually, that isn't a very easy one to answer because it's such a versatile unit. But, basically, it's a shack controller for your rig but with other inbuilt facilities such as a logbook, callsign database and more. It's built around a Raspberry Pi (which you'll probably have guessed from the name!) and consists of a Pi 3B+ board plus an audio board and a K1EL keyer board.

The online User Manual describes the RigPi as follows: *RigPi Station Server (RSS) is a computer system designed to control your station and facilitate on-air activities. RSS introduces a radically new way of station control by using a server model for allowing multiple users and radios to be accommodated simultaneously through standard internet browsers.*

Probably the best way to understand what the RigPi can do is to look at its use in three scenarios. First, in true 'local' mode where you sit at the Pi and control your radio. Second, in remote within the range of your home network. And, third, controlled from elsewhere (and I mean, literally elsewhere provided you have an internet connection).

What it Consists Of

Before doing that, though, let's have a look at the box itself. It is, quite literally, a black box. There are lots of interfaces, scattered around three sides of the box, **Figs. 1**, **2** and **3**. From the Pi board itself you have the power connection (micro-USB), HDMI for an external monitor, Ethernet and four USB connectors. Above that is the K1EL keyer board, with keyer speed control, PTT, paddle input and keyed output. And on top is the audio board, with IQ and receiver in, transmitter out and a more generic audio connector. Incidentally, as well as the Ethernet port, there is on-board Wi-Fi. The photo, **Fig. 4**, shows the internal arrangement.

The Raspberry Pi board has a mini-SD card pre-loaded with the Pi operating system, WSJT, JS8call and Fldigi software, a Mumble server (to handle remote audio), FCC callsign database and a logbook program. Also included are TQSL (for uploading your log to the ARRL's Logbook of the World) as well as various office software, including an e-mail client, and some games. There is also a facility for downloading spots from the DX Cluster.

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It has to be said that the instructions that come with the RigPi are somewhat cursory, understandably perhaps, given that it can be used in so many ways. You really do have to engage with the internet but the good news is that there is a lot of information available, albeit the obvious starting point is the RigPi support forum and the main RigPi website:

Groups.io/g/RigPi
rigpi.net

Getting Started

Probably the most useful starter document is the RigPi *User Manual*, written by **Howard Nurse W6HN**, the RigPi's designer, downloadable from the RigPi website. It runs to 133 pages but it pays to study the material before diving in. As well as this document there really is a lot of other information available on the main RigPi site. It's also worth joining the support forum, especially as one of the most active members is Howard Nurse himself. However, do read the documents first – I'm afraid, in my haste to get started, I was guilty at first of asking questions on the forum that I could easily have answered from the *User Manual*.

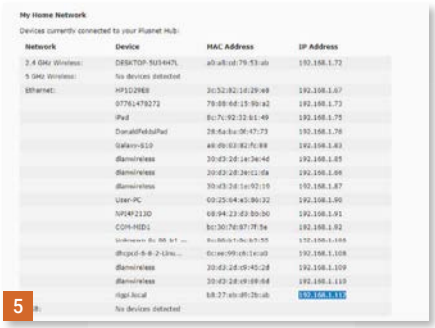
But above and beyond the main site, there is lots of additional material available, including YouTube videos. I found their quality somewhat mixed – some have been produced by 'geeks' who obviously enjoy playing with the RigPi but don't seem to get around to actually operating their radios! Others are more informative.

Anyway, let's move on to what you can start to do with a RigPi. I need, though, to mention the power supply. The RigPi requires 5V at 2.5A through a micro-USB connector. No power supply is included with the RigPi so you will need to find something suitable. Many wall-wart PSUs for USB are not up to the job, as I quickly discovered, when the RigPi failed to come fully to life with the first one I tried. Fortunately, I was able to find one that did the job.

Local

In local mode, you can simply connect a keyboard, mouse and monitor to the RigPi. You can now use it as a PC in its own right (running the Pi operating system, Raspbian, a version of Linux), so you can browse the net, for example. You can run your radio, using the RigPi's in-built keyer for CW, the audio interfaces for phone operation and the supplied WSJT software for data

Fig. 1: Front view, showing power connector, HDMI port and keyer speed control. Fig. 2: Right-hand side, with audio, Ethernet and USB connectors. Fig. 3: Left-hand side with I/Q, Rx in, Tx out, PTT, paddle and keyer sockets, along with status LEDs. Fig. 4: Internal view. Fig. 5: List of devices connected to my router, with the RigPi IP address highlighted. Fig. 6: Controlling the radio from the PC.



modes. And, of course, there is nothing to stop you adding other software such as for SSTV, RTTY or whatever. And you even have a logbook, along with TQSL to upload your log to Logbook of the World.

What this means is that, with RigPi, you don't need a shack PC. That said, for my operating I tend to use Windows programs for regular station logging, contest logging and so on, so I have no particular wish to use a RigPi in local mode. But your mileage may vary, as they say.

Networked

However, I very much want to be able to operate my rig from elsewhere from time to time, whether from around the house or from a more remote location. And this, at least for me, is where the RigPi comes into its own. Indeed, I started this way, because initially I didn't have a spare HDMI monitor to use the RigPi in local mode. Using just a web browser, it's easy to get the RigPi to connect to your radio. You just need to point your browser at the RigPi to get started. The only snag is that, to do so, you will need to find the IP address assigned to the RigPi by your router. This threw me at first because I couldn't remember how to connect to my router (something that we don't often have to do) but, once I'd rediscovered how to do that, I was able to see the RigPi listed as one of the connected devices, **Fig. 5**.

You can actually use the features of the Raspberry Pi in the RigPi by using VNC Viewer from another PC on your network. However, this isn't necessary simply to connect your radio. The setup is straightforward, especially in my case, using an IC-7300, which has a USB connection to the RigPi that supports both rig control and audio. That said, my IC-7300 failed to connect at first but I was able to find the necessary settings for the IC-7300 on the following website:

www.remotetx.net/icom-7300-quick-start

Having set my radio up as described, it connected without difficulty, although I am still no wiser as to which of the settings was causing the problem in the first place. I was now able to tune my IC-7300 from the web browser, **Fig. 6**, and similarly, I was able to do the same from the browser on my Android phone, **Fig. 7**.

If, by the way, you have a radio without a USB connection, you can probably use a USB-to-RS232 connector to pick up the necessary data. And audio connections will be via the audio interfaces on the RigPi rather than over the USB interface.

The next step was to connect audio. The RigPi uses the Murmur server, which normally requires a Mumble client. However, my mobile phone is Android and there is no Mumble for Android so I needed to use Plumble instead, **Fig. 8**.

For CW work, you can send pre-programmed messages or you can type in at the keyboard. The CW screen is shown at **Fig. 9**. Speed is adjustable in 5WPM increments. For me, the system isn't ideal because I can't plug in my paddle remotely but, then, I wouldn't be able to do that with most other remote solutions.

For phone operation, the RigPi is pretty straightforward, provided you take care setting up audio levels and the like.

But, to my mind, the RigPi really comes into its own for data modes operation,

Fig. 7: The control panel on an Android phone.
Fig. 8: Plumble running on my mobile phone.
Fig. 9: The CW screen.

where QSO format is standardised and human intervention is minimal. Work FT8 from your living room, your hotel room or wherever with ease. You'll need, though, to use a virtual network connection (VNC) to run the WSJT software installed on the RigPi.

From Outside

There is really no difference between using the RiPi on your home network and using it from outside. However, in order to do so it is necessary to invoke port forwarding on your router. Having previously rediscovered how to connect to my router, this proved to be a fairly straightforward process.

Beware, though, that strictly speaking you need to be able to close down your station if a problem occurs and this may prove more difficult if you are away from home and, for example, you have an internet drop-out.

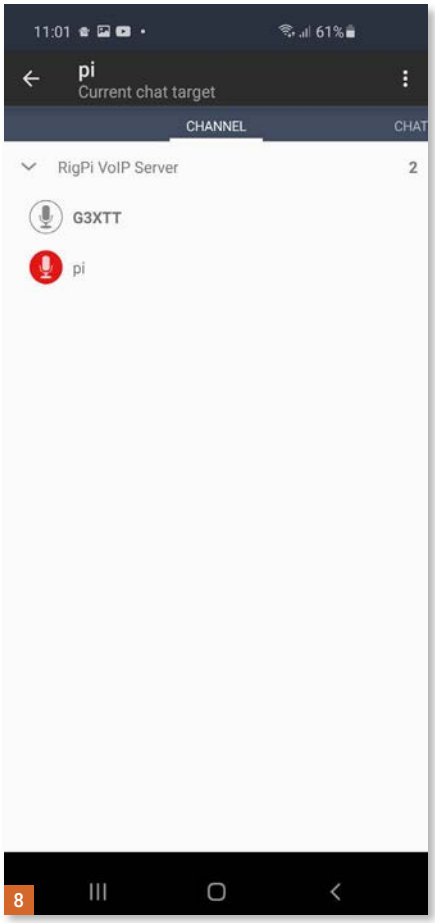
Other

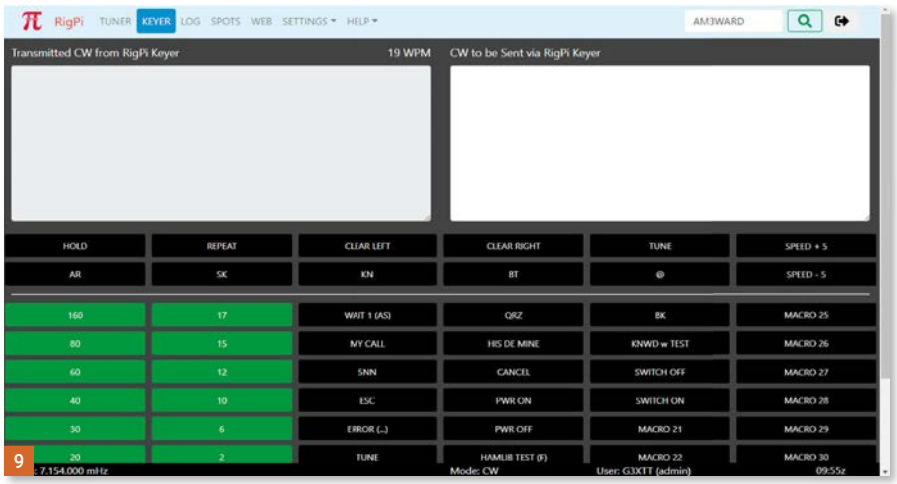
In terms of what you can use to remotely control your RigPi, you can basically use anything that supports a web browser – PC, Mac, iPhone, Android phone, iPad and so on. There is also an app, CommCat, written by Howard Nurse and bringing together many of the features that you can use through the RigPi. CommCat is available for the PC, iPhone, iPod touch and iPad.

Summary

You'll have begun to appreciate from the foregoing that the RigPi is a versatile box and, indeed, it has lots of development potential – these are early days. New software is appearing all the time. But already the RigPi is a useful solution to remote control, particularly for phone and data modes. It can work with pretty much any radio and, in addition, can act as a shack computer, taking some of the load off your main PC.

But, equally, the RigPi is absolutely not 'plug and play', For anything other than the most basic uses you will need at least some understanding of networking. If you are prepared to read around the various forums, experiment and be prepared to meet with frustration from time to time, you'll get a lot of satisfaction from using the RigPi. If, though, you are someone who wants to connect up your rig and start making QSOs, the RigPi probably isn't for you. That said, basic operation of the RigPi is relatively straightforward if you are using a modern rig such as the IC-7300.





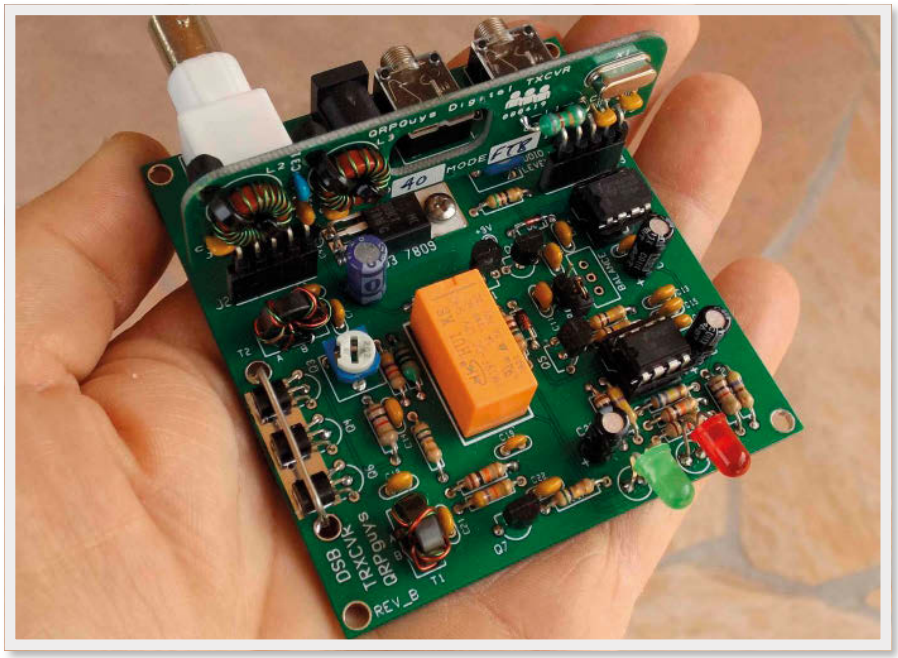
I haven't been able to cover all aspects here and, indeed, in the time I was using the Pi I can't say I was able to try out the many possible configurations and uses. However, I hope I've been able to give you a general idea of what the RigPi is and does. Just as a brief flavour of what I didn't include, RigPi can control multiple radios and can handle several user accounts. It also has rotator control facilities, if you have a modern rotator with the ability to handle computer control (the radio and rotator control facilities use the Hamblib library of functions). And I have not covered the I/Q port, which allows an input from an SDR radio to be able to look at up to 96kHz of spectrum. Also, as I said earlier, given that the software is open source, expect to see new applications coming along in due course.

The RigPi is available from Moonraker and other *PW* advertisers for around £350. My thanks to **Chris Taylor** of Moonraker for the loan. Moonraker are kindly offering free UK shipping if you quote '*PW* review'.

The QRPGuys DSB Digital Transceiver Kit

Martin Peters G4EFE
practicalwireless@warnersgroup.co.uk

Martin Peters G4EFE builds a QRP transceiver for the data modes.



According to Wikipedia, a supergroup is a musical performing group whose members have successful solo careers, or are well-known members of other groups. For example, *The Traveling Wilburys* were an English-American supergroup, consisting of **Bob Dylan**, **George Harrison**, **Jeff Lynne**, **Roy Orbison** and **Tom Petty**.

Similarly (although none of them is an international rock star...yet), *QRPGuys* is a group comprising a number of heavyweight and instantly recognisable names, in the field of amateur radio design, including **Ken LoCasale WA4MNT**, **Doug Hendricks KI6DS**, **John Stevens K5JS**, **Steve Weber KD1JV**, **Dan Tayloe N7VE**, Wim **Slawa SP5DDJ** and **Cliff Donley K8TND**.

If you read **Tony Smith's** take on the Morse Tutor from *QRPGuys* (see *PW*, March 2020) you'll know that they're dedicated to offering 'low-cost, high-enjoyment kits that can be assembled in an evening or two'.

They aim to provide kit designs that are 'unique in some way, possibly combining features not normally seen'. And their door is always open, should you hit upon an idea or design that meets their criteria.

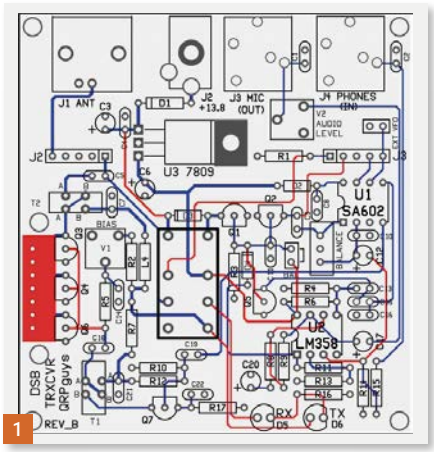
The **QRPGuys.com** website showcases their offering, which includes transmitters, receivers and transceivers, antennas, tuners, paddles and keyers, CW trainers, test equipment and more. Quite a range.

Payment is through PayPal but if you don't have an account, you can pay by card. They dispatch items once a week via First Class USPS; international shipping costs US$18 + US$2 for each additional item. PayPal sends a receipt but you won't actually hear from the 'guys' themselves

Data Modes

Like many folks these days, I don't actually get a lot of time to devote to the hobby. Unfortunately, I'm also being suffocated by ever-increasing levels of local interference. Over the years, these constraints have nudged my operating habits towards the data modes, which are not only robust enough to give the QRM a run for its money, but can pretty much look after themselves, with the minimum of intervention from moi. WSPR is the 'go to' mode, in both these respects. But for those wanting to work other stations (as opposed to merely running a beacon), FT8 is hard to beat. These modes are a godsend for anyone in a similar position, and I'm grateful to all of those who have given their time to write the software and maintain the reporting sites – essentially, for free. For many, it has breathed a whole new lease of life into their ability to operate.

As soon as I saw the DSB Digital Transceiver kit, on their website, I had to buy one (two, actually; one extra, for a friend, to save on postage). The order went in and the receipt came back from PayPal, by return. Ten days later I received confirmation that the package had been dispatched. I'd been wondering if there would be any VAT and Customs Duty to pay but, in the event, another five days later, the jiffy bag dropped on the mat, along with the latest edition of *PW* (hurrah!) and (another) pizza delivery leaflet (sigh).



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The Overview

The *QRPGuys* DSB Digital Transceiver's main board is of wideband design, and comes with three plug-in FT8 modules, one each for 40, 30 and 20m. These band modules serve a dual purpose. The first is to determine the operating frequency, by means of an on-board crystal and its associated circuitry and the other is to provide lowpass filtering, for the band in use.

The transceiver's specification quotes an approximate maximum output of 2.5W on 40m, over 1.5W on 30m and over 1W

1: Board layout. 2: Main board with add-on lowpass filters for 40, 30 and 20m. 3: A typical day's spots on 10MHz.

on 20m, and a receiver sensitivity of 0.4µV (–115dBm).

VOX circuitry automatically switches the rig to transmit when it senses a sufficiently high-level audio input.

The connections to the transceiver are all board-mounted: BNC for the antenna, two 3.5mm stereo sockets for audio in/out, and a 2.1mm power socket for a 12-14V DC supply.

The main board is around 80mm square. With a plug-in module connected, the overall height is around 35mm. Weight, including the band module, is 65 grams.

A custom enclosure isn't offered. Instead, DIY plans for a lightweight chassis fashioned out of PCB material, and a link to a 3D printed case project, are provided.

Construction

You'll need only a soldering iron with a small tip and some small side cutters. A digital multimeter will assist during the setup procedure. According to the online manual, the transceiver can be built in an evening, and – on a difficulty scale of 1 to 5 – is rated at a 3, 'depending on your experience'.

The kit includes everything you need for the main, high-quality, silk-screened and through-plated board, and the three, plug-in band modules. You can buy extra, unpopulated band module boards, if you fancy trying another mode, frequency or band.

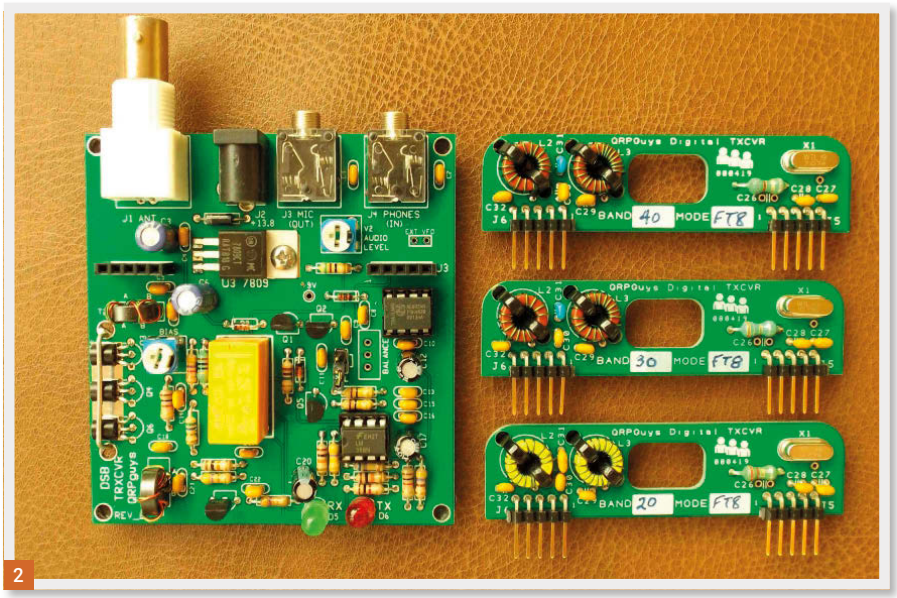
I spent two fragmented evenings building this, at a leisurely pace; six hours in all. That includes double-checking component values before committing to the board.

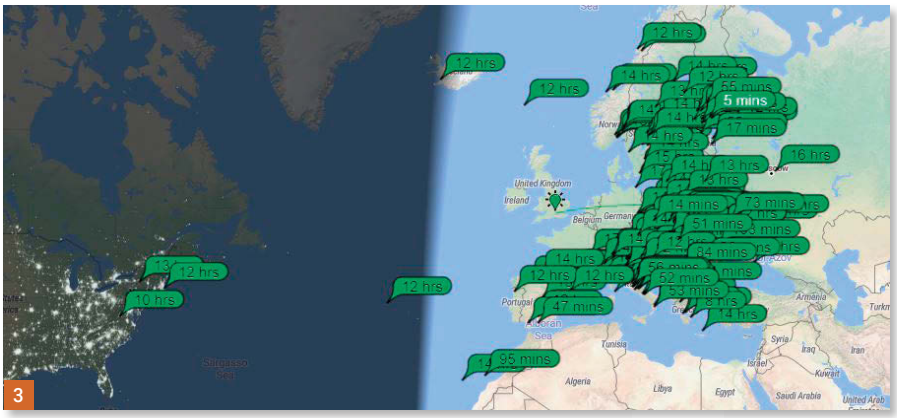
The instructions are near perfect. To make life a little easier, I mounted the components (which are all through-hole, by the way) in strict order of height profile. Doing this allows the weight of the board to bear down on each component, ensuring that it remains snugly in place while soldering.

Construction went very smoothly, with no problems to report. While winding the toroids, I did my usual thing of losing track of the number of turns I'd already made. Needless to say, my attention span would have benefited from a higher intake of coffee (or a lower intake of wine).

The Switch-On

Set up merely requires you to measure one of the main board's voltages (even that is optional), then monitor the current draw on transmit, whilst adjusting the PA bias





trimmer…and that's it.

Time for the on-air test. At this point, the instructions warn that 'operating or testing into a bad SWR or no antenna will permanently damage the three power amplifier BS170s'.

You'll need to supply your own 3.5mm stereo patch leads, for connection to your sound card's microphone and speaker sockets, and a 2.1mm DC plug on a power lead.

Most folks will make use of the excellent and popular (and free!) WSJT-X software. You'll need to ensure that the clock on your hardware is accurate to within about one second.

Plug in the desired band module, connect up your (matched) antenna, and power the board.

I fired up the WSJT-X software and looked in vain for a hint of a signal on the waterfall display. Nothing! I quickly discovered that I'd incorrectly plugged in the band module, completely missing one set of the SIL sockets in my haste. Emotional rollercoaster over, I was delighted to have FT8 signal traces flooding the screen.

I measured the current consumption at 12.4V on 7 and 14MHz, and observed that it draws approximately 13mA on receive (on both bands), and around 450mA for 1W output on 7MHz, or 520mA on 14MHz.

The modest current draw on receive is even more impressive when you consider the retina-scorching intensity of the green 'Receive' LED!

Although the transceiver is indeed capable of higher power on the lower bands (see above), I never tire of 'doing more with less' (as Mrs P will confirm) so I kept the rig throttled back to 1W at all times. Because we're transmitting a double-sideband signal here, half of the power is wasted, in the lower sideband. So, 1W on the power meter is equivalent to 500mW of single-sideband. 'Proper' QRP.

I'm happy to report that during just a week of casual operating across the three bands, I've completed contacts with scores of stations, working 34 DXCC entities – all in Europe, bar one, in North America. For the record, my antenna for 7 and 14MHz is

a full-size 40m loop, between only 2m and 8m above ground, and a random end-fed wire (approximately 70ft), for 10MHz.

A look at *PSK Reporter* reveals that my signals have been widely heard across much of the globe, by hundreds of stations. Unlike WSPR, FT8 is not considered a QRP mode, so I find this doubly impressive.

Even though the receiver is of simple design, and despite poor propagation and the high noise level, I've spotted countless stations on all continents (except Antarctica), with the best DX being south-east Australia.

Should you so wish, the receiving circuitry operates right down to a supply voltage of under 7V. I had it running on a rechargeable PP3 Li-ion battery, all day.

Caveats

The transceiver accepts audio from any source, which, on the upside, means that with a shift in frequency (more about this, at the end) you can use it for FT4, WSPR, even speech. The flip side is that it will transmit any audio your computer cares to utter, from notification alarms, to your darkest online radio-listening preferences (Mellow Magic?).

Secondly, there is no CAT control of the transceiver by the computer, so you'll need to get into the habit of manually changing the band, in the software, every time you swap the plug-in modules. Failing to do so will result in the wrong band information being included in your spots of other stations when they're uploaded to the reporting sites (unless you completely disable the reporting function in WJST-X).

The Cost

The DSB Digital Transceiver kit from *QRPGuys* costs US$40 (around £31), plus shipping. Bang for buck, I believe it offers almost unprecedented value for money, providing intercontinental two-way data communication, for a budget that won't break the bank.

Stop Press!

At the time of writing *QRPGuys* were unveiling details of a matching VFO for the DSB transceiver. Covering 160 to 17m and featuring a five-digit LED frequency readout to 10Hz resolution, the kit contains all the components and hardware to facilitate piggybacking onto the transceiver's main board. It comes pre-programmed with the FT8 frequency for all included bands, and you can tune up or down from these points. Check out their website for the latest details.

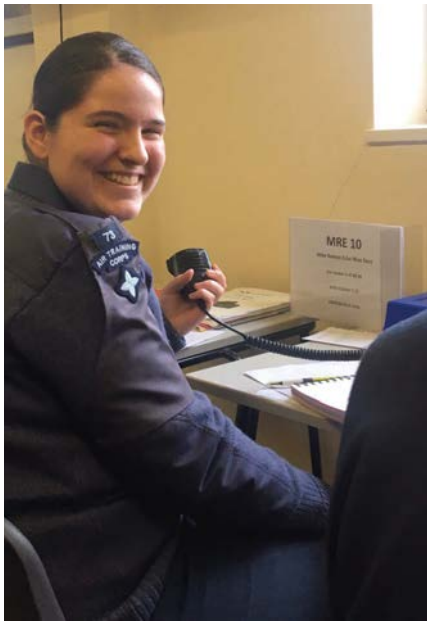
Radio Round-up

BLUE HAM 20-1: Once again UK Cadet Units took part in Exercise Blue Ham, which was run over the weekend of March 7/8th 2020 using the 5MHz (60m) shared band. Cadets who take part would have had to pass both their Blue and Bronze Radio Operator Modules as a minimum and the 'on–air' time would also count towards their Foundation Licence HF operating providing it was entered into their logbooks. Blue Ham was introduced to enhance the overall Cadet experience of radio operation and to reach out to radio amateurs who may wish to join the Cadet Organisations as Unit radio instructors.

Units are able to set up and operate HF stations for the purpose of making contact with radio amateurs to exchange specific information during their QSOs. The way the Exercise was to be run was contained in a brief sent out to all the Units so that planning could begin by choosing the right antenna configuration and radio setup. We all know HF working conditions are not their best at the moment, so this was going to be a challenge for all taking part as regular operators know the band can suffer from QSB. Previous Blue Ham exercise data gathered during the input of the operating logsheets shows quite a variety of different and diverse antenna and radio setups.

For the exercise Units were allocated MRE callsigns for the duration of the activity with a chance to practice using them prior to the start. It should be noted that to comply with RAFAC operating instructions no location information was given out during the exercise. The MRE calls are normally only used during the exercise dates; this provides some interesting callsigns in everyone's logbooks.

A look into the online logger at the end of the exercise showed the cadet stations had logged some 1730 calls/QSOs during the period of operation. This was about 50% more than the other Blue Ham exercises. Well done to all concerned for the effort put in and the great on-air operating conditions – for a change!



The Blue Ham Team have to date issued 45 PDF Participation Certificates to callsigns that have e-mailed requesting them.

Again, the Blue Ham Team would like to thank the considerable effort .and time put in by all who took part in the Exercise. There is another one planned for the weekend of June 6/7th 2020 so if you missed the chance to work the cadet stations and get into the log then this will be your opportunity.

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AT-D578UV Pro FM/DMR mobile radio This AT-D578UV-pro is a true TWIN band radio for digital DMR radio systems, compatible to MOTOTRBO Tier 1 and 2. Traditional FM is of course equally supported. In contrast to many other DMR radios the AT-D578UV offers real VFO operations, which makes it much more suitable for amateur radio. Here you can adjust frequency and other parameters as you are used from traditional radios, instead of just using pre-programmed memories. Ofcourse the AT-D578UV offers these memories as well, quite a lot: 4000 to be precise. But you are not limited to those memory channels. £349.99

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UV-5RC PLUS TWIN pair of UV-5RC's as above **£55.00**
GT-3 MK2 is a great dual band Baofeng with human-oriented features. Large capacity Li-ion battery that can last for between 7-9 hours of continuous use. Small and lightweight, it is small enough to fit into your shirt pocket. Upgraded frame material makes it more durable and the great orange & black colour gives it a great appearance. It also comes with a more user-friendly user manual making it easier to understand and use **£39.95**
GT-5 dual band, dual display, dual frequency and dual standby This is the latest Baofeng two way radio with great new features. Large capacity Li-ion Battery can last for 7-9 hours of continuous use, small and lightweight with upgraded frame. **£39.95**
BF-888S is a professional UHF transceiver with good performance and reliable quality. Extra functions such as Noise Reduction and Scrambler make it as a cost-effective transceiver covering 400-470MHz and including desktop charger for an amazing **£12.95**
DM-9HX DMR radio Tier II VFO digital & analogue dual band UHF/VHF handheld transceiver ..... ~~£89.95~~ **£69.95**

Accessories

UV-5SM Branded speaker microphone for all listed Baofengs **£9.95**
UV-5PC Branded software cable with USB for all listed Boafengs .. **£9.95**
UV-5BE Original battery eliminator for UV-5RC+ **£9.95**
UV-5AT Original replacment antena for UV-5RC+ **£4.99**
UV-EP Original replavement ear piece for UV-5RC+ **£4.99**
UV-5SC Original soft case for UV-5RC+ **£9.95**
BL-5 Original 1800 mAh replavement or spare battery for UV-5RC+ **£9.95**
GT-5 Original GT-5 2000 mAh replaement or spare battery for GT-5 ..... **£14.95**
GT-3 Orginal GT-3 1800 mAh replacement or spare batery for GT-3 ..... **£12.95**
BF-8 6 way charger for BF-888S **£44.95**

LEIXEN

Leixen having developed a full range of "LEIXEN" series of radios. widely used in transport, construction, telecommunications, security, restaurants, residential property management and other departments and areas, especially popular in the HAM's world.

Mobile Transceiever

VV-898 136-174/400-470MHz mobile transceievr. What a great entry level dual band rig, with only 10 Watts it is ideal for the new foundation pass holders. Comes complete with radio bracket and keypad microphone **£59.95**
VV-898S as above but with 25 Watts **£69.95**

Handheld Transceiver

NOTE is a rugged 400-480 MHz handheld transceiver with a massive 20W output! Comes comlpetre with antenna, belt clip and drop in charger – are you ready to be heard! **£69.95**

SenHaiX

SenHaiX was estabished in 2012 and is in located in the located in the hometown of two way radio Quanzhou city, Fujian Province, China. The company is a high-tech enterprise specialising in radio communications R&D, manufacture of two way communications and accessories.

Mobile POC Network Radio

SPTT-N60 is a 3G network android mobile radio with wifi, bluetooth, zello, sos, phone function, gps function, with touch screen and large LCD **£249.95**
4G version **£299.95**

Handheld Transceiver

8800 Dual band, dual watch, dual standby, 5W Sport radio. This is a rugged and reliable, waterproof, dustproof and shatterproof handie with lots of extras including bluetooth progarmmoing option – amazing avlue at just **£64.99**

Inrico

Inrico Electronics is a high-tech enterprise which focuses on the design, construction, production and sales of radio communication equipment.

Mobile POC Network Radio

TM-7 PLUS is the first 4G 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! ... **£159.95**

Handheld POC Network Radio

T199 is a 3G / WiFi Android Radio, without display, for basic operation. You can install apps from your computer to the radio via the USB port. Great network radio at a great price **£99.95**
T192 is an IP-67 rated 3G / WiFi Android Radio as above but with the IP rating **£109.99**
T320 is the current best seller 4G / WiFi Radio. I t has a host of features and a great szie screen including Intelligent global intercom, Front & rear camera with auto-focus function, Longer standby time more than 80 hours, 36mm-diameter speaker with double chambers, Positioning system supports, Support WIFI, Micro 5pindata cable, Support MP3 / MP4, Sturdy and durabable with military quality **£169.95**

ICOM

ICOM is an international manufacturer of radio transmitting and receiving equipment, founded in 1954 by Tokuzo Inoue with the company's original name being "Inoue". There products now include equipment for radio amateurs, pilots, maritime applications, land mobile professional applications and radio scanner enthusiasts.

Handheld Transceiver

ID-51E The Icom ID-51E PLUS 2 is the third generation of the successful D-Star HT. Like the original ID-51A, it covers 2 meters and 440 MHz and receives two bands simultaneously (V/V, U/U & V/U) **£379.00**

Base Transceiver

IC-7300 HF/50/70 is a revolutionary compact radio that will excite HF operators from beginners to experts **£1199.00**
IC-9700 2/70/23 is an all mode, tri-band transceiver covering the 144, 430/440 as well as 1200 MHz. Real-time, high-speed spectrum scope for the 144, 430/440, 1200 MHz bands. New PA provides a powerful 100 W (144 MHz), 75 W (430/440 MHz) and 10 W (1200 MHz) output **£1795.00**

COVID-19 NOTICE - STAY SAFE

WE ARE OPEN AND HERE TO HELP YOU IN THESE DIFFICULT AND UNCERTAIN TIMES. KEEP SMILING

Mobile Antenna Mounts

TRIMAG-S Triple magnetic mount with SO239 antenna fitting with 4m RG58 and PL259 fitted – ideal for those larger antennas..... **just £39.95**
TURBO-S single 170mm magnetic mount with SO239 antenna fitting with 4m RG58 and PL259 fitted – will suit most antennas upto 5ft. **£19.95**
HKITHD-SO Heavy duty hatch back mount with SO239 antenna fitting with 4m RG58 and PL259 fitted **£32.95**
HKITM-S Mini hatch back mount with SO239 antenna fitting with 4m RG58 and PL259 fitted..... **£32.95**



Multiband Mobile

Why buy loads of different antennas when Moonraker has one to cover all! SPX series has a unique fly lead and socket for quick band changing

SPX-100 9 Band plug n' go portable, 6/10/12/15/17/20/30/40/80m, Length 165cm retracted just 0.5m, Power 50W complete with 38th PL259 or BNC fitting to suit all applications, mobile portable or base - brilliant! **£44.95**
SPX-200S 6 Band plug n' go mobile, 6/10/15/20/40/80m, Length 130cm, Power 120W, PL259 fitting..... **£44.95**
SPX-300S 9 Band plug n' go mobile, 6/10/12/15/17/20/30/40/80m, Length 165cm, High Power 200W,PL259 fitting **£59.95**

VHF/UHF Mobiles

GF151 Glass Mount 2/70cm, Gain 2.9/4.3dBd, Length 78cm complete with 4m cable and PL259 ..... **£29.95**
MRM-100 MICRO MAG 2/70cm, Gain 0.5/3.0dBd, Length 55cm, 1" magnetic base with 4m coax and BNC **£19.95**
MR700 2/70cm, Gain 0/3.0dBd, Length 50cm, 3/8 fitting..... **£9.95**
MR777 2/70cm, Gain 2.8/4.8dBd, Length 150cm, 3/8 fitting..... **£19.95**
MRQ525 2/70cm, Gain 0.5/3.2dBd, Length 43cm, PL259 fitting (high quality)... **£19.95**
MRQ500 2/70cm, Gain 3.2/5.8dBd, Length 95cm, PL259 fitting (high quality)... **£26.95**
MRQ750 2/70cm, Gain 5.5/8.0dBd, Length 150cm, PL259 fitting (high quality). **£36.95**
MRQ800 6/2/70cm Gain 3.0dBi/5.0/7.5dBdBd, Length 150cm, PL259 fitting (high quality) **£39.95**
MRQ273 2/70/23cm Gain 3.5/5.5/7.5dBdBd, Length 85cm, PL259 fitting (high quality) **£49.95**
MRQ900 10/6/2/70cm Gain 10m (2.15dB) 6m(2.5dB) 2m (2.8dB) 70cm (5.5dB)
Length: 125cm PL259 fitting **£49.95**

Coax Cable Drums

Save money buying in bulk – handy 50m as well as 100m drums at discounted prices

RG58-DRUM-50 standard RG58 6mm 50m reel..... **£19.99**
RG58-DRUM-100 standard RG58 6mm 100m reel..... **£29.99**
RG58M-DRUM-50 military spec RG58 6mm 50m reel **£24.95**
RG58M-DRUM-100 military spec RG58 6mm 100m reel..... **£44.95**
MINI8-DRUM-50 military spec MINI-8 7mm 50m reel **£34.99**
MINI8-DRUM-100 military spec MINI-8 7mm 100m reel..... **£64.99**
RG213-DRUM-50 military spec RG213 9mm 50m reel..... **£64.99**
RG213-DRUM-100 military spec RG213 9mm 100m reel **£119.99**
WESTFLEX-DRUM-100 military speck Westflex 103 10mm 100m reel..... **£159.99**
RG174-DRUM-100 military spec RG174 2.8mm 100m reel..... **£59.95**

Masts – Push Up

Lightweight medium and heavy duty swaged masts sets from 1.25-2" diameter 5ft sections to create a lovely 20ft mast – choose the correct size needed for the antenna installation. Masts have a lovely push fit for easy of use and to give a strong connection

MSP-125 20ft Medium Duty (set of 4 poles) 32mm dia 1.6mm gauge.... **£44.99**
MSP-150 20ft Medium Duty (set of 4 poles) 38mm dia 1.6mm gauge.... **£49.99**
MSP-175 20ft Medium Duty (set of 4 poles) 44mm dia 1.6mm gauge.... **£59.99**
MSP-200 20ft Medium Duty (set of 4 poles) 51mm dia 1.6mm gauge.... **£69.95**
MSPX-150 20ft Heavy Duty (set of 4 poles) 38mm dia 2.65mm gauge..... **£69.95**
MSPX-200 20ft Heavy Duty (set of 4 poles) 51mm dia 2.65mm gauge..... **£89.95**

GRP Fibreglass Base Antennas Diamond quality – Moonraker pricing

These high gain antennas have been pre-tuned for your convenience, easy to use, easy to install, and a choice of connection … look no further

SQBM100P 2/70cm 3.00/6.00dBd, RX 25-2000MHz, Length 100cm SO239..... ~~£49.95~~ **SPECIAL OFFER £39.95**
SQBM200P 2/70cm, Gain 4.5/7.5dBd, RX 25-2000MHz, Length 155cm, SO239..... ~~£54.95~~ **SPECIAL OFFER £44.95**
SQBM500P 2/70cm, Gain 6.8/9.2dBd, RX 25-2000MHz, Length 250cm, SO239..... ~~£74.95~~ **SPECIAL OFFER £69.95**
SQBM1000P 6/2/70cm, Gain 3.0/6.2/8.4dBd, RX 25-2000MHz, Length 250cm, SO239..... **£84.95**
SQBM223N 2/70/23cm, Gain 4.5/7.5/12.5dBd, RX 25-2000MHz, Length 155cm, N-Type **£79.95**
SQBM3000N Triband 2/70/23cm, Gain 4.5/8.3/10.7dBd Length 1.55m **£79.99**
SQBM3500N Triband 2/70/23cm, Gain 6.8/9.2/11.8dBd Length 2.70m **£119.99**

HF Wire Antennas

Our HF wire antennas are made with complete waterproof potted baluns and high quality "original" flexweave antenna wire.

MDHF-80 3.5MHz balun matched mono dipole, length 40m..... **£59.95**
MDHF-40 7.0MHz balun matched mono dipole, length 20m..... **£44.95**
MDHF-20 14MHz balun matched mono dipole, length 10m..... **£39.95**
OSHF-80 3.5-30MHz balun matched off set dipole, length 40m **£59.95**
OSHF-40 7.0-30MHz balun matched off set dipole, length 22m **£44.95**
OSHF-20 14-30MHz balun matched off set dipole, length 11m **£39.95**
LWHF-160 1.8-50MHz unun match end fed antenna, length 42m ... **£49.95**
LWHF-80 3.5-50MHz unun match end fed antenna, length 20m ... **£44.95**
LWHF-40 7.0-50MHz unun match end fed antenna, length 10m ... **£39.95**

Yagi Antennas

All Yagis have high quality gamma match fittings with stainless steel fixings!

YG27-35 Dual band 3/5 element 3.5/12.5 dBd gain with one feed! **£79.95**

Masts GRP Fibreglass

Ideal heavy duty fibreglass masts for those antennas that need to be insulated from metal hardware or pole – convenient 2m lengths in a light grey

GRP-150 2m 37mm OD..... **£29.95**
GRP-200 2m 51.7mm OD..... **£39.99**

Masts Telescopic

We offer both aluminium and GRP fibreglass push up masts ranging from 20-50ft to suit your needs. The aluminium versions are for portable/occasional use and the fibreglass versions can also be used for fixed instillation

LMA-M 26ft open 5.5ft closed 50-25mm aluminium mast **£109.99**
LMA-L 33ft open 7.2ft closed 50-25mm aluminium mast..... **£119.99**
TMF-1 20ft open 5.6ft closed 50-30mm high quality GRP mast..... **£199.99**
TMF-1.5 30ft open 7.5ft closed 57-30mm high quality GRP mast..... **£299.99**
TMF-2 40ft open 9ft closed 57-30mm high quality GRP mast **£349.99**
TMF-3 50ft open 8ft closed 65-23mm high quality GRP mast **£399.99**

QRP Antennas

The Moonraker Whizz range are great for getting on HF in a neat compact and totally portable way

Whizz Whip HF/VHF/UHF portable antenna with telescopic whip - ideal for any situation where a long wore or vertical antenna is just not an option - get on air today for **just £99.95**

Whizz Loop 20-60m compact loop is ideal for QRP Transceivers when space is limited or using portable with a Yaesu FT-817ND or similar. Can be used indoors with surprising results and handy for travelling due to its "pocket" size antenna ideal for indoor or out and can be packed away and all for just **£69.95**

Whizz Loop V2 (right) same as above but with a frequency range from 40-10m..... **£79.95**

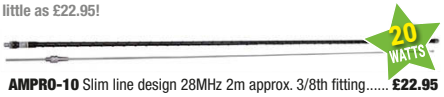
Base Antennas

Simple plug and play HF antennas radial free and at a great price

GP2500 All Band 80-6M Vertical TX 80-6M RX 2-90MHz, Power 250W Length 7.13M **£199.95**
GPA-80 budget version of GP2500 80-6M Length 6.0M **£99.95**
GPA-80F fibreglass version of GPA-80 ..... **£129.95**

HF Mobiles

Get great results with the Moonraker range of HF mobiles! From as little as £22.95!



AMPRO-10 Slim line design 28MHz 2m approx. 3/8th fitting..... **£22.95**
AMPRO-11 Slim line design 27MHz 2m approx. 3/8th fitting..... **£22.95**
AMPRO-12 Slim line design 24MHz 2m approx. 3/8th fitting..... **£22.95**
AMPRO-15 Slim line design 21MHz 2m approx. 3/8th fitting..... **£22.95**
AMPRO-17 Slim line design 18MHz 2m approx. 3/8th fitting..... **£22.95**
AMPRO-20 Slim line design 14MHz 2m approx. 3/8th fitting..... **£22.95**
AMPRO-30 Slim line design 10MHz 2m approx. 3/8th fitting..... **£22.95**
AMPRO-40 Slim line design 7MHz 2m approx. 3/8th fitting..... **£22.95**
AMPRO-60 Slim line design 5MHz 2m approx. 3/8th fitting..... **£24.95**
AMPRO-80 Slim line design 3.5MHz 2m approx. 3/8th fitting..... **£27.95**
AMPRO-160 Slim line design 1.8MHz 2m approx. 3/8th fitting... **£59.95**

Other frequencies available. Call or see online for more details.

Make Your Own? Wire, insulators & bits

Have fun but making your own antenna system and see how it works against the commercial designs

SCW-50 Enamelled copper wire, 1.6mm, 50m length **£24.95**
HCW-50 Hard drawn copper wire, 1.6mm, 50m length **£29.95**
FWPVC-50 high quality flexweave with PVC coating 4mm, 50m **£44.95**
300-20 Ribbon feeder 300 ohm high quality slotted, 20m..... **£17.95**
450-20 Ribbon feeder 450 ohm high quality slotted, 20m **£19.95**
DPC-W Wire dipole centre with securing clamps **£5.95**
DPC-S Wire dipole centre with SO239 socket for PL259 ..... **£6.95**
DPC-38 Dipole centre for 2 x 3/8th whips antennas to make dipole **£6.95**
DOGBONE-S small plastic insulator **£1.00**

Hardware

We offer all type of mounting hardware to help get you rigged up at home – if you cant see it listed chances are we have it. Check www.moonraker.eu or just give us a call

TRIPOD-HDA heavy duty collapsible tripod to suit base mats up to 67mm **£149.95**
TK-24 wall bracket offers 18" clearance **£29.95**
TK-12 wall bracket offers 12" clearance **£19.95**
BB2 mast base plate to suit up to 2" masts/pole **£22.99**
JOIN-200 clamp 2" poles back to back **£17.95**
PTP-20 2" to 2" mast clamp **£5.95**

Join the best loyalty programme and start earning WATTS now!

All registered retail customers can now earn and redeem free product credits known as WATTS. It's simple the more you spend the more WATTS you receive. You will also receive bonus WATTS when you refer a 'New Customer', 'Write a Product Review', 'Share' a product' or 'Refer a Friend'

Don't miss out – Register now and start enjoying free WATTS

The Practical Wireless 144MHz QRP 'Fun' Contest

Colin Redwood G6MXL, our QRP Contest adjudicator, introduces the 'Fun' version of our 144MHz contest, which takes place on Sunday June 14th 2020.

Colin Redwood G6MXL
practicalwireless@warnersgroup.co.uk

With the government constraints on leaving home due to the coronavirus, running the 2020 *Practical Wireless* 144MHz QRP Contest in its usual format has been ruled out. After surveying a geographically widespread range of 2019 entrants to gauge opinions, the majority wanted the contest to go ahead in some manner. With this in mind, this year's contest will be run as a 'Fixed, Single Household Fun' contest. This will provide an opportunity not only to make some contacts but also to show others in the house some aspects of our hobby. No doubt many entrants scores will be much lower than usual, but I would urge as many as possible to participate and encourage you to introduce other local amateurs to VHF contesting.

Date & Time

The date remains Sunday June 14th 2020. Entrants can operate for up to **4 complete hours** of their choosing between 0900UTC (10:00 BST) until 1600UTC (17:00 BST), e.g. 1000UTC to 1200UTC and 1400 to 1600UTC. This will enable participants to fit the contest around their home life. Please declare the times of operation on your entry.

Power

For this year **only**, the power limit will be increased 10 Watts at the transmitter so that participants with all types of UK licence can participate equally, and with mains supply available.

Equipment

The only equipment you'll need is a low-power 2m transceiver and an antenna. You should be able to make some contacts with a basic 2m FM hand-held transceiver in your immediate locality, and somewhat further if you use single sideband (SSB) or CW with a directional antenna.

Location

This year entrants don't have the possibility of operating from a remote hilltop, so it will be either from inside the home or perhaps in the garden. You'll need to find the 6-character IARU locator (sometimes it is known as 'Maidenhead Locator') for your station's location, for example IO92KL. I think the easiest way to find your locator is to visit: **https://tinyurl.com/ycec66pg**

Contest Exchange

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

Exchange Example

Imagine your callsign is M7GFD and you are located in IO92KL and have a contact with M6VTH as your fourth contact. You might transmit, "*Mike six Victor Tango Hotel from Mike seven Golf Foxtrot Delta, you are five and six, zero zero four, in India Oscar nine two Kilo Lima*". Using phonetics will make sure that similar sounding letters (e.g. B, D, P, V) are clearly understood by the station you are in contact with.

Hints and Tips

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

Make a point of accurately recording in your log the details of each contact as required by the rules – in particular the callsign of each station you contact, their locator and the time in UTC (not BST). If you are transferring a paper log to a computer log, be careful to transcribe the details accurately' The format of locators is letter letter number number letter letter (e.g. IO92HG).

Directional Antennas

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

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

Submitting an Entry

Don't forget to submit your entry after the contest. Although electronic entries via e-mail are very much preferred and make the task of adjudication easier, paper entries are also accepted. As this is a home-only contest, this year the timescale for submitting entries is reduced to **10 days** after the end of the contest. The e-mail address for logs for 2020 is **entries@pwcontest.org.uk**

Have a Go

Hopefully there'll be other *PW* readers on the air, keen to exchange reports, serial numbers and locators. Good luck in this year's 'fun' contest and don't forget to submit your logs and photos.

Website

The rules appear on the next page. Please consult the website during the early days of June just in case there are late changes to the rules. The contest website is also a valuable source of information and has a link for downloading log sheets and an online entry form (known as a cover sheet).
www.pwcontest.org.uk

The 2020 Rules

1. GENERAL: The contest is open to all licensed radio amateurs operating fixed stations, using SSB, CW, AM or FM in the 2m (144MHz to 146MHz) band. Entries can be from all licensed members of the same household. Non-licensed members of the same household are welcome to support entrants (e.g. keeping their own check log).

- The contest runs from 0900UTC (10:00 BST) until 1600UTC (17:00 BST) on Sunday June 14th 2020. Entrants can operate for any 4 complete hours of their choosing between 0900UTC (10:00 BST) until 1600UTC (17:00 BST), for example 1000UTC to 1200UTC and 1400 to 1600UTC.
- All stations must operate within the terms of their licence. Entrants must observe the band plan and must keep clear of normal calling frequencies (144.300MHz and 145.500MHz) even for *"CQ"* calls.
- Entrants must allow other users of the band to carry out their activities without hindrance. Please avoid frequencies used by GB2RS (144.250MHz and 145.525MHz), and other frequencies, such as local nets, in use for non-contest purposes.
- The station must use the same callsign throughout the contest.

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

1. callsigns of both stations
2. signal reports, standard RS(T) system
3. serial numbers: a 3-digit number incremented by one for each contact starting at 001 for the first contact.
4. locator (i.e. full 6-character IARU Universal Locator for the location of the station.

Information must be sent to, and received from, each station individually using just the 2m band, and contacts may not be established with more than one station at a time. Simultaneous operation on more than one frequency is not permitted.

If a non-competing station is worked and unable to send his full Universal Locator, their location may be logged instead. However, for a square to count as a multiplier (see rule 4), a full 6-character locator must have been received in at least one contact with a station in the square.

Contacts via repeaters, satellites, or using digital voice modes (including D-STAR, Fusion, DMR and Echolink) and data modes or machine-generated modes such as FT4, FT8, JT65, RTTY and PSK31 are not permitted. Neither is the use of the DXCluster, ON4KST chat, social media and similar.

3. POWER: The output power of the transmitter or transverter final stage must not exceed 10W peak envelope power (PEP). If the equipment is capable of higher power, the power must be reduced and measured by satisfactory means. With most modern transceivers, power can be reduced by using a menu setting.

4. SCORING: Each contact will score one point. The total number of points gained during the contest will then be multiplied by the number of different locator squares with which contacts were made (a 'square' here is the area defined by the first four characters of the IARU Locator).

Example: 12 stations worked in IO81, IO90, IO91, IO92 and JO01 squares; final score = 12 x 5 = 60.

Only one contact with a given station will count as a scoring contact. If a duplicate contact is inadvertently made, it must still be recorded in the log and clearly marked as a duplicate (not necessary in computer log files).

5. THE LOG: Logs must contain the following information for each contact:

1. time (UTC – not BST)
2. callsign of the station worked
3. report sent (e.g. 56)
4. serial number sent
5. report received (e.g. 54)
6. serial number received
7. locator received.

The preferred form of a log is a computer file in REG1TEST, .log, adi or .edi formats sent by e-mail. This may be generated by contest logging software such as MINOS or EI5DI's SDV, provided it contains all the information listed above. Alternatively, a file in any other suitable format (such as the spreadsheet available on the contest website) or in plain text provided each of the items above is separated by a separating character such as a comma or tab. Give the file a name including the station callsign (e.g. g6mxl.log), and send as a standard e-mail attachment to

entries@pwcontest.org.uk

Note change of e-mail address from last year.

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:

www.pwcontest.org.uk

6. ENTRIES: The covering information listed below must be provided with each entry. Please submit this using the online facility on the website. For postal entries, it should be written on a separate sheet of A4-sized paper. The information required for every entry is:

1. name of the entrant(s) as it is to appear in the results table and on the certificate
2. callsign you transmitted during the contest
3. name and address for correspondence
4. location of the station during the contest
5. full 6-character locator you transmitted during the contest
6. a full description of the equipment used, including transmitted PEP output power
7. if the transmitting equipment (including any transverter employed) is capable of more than 10W PEP output in the 144MHz band, a description of the methods used to (i) reduce and (ii) measure the 144MHz output power
8. antenna used and the approximate station height in metres above sea level (ASL)
9. 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"*.
10. operating hours.

Failure to supply the required information may lead to loss of points or disqualification.

Entries by e-mail must be sent to

entries@pwcontest.org.uk

Note change of e-mail address from last year.

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 Wednesday June 24th 2020. Late entries will be disallowed.

Any other comments about the station, the contest and conditions during it are welcome along with photographs. Please note these cannot be returned and may be published in *Practical Wireless* or on the contest website. Please send them by separate e-mail or post, to arrive by Wednesday June 24th 2020.

When entering, you will be asked to agree to the storing and processing of your entry and to the publication of the results. Warners Group Publications data policy can be seen at:

www.radioenthusiast.co.uk/privacy-policy

7. POOR SIGNALS: Make sure your transmitting equipment is properly adjusted and is not radiating a broad or poor-quality signal, e.g. by over-driving or excessive speech compression. On the other hand, be aware that your receiver may experience problems due to the numerous strong signals it will have to handle, which may lead you to believe that another station is radiating a poor signal. Before reaching this conclusion, try heavy attenuation at the receiver input. Using a high-gain RF pre-amplifier is likely to worsen strong-signal problems, so it is best to be able to switch it off when necessary.

If after making the checks above, you are certain that another station participating in the *PW* 144MHz QRP 'Fun' contest is radiating poor quality signals, please call the station, giving your callsign, and tell them about the problem. You cannot expect a station with a poor signal to do something about it if they are unaware!

If you receive or send a report of poor-quality signals, you must record on the cover sheet full details of the complaint including time, callsigns of stations involved, nature of complaint and actions taken during the contest to investigate and resolve.

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

Eddystone ECR

Bernard Nock G4BXD
military1944@aol.com

Bernard Nock G4BXD describes a recent acquisition to the Military Wireless Museum.

A warm welcome to the *Valve & Vintage* column from the Military Wireless Museum in Kidderminster once again. I am getting ready for another season in the museum, reorganising various aspects of the displays and trying to get new items, things that have been hiding in storage before or pushed behind sets already on the shelving, out on to the shelves for people to view. Even after eight years since the move to the new location I am still opening long buried boxes to find all sorts of treasures.

The microwave side of the museum continues to grow with the addition of various parts, receive converter, linear PA stage, and even a C Band LNB for the 9cm (3.4GHz) band, receivers, transmitters and antennas. The dish garden is also coming on a treat and great things are expected later in the year.

Eddystone ECR

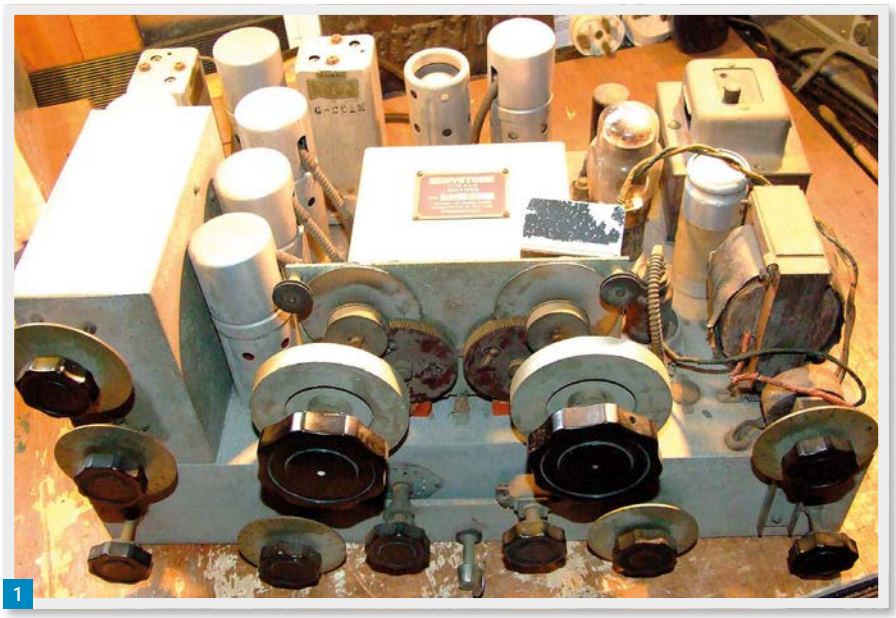
A recent pleasing addition to the collection was a second example of the Eddystone ECR receiver. I already had an example of the set, **Fig. 1**, in the museum's Eddystone collection, but this set was minus its outer case and, oddly, minus its tuning dial and pulley wheel arrangement. The ECR was Eddystone's reply to the influx of US made sets, Hallicrafters, National, Hammarlund and others just before WW2 and its attempt to muscle into this lucrative shortwave listener and amateur radio markets.

The Eddystone *Quick Reference Guide* dates the set's introduction at 1939 and offered for sale at a price of £45. Using the online CPI Inflation calculator page, it appears that £45 in 1939 equates to £2960 in 2020. Now, call me a Scrooge but that's quite a lot of money.

The new ECR example that arrived, **Fig. 2**, does have its original case although this has been repainted, in what looks like Hammerite or such, by someone who obviously only had a 6in brush. Luckily the full tuning dial arrangement, the two tuning cords and dials and all the associated pulleys etc were still intact although the set has been rewired and 'improved' by Mr A N Other.

The receiver is a ten-valve four-band standard single conversion superhet configuration set tuning 1.6 to 32MHz with a bandspread tuning facility as well, handy for the various amateur bands. The bands are 1.6 to 3.5MHz, 3.39 to 7.4MHz, 7.13 to 15.5MHz and 14.7 to 32MHz.

The set, **Fig. 3**, has a moving coil S-meter, a crystal filter with phasing control and a built-in mains power supply but oddly though, the set was originally sold without a loudspeaker. In fact, the set has no audio output transformer fitted inside in its original form. This transformer was fitted in the matching moving coil loudspeaker model 1134, which was sold separately. This housed the audio output transformer and a winding used in the power supply circuit.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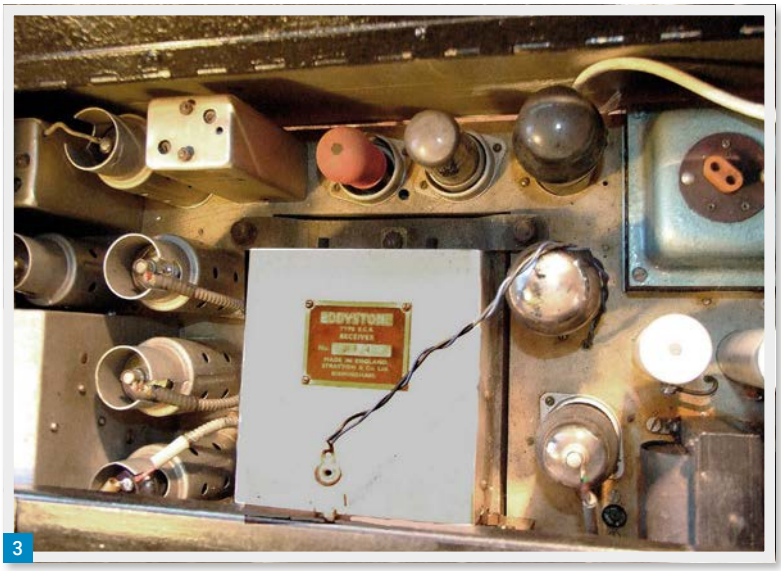
The original Eddystone manual for the set states: *"The Eddystone communications receiver type 'ECR' is the result of extensive research and development, the outcome of which is the production of an instrument highly efficient for all communication purposes."* Self praise indeed.

Circuit Design

The circuit design of the ECR consists of a 6K7 variable mu pentode as the RF amplifier stage. This feeds a 6L7 pentagrid mixer stage along with the signal from the local oscillator, a 6J7 pentode, which operates on the high side of the received signal. Interestingly the



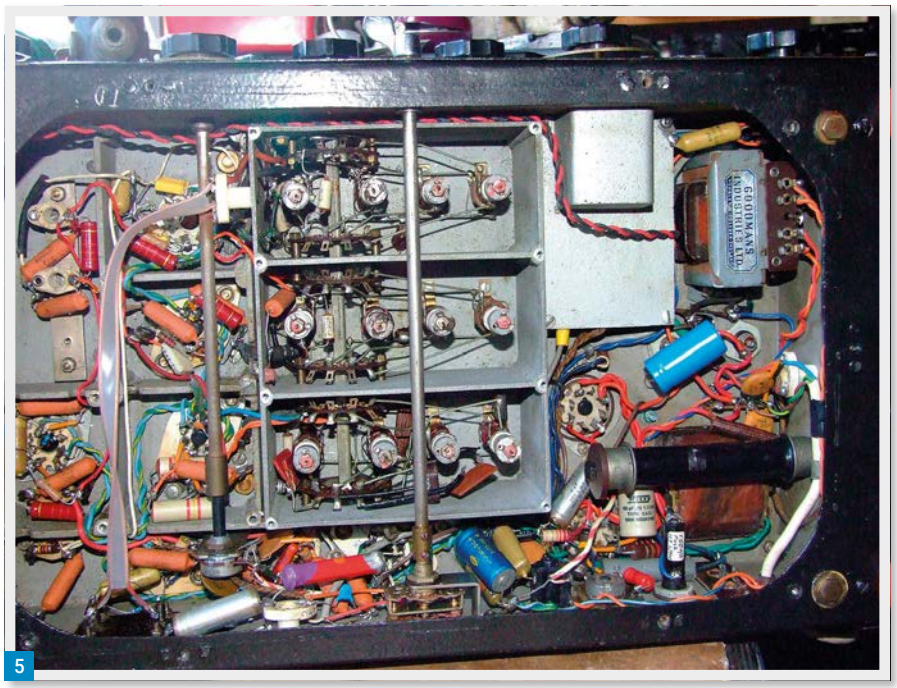


Fig. 1: My original ECR. Fig. 2: The recent model ECR. Fig. 3: Inside the recent addition. Fig. 4: The loudspeaker. Fig. 5: The new audio output transformer.

6L7 type was designed to ensure maximum isolation between oscillator and signal, and to provide a mixer that is efficient even up to VHF frequencies.

For applications where a self-oscillating mixer (i.e. pentagrid converter) could provide adequate performance there were other octal types specifically designed for this purpose. The oscillator injection needed to be 18V peak-to-peak and is fed to g3. The signal feed to the top cap is typical of the period and this arrangement is to improve signal isolation.

There are two stages of IF amplification at 465kHz using a further two 6K7 types. A 6H6 double diode is used as the AVG or AGC detector and audio detection of AM signals in one version of the set. The AGC voltage feeds back to control the two IF stages and the RF amplifier stage but it can be switched off and then the manual RF gain control will be used.

The audio first amplifier is a 6Q7 double diode triode in a later version working as the preamplifier, which has a jack connector fitted after the anode coupling capacitor to the output stage so that high impedance headphones can be used. With no plug inserted the audio is fed to a 6F6 general-purpose audio output pentode type acting as the audio output valve. On this version one of the diodes of the 6H6 is used for noise limiting and the AGC detector consists of the double diodes from the 6Q7 strapped together.

The BFO (Beat Frequency Oscillator) operates at the IF frequency and uses a 6J7 pentode while the set is finished off with a 5Y3 full-wave rectifier in the power supply. Oddly, considering the claim of 'extensive' research, it's strange that there is no stabilisation of the local oscillator or BFO HT voltages.

A Crystal Filter and Phasing control are fitted. The action of the crystal filter with the phasing control is to narrow the normally 8kHz wide IF stage down to just a few hundred Hertz, ideal for CW stations down in the noise. A moving coil meter is fitted and is used for measuring relative signal strength, though termed an 'R' meter in the manual.

The noise limiter on the later set can be switched in though again, oddly, this control is on the back wall of the set next to the antenna terminals. The manual does say it can be left switched in for most operations. A front panel switch is fitted, which breaks the HT voltage if the set is to be used with a transmitter, i.e. a receive/transmit switch.

Nasty Paint Job

The newly arrived example has, as I mentioned, this rather nasty paint job on the outer case. It will need removing, probably stripping with chemicals and then repainting in a nice shade of grey to match the speaker I have, **Fig. 4**, but the set might have originally been a different colour. Many of my Eddystone sets are grey but there are black cases, brown cases and of course, the 870 series came in numerous shades.

The recent set has been rewired in the past, modern plastic covered wires, new capacitors and the odd new resistor and what's obvious is that a large audio output transformer has, amazingly, been shoehorned into the chassis, **Fig. 5**. Obviously, the previous owner did not have the original speaker. Luckily

6

that's something I can remedy.

The original example I have in the museum was, as I said, missing its outer case, which in most instances would not be too hard a thing to replace – a square or oblong box with a few holes in it, etc –but the ECR has a shaped case with a sloping front around the tuning dial. The two tuning dials and pulley system were also missing along with the long rotating drum on which are marked the frequencies and amateur and shortwave broadcast bands.

I do not know how many of these sets were actually manufactured but given the large number of Hallicrafters, National and other such sets still around even today and the fact that in 50 years of playing radio I have only ever seen these two examples and know of only two others, I'm guessing there were not many made in the end.

The data plate, **Fig. 6**, on my original set says AP4, dating it to January 1938, while the second set's data plate states GQ38, dating it at July 1939. No doubt though if its design did see the light of day in 1938/39 period the disruption due to WW2 and the need to supply the military knocked the making of amateur radio sets right on the head.

The question now concerning me is, do I combine the two sets to make a result nearer the original design? My original example will itself need rewiring, the rubber covering, **Fig. 7**, on the wires has turned brittle and breaks off at the slightest touch. The later set has a few modifications that I can see but is complete mechanically.

The size of the ECR is much bigger than, say, the S504 or 640 sets, **Fig. 8**, shown compared to the 880 and 1004 sets. For now, I'll put the project on the ever-growing list of things to do and hope there's enough time left to attempt it.

And Finally

The museum continues its operations on the Oscar 100 stationary satellite, going up on 2.4GHz with a new transmitter line-up consisting of a DXPatrol up converter and Chinese wi-fi amp and still receiving on 10.4GHz. The next foray into these wonder frequencies will be to arrange the already bought items and supply a few more bits, oscillators, filters and the like for the 9cm band. We will soon be up to H2S frequencies, which might inspire me to finally get my set working.

More pictures on the website, below, and hope to see you here soon, Coronavirus permitting. Cheerio.

www.militarywirelessmuseum.co.uk

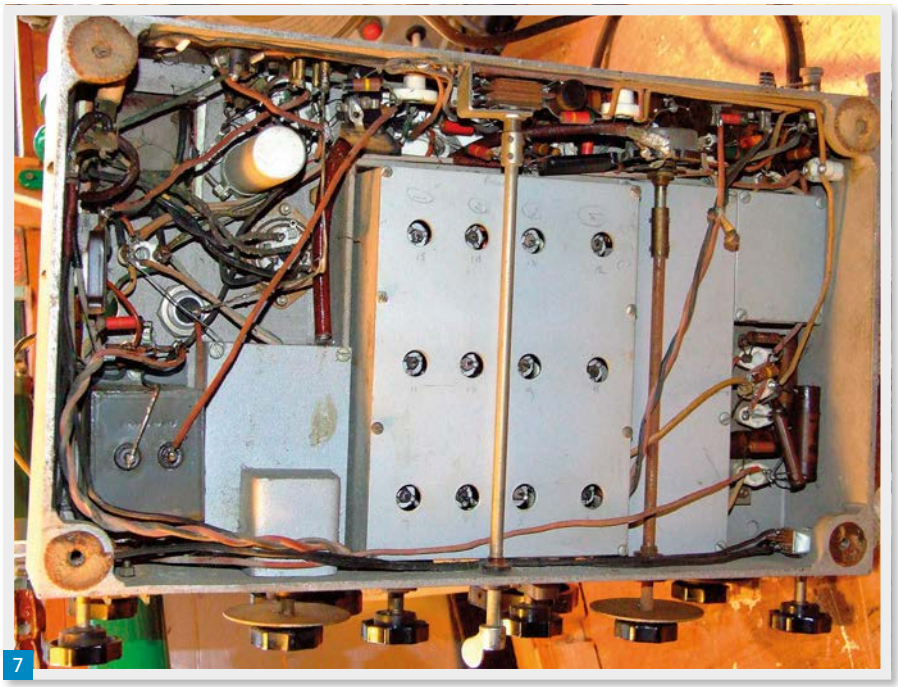

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Fig. 6: The Data Plates off both sets.
Fig. 7: The original wiring to replace.
Fig. 8: Size comparison.

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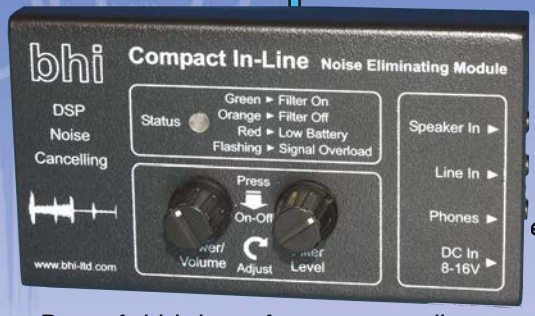

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Morsum Magnificat

Roger Cooke G3LDI tells the story of this iconic Morse publication.

Roger Cooke G3LDI
roger@g3ldi.co.uk

Last time I featured a variety of artistic keys made by **Valery RA1AOM**. Following the article, I sent six copies of *PW* to Valery to distribute to his local friends. They were all impressed with both Valery's keys and *PW*. I am not sure how much it will affect his orders for more keys, but I suspect he will be busy. I wonder if *PW* will now be widely read in St Petersburg. If you fancy ordering one of Valery's keys you can, but will have a three-month wait because each one is hand made. He has offered to make me a single lever paddle using Serpentinite for the base. I am looking forward to receiving that!

Morsum Magnificat

I was very lucky last year to procure a few copies of *Morsum Magnificat*, **Fig. 1**. I found that **Tony Smith G4FAI**, **Fig. 2**, who was the Consultant Editor, lives in Sheringham, north Norfolk, 'just up the road' from me. Following a few e-mail exchanges Tony sent me the full story of the magazine, which is presented here.

The Story of MM

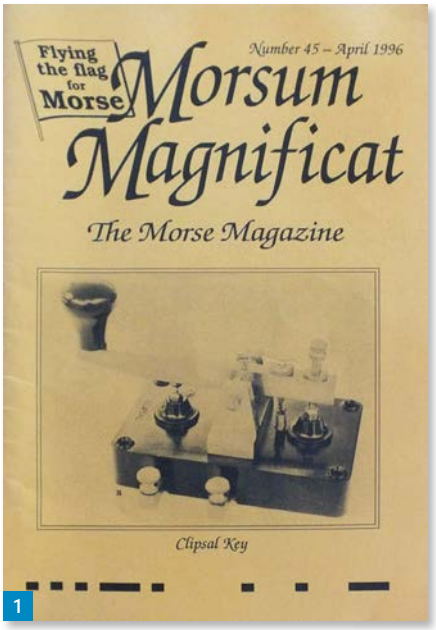
Known to its readers as *MM*, *Morsum Magnificat*, was first published in Dutch in 1983 by the late **Rinus Hellemons PA0BFN** assisted by **Dick Kraayveld PA3ALM** (now **PA8DWN**). In 1985 they published a special English language issue of the magazine in the hope of widening its readership. Not many copies were printed, and this issue is now a very rare collector's item.

The following year Tony G4FAI, who had been writing Morse related articles for British and foreign magazines for some years, was planning to publish his own magazine called *Morse Report*. At that time both Rinus and Tony were in correspondence with **Pat Moran W2EM**, who was writing and publishing detailed articles on the history of Morse telegraphy in the United States. Pat knew about Rinus's activities and Tony's plans and wrote to both saying, *"why don't you guys get together?"*

As a result of this suggestion, Tony abandoned his plans for *Morse Report* and joined Rinus and Dick to produce a new English language edition of *MM* (EMM) with Tony as English Language editor. All the material prepared for Morse Report later appeared in the Dutch and English versions of *MM*, both of which were printed and published in Holland.

Final Dutch Editions

DMM, as Rinus called the Dutch edition was already well established, with an enthusiastic following, when *EMM* was launched by Rinus, Dick and Tony in the autumn of 1986.



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Rinus was full of ideas for *MM*. He and Dick produced the *MM* Q/Z codebook and had plans for a German language edition of the magazine. There was an annual *MM* Morse day in Dick's hometown of Maassluis with plans to invite English readers to join the Dutch enthusiasts at the 1988 event, and Rinus was keen for a similar event to be held in the UK.

He lived for *MM*. He thought about it and made plans for it continuously but had to give it all up when his doctors told him he had cancer and only a short time to live.

He and Dick then produced three final 'special' editions of *DMM*, entitled 73, 88 and 30 in Dutch, using all of the material they had in hand for the magazine. They then shipped everything over to Tony to use in *EMM* in due course.

An International Readership

From the outset the aim of the English edition was to have an international readership and a good beginning was made when the very first issue of *EMM* was mailed to subscribers in ten different countries. Eventually the magazine had readers around the world, including amateur and professional radio operators, telegraph enthusiasts, key collectors, and telegraph historians. The articles were researched and written by the editors as well as by readers of the magazine.

Move to England

Following the death of Rinus the Dutch edition ceased publication in 1987. Tony took over the title and *MM* became an English language-only publication printed and published in England. In 1990 Tony was joined by **Geoff Arnold G3GSR**, founder and editor of *Radio Bygones*, the vintage radio magazine and who was previously editor of *Practical Wireless*. Geoff became Editor of *MM*, and Tony Consultant Editor and they continued publication of MM until December 1998.

In 1999 the magazine was taken over by **Zyg Nilski G3OKD**. Zyg had been a radio amateur and CW enthusiast since 1960 and was semi-retired from a career that embraced electronics engineering, computing and systems analysis, and the education service. Tony continued to support the magazine in various ways in the next few years but finally retired in 2002.

The last issue of the magazine was *MM89*, March 2004. Zyg had hoped to find a new publisher but despite several enquiries this did not prove possible.

Original copies of *MM* have now become collectors' items and can sometimes be found advertised in radio magazines or on eBay. Copies of all issues were lodged for posterity at the British Library, the Bodleian Library, Oxford, the Library of the University of Wales and the Library of Trinity College Dublin.

Free Downloads

In April 2017 all published copies of the English language version of *MM*, Nrs 1-89, became available for free download from the internet, including:

The Story of the Key: The Best of MM-1, by **Louise Ramsey Moreau W3WRE**.

Key WT 8 Amp Worldwide Survey: The Best of MM-2, by Tony Smith G4FAI, an updated and revised version of a 54-page booklet, which provides much information about the well-known pre-WW2, wartime and post-war military Key WT 8 Amp.

The MM Q & Z Codebook, (in English),

Fig. 1: Morsum Magnificat.
Fig. 2: Tony Smith G4FAI.

compiled by Rinus Hellemons PA0BFN and **Dick Kraayveld PA3ALM**, which lists all the Q & Z codes in their original applications.

MM Cumulative Index. A searchable index covering all issues of *MM*, Numbers 1 to 89.

There has been an enthusiastic response to the availability of the free downloads, which have attracted over 24,400 'hits' on the website since their launch in April 2017.

The 89 issues contain well over 4,000 printed pages covering all aspects of Morse telegraphy past, present and future. It was hoped that the free release of this vast resource would help to stimulate and maintain interest among today's Morse enthusiasts.

Fourteen years after it ceased publication, Rinus's creation is still Flying the Flag for Morse. It may be gone but it is not forgotten!

Copyright

With the permission of the present copyright holder, Zyg Nilski G3OKD, and thanks to the generosity of **Lynn Burlingame N7CFO** in hosting the *MM* issues and publications on his N7CFO website, all copies can now be downloaded free of charge, in PDF format, from:
https://tinyurl.com/mosmpkz


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Please Note: Copies of *MM* or associated publications downloaded from this website are made available for personal use only. They may not be downloaded or distributed for any commercial purpose whatsoever. All articles in *MM* by Tony Smith G4FAI are the copyright of Tony.

Tony is still active, mostly QRP, with the Yaesu FT-817ND, running 5W. Actual magazines are quite rare these days, but they are all available to download, so if you want to do some reading, what better time now that we are all isolated.

The magazine ran to 50 pages per copy and had a varied selection of interesting articles and pictures, still relevant today of course. I think the nearest magazine I can relate it to would be the FISTS magazine *Key Note*. 73 and May the Morse be with you! Roger G3LDI.

Transatlantic propagation on 144 and 432MHz

Tim Kirby
longworthtim@gmail.com

Tim Kirby GW4VXE has news of some very exciting contacts, especially on the 432MHz band.

1

At the time of writing, there's a very interesting bit of VHF propagation happening from the Cape Verde islands into the Caribbean. On April 7th, D4VHF (the new callsign used on VHF by the D4C group) worked FG8OJ in Guadeloupe on 432MHz FT8. The distance was 3867km. In fact, 9Y4D was the first to hear D4VHF on 432MHz in the early evening of April 6th, but no contact was made at that time.

The first hint of the opening came on April 5th, when FM4SA started hearing D4VHF on 2m, with FM5CS being worked on 2m the following day. On April 9th, D4VHF worked PJ2BR (FK52) on 2m, over a distance of 4747km, which is close, but not quite as far as the D41CV to GM0EWX QSO made earlier in the year, over a distance of 4776km. Also, on April 9th, D4VHF worked J69DS on SSB at 3866km, followed on April 10th with an SSB QSO with PJ2BR. The same day saw another stretch of the 432MHz propagation, with FG4ST being worked over a distance of 3911km.

On April 10th, D4VHF worked 9Y4D at 4007km on 432MHZ FT8 – which was good to see, as Chris 9Y4D had been the first to hear D4VHF on the band – not only another stretch of the 432MHz record, but a new continent, South America, on the band! Another remarkable QSO took place on 432MHz, between D4VHF and FG4ST who was running a Diamond X50 vertical and 50W – pure magic!

What a remarkable series of QSOs! I am sure there is more to come over this path – for example the north east coast of Brazil starts to look in range from Cape Verde given the right conditions and the right stations.

Lockdown Radio

I'm writing this with 'lockdown' in progress to try and stem the tide of Coronavirus. I am pleased to see many amateurs are taking advantage of their time at home to get on the air and/or work on their stations. A few weeks ago, I was pleased to hear an Irish amateur on one of the repeaters saying that he had dusted off some of his equipment that had been unused for some while, so that he could keep in touch with the outside world. I think more generally I have noticed more weekday activity on most bands and indeed, some of our band reports reflect this.

I was particularly pleased to see that the RSGB were making more provision for online Foundation examinations and can only hope that this will continue long after Coronavirus is a distant memory. I'm similarly minded about the Foundation practical assessment, which has been suspended for the duration of the current situation. There is certainly value in showing new amateurs how to perform various tasks that could be done in person, or by video. Do they really need to be examined practically on it? I'm not convinced it's crucial and cannot be learned or examined another way, in the written paper perhaps. I mean no disrespect to those of you who feel differently or who have done dedicated work on this part of the syllabus in the past.

I gather that online sales of CB and PMR as well as amateur radio equipment have been strong as people seek ways of keeping in touch with friends and communities – and it's intriguing to see that happening in this situation, alongside the pervasive use of mobile phones and internet communication channels.

Talking of internet communication channels, the Zoom videoconferencing software has been widely used during the lockdown period, including, it would seem, by the Cabinet, which probably gave security advisers a few heart-stopping moments! More interestingly, for me, though, were reports that some UK radio clubs had been incorporating Zoom with their on-air nets.

My initial reaction was to wonder whether it wouldn't be tempting to do the

1. Colin G8YIG's 40 year old Jaybeam 432MHz yagi – ready to get back on the air.
2. Patrick WD9EWK's Mode L/V station for AO-92. The pink bin is a key component!

whole thing over Zoom, thus making the 'on-air' component of the net less relevant, but I gather that this was not the case and that audio was solely carried on VHF and Zoom was just used for video exchange. It's quite a nice touch and probably enhances the net experience – giving the opportunity to show things in the shack or similar and, of course, when radio clubs are not able to meet, then it's nice to be able to see each other. Although, as I reflected to a friend the other day, there are times when I am very glad that it is radio and that my QSO partner cannot see me! I do wonder whether, if people get used to seeing each other during nets, this may be a boost for amateur television activity and interest.

Zoom also affords the possibility of doing remote presentations and talks, something which radio clubs have also been trying out. Although perhaps it's not as enjoyable as all meeting up, it does mean that you can cast your net for speakers much wider without having to pay travelling expenses and so on. This is something else that I rather hope might continue after the Coronavirus outbreak is over – where clubs have the option to have 'remote presenters' and are comfortable with the logistics and technology for doing so. If any club secretaries reading this would like to have a go – I'm very happy to present any of my talks remotely – just e-mail me and let's see what we can do.

The NanoVNA–First Impressions

It was my birthday a few days ago and **Julie** kindly gave me a NanoVNA. If you've not seen one, they are a very small, low cost, vector network analyser. I'd seen them mentioned for quite a while and wondered what I might use one for. It wasn't until I saw a video the other day of someone using one to experiment with an antenna that the penny really dropped!

It's a standalone device with a built-in screen and controls, but I found I got more out of it when I installed the NanoVNA software on my PC and connected to the unit by USB connection. There's lots you can do with one and I have only scratched the surface so far in looking at the resonant points and SWR of various antennas. For example, the other day, I connected up a 'dual-band' antenna that I was suspicious of as not being as 'dual-band' as it said. Actually, I was wrong. It showed sharp resonance around the 2m band and then around 70cm, a much broader but less sharp resonance. Various handheld antennas, including 'is it fake, is it not' aftermarket examples have been tested. It's all very interesting and I am looking forward to learning much more. If you haven't looked at one and like playing with antennas it's something you'll probably enjoy. Cost is fairly low, between £30 and 40, so shouldn't represent a huge investment *(and, as it happens, look out for my review of one next month – **ed**.)*.

Twitter

Readers may well remember that my Twitter ID used to be shown at the top of each column and then it vanished! I gather that our publishers do not like to use it. I was disappointed by this as I find Twitter a very useful of keeping in touch with many of you and enjoy the messages that we exchange. So, just a reminder that you can still keep in touch using Twitter and my ID is @gw4vxe – see you there. You can also follow @REnthusiasts the official Twitter account of *PW* and our sister magazine, *RadioUser*.

The 6m Band

Kevin Hewitt ZB2GI (Gibraltar) is also in lockdown and therefore portable operation from the top of the rock is precluded. Kevin found a weak 6m opening to Italy on March 24th, when he worked IW0BCF (JN61), EA7SG (IM76) and F8ZW (JN38), all on FT8. On March 28th, there was a good opening into the UK, when he worked G0GGG (IO81), G4FKA (IO81), G3OIL (IO91), G1GEY (IO94), G0CER (IO82), G0PQO (IO92), G0JHC (IO83), DK9KX (JO30), G0LGS (IO81), G4APJ (IO83) and EA7JNC (IM76) on FT8. Kevin also worked EA7JNC on FM.

Peter Taylor G8BCG (Liskeard) has his antenna arrays back in the air after the winter storms. He's worked some new stations on 6m EME this month, including UT7UV, EY8MM (DXCC 91 off the moon!), K8CX, YL2GD, I4YRW, JM1OAX, YL2AO, S50A, DL8YR and also YB2MDU (DXCC 92 off the moon). Peter says that **Bint YB2MDU** is well known to 2m EME folks but is new to 6m and is much in demand. Peter also managed to catch a few of the early season Es openings.

With the V-2000 in the air at **GW4VXE** (Goodwick), I have been monitoring 6m FT8 again. The first local QSO was with GW1JFV (IO71) on March 13th with QSOs across the water to EI8KN (IO62) and GW0PLP (IO72) quickly following. The first Es opening of the year for me was on March 24th when around 40 stations were worked from I, HB9, EA, F, and G. Next day, I caught a quick opening to DL9RDM (JN68), EA6XQ (JM19) and EA5DF (IM99). On March 27th I found IS0BSR (JM49) and then on March 28th the band was open to EA5, EA7 and CT. It's also interesting to note that I am hearing a lot more from Scotland here, with the excellent path to the north across the water.

Phil Oakley G0BVD (Great Torrington) took part in the 50MHz contest on April 12th working GW0GEI (IO72), G4FKA (IO91) and G3WGN (IO80).

The 2m Band

Jef VanRaepenbusch ON8NT (Aalter) listed stations worked over 400km as well

as unusual callsigns that he'd worked: G4ASR (IO81) worked on CW and SSB, G0LTG (IO81) worked on SSB and LX1ER (JN29) and PA800D (JO21) worked on FT8.

Mike White K7ULS continues his excellent 2m moonbounce activity and on April 2nd, worked 12 stations, eight of them for the first time. Mike runs a single 18-element Yagi and 350W. Stations worked were R6CS (KN95), IK4WLV (JN54), S54AC (JN86), IK2DDR (JN55), S52LM (JN65), GW4BVE (IO82), DK5AI (JO51), DL8II (JN49), DL9DBJ (JO31), OE5KE (JN78), SM5CUI (JO89) and MW0HCC (IO83). With his single Yagi, Mike worked a couple of two Yagi stations and one single Yagi station, DK5AI.

Simon Evans G6AHX (Twyning) says that the local VHF/UHF activity is up due to the lockdown with the **Cheltenham Amateur Radio Association** having on-air meetups instead of the monthly meetings. Simon took part in the April 2m UK Activity Contest and wondered whether the lack of portable activity would be very noticeable. As it turned out, Simon worked 21 stations, including G7RAU (IN79), but his best DX was GM3SEK (IO74)

Here at GW4VXE I've been enjoying FT8 on the band. I use both vertical and horizontal antennas, but very often use the vertical for monitoring unless a particular direction looks especially interesting. Highlights during the month have been G4YTM (IO93), EI4GGB (IO63), G4PDF (IO93), G0BBB (IO91), GM0HBK (IO77), EI20C (IO51), M1AIX (IO83), EI4KP (IO52), G0UWS (IO91), EI8KN (IO62), G0JEI (IO93), G8BCG (IO70), G0UYT (IO92), M0DHO (IO91), EI6KO (IO63), G0IUE (IO81), GU8FBO (IN89). Each QSO over the mountain ranges feels like an achievement – great fun!

The 70cm Band

Apologies to **James Stevens M0JCQ** (Berkhamsted) whose report I managed to miss out last month. James was testing a new mast and rotator in his back garden during the March 70cm UK activity contest and writes, "*I was really happy to work some DX (all SSB). Both ON5AEN (JO10 at 321km) and PA1BVM (JO21 at 420km for best DX) came back to my CQ calls. I also managed to get the attention of GM3SEK (IO74 at 417km) who gave me a 58. The next step is to add a preamp to the mix; everyone was hearing me better than I could hear them! Antenna used was a small 10-element Yagi*".

Colin Fawcett G8YIG has been refurbishing his 40 year old Jaybeam 432MHz Yagi and is hoping to have it on the air in time for the April 70cm UK Activity contest.

It's been nice to get back on 70cm FT8 here at GW4VXE using the V-2000 vertical. Only fairly local contacts so far but GW1JFV (IO71), G8IXN (IO70) and MW1BAJ (IO71) are all in the log.

Satellites

Jef ON8NT has been very active. On EO-88 he worked PI4DHV (JO22), IW3RGK (JN65), EB1HRW (IN71) and IW3HRT (JN55). AO-91 produced M0KPW (IO84), EA1PA (IN71) and DL4EA (JN48) while on AO-92 Jef found IW3HRT (JN55), DC5MJ (JN58), MI0KOA (IO74), IW3HRT (JN55), EI5EV (IO62), 2M0SQL (IO87) and EA1PA (IN71). On the XW-2 satellites, Jef worked G4GVB (JO02), EA8CUZ (IL18) and DL5FAB (JN49).

Patrick Stoddard WD9EWK reports from Phoenix, "*After my last road trip on March 13th to south-eastern Arizona, my travels to hamfests or just to operate from different locations came to an end. For now, all of my satellite operating is from home. Instead of going to the office during the weeks, I have been working from home for the past month. I have additional opportunities during the weekdays to get on the air, opportunities I don't normally have when in an office. I can't be on the air full-time, but it is nice to take breaks from the day job and spend a few minutes on the air.*

"Ever since AO-92 was launched in 2018, I have been active when it is in the L/V mode – uplink around 1267.360MHz, downlink around 145.880MHz. My uplink setup started with an Alinco DJ-G7T and a small 5-element Yagi made by Comet in the early 1990s. Even with 1W on the 23cm band, I was heard through the satellite, and made contacts. I tried another old 23cm HT, an Icom IC-12GAT, which also worked. I upgraded the antenna last year to a 10-element 23cm Yagi I found on eBay, and saw an improvement straight away. In the past few weeks, I purchased an old Kenwood TM-541 23cm FM mobile radio. The TM-541 can transmit at either 1W or 10W, so this should be another improvement on my AO-92 L/V setup.

"The DJ-G7T can tune in 5kHz steps, even on the 23cm band. This is important for AO-92 L/V, as the satellite's AFC function isn't as effective on weaker uplink signals when those signals aren't on the uplink frequency AO-92 is expecting. Stations need to tune carefully, to ensure the satellite hears the uplink signals throughout the passes. The TM-541's smallest tuning step is 10kHz. This has been a challenge at the start of passes, but the larger tuning step isn't as much of an issue when coupled with the higher transmitter power. Using 10W, the AFC on AO-92's uplink receiver can pick up the signals when they are more than a kilohertz or two off the frequency the satellite is expecting. Using the up/down buttons on the TM-541's microphone, I don't have to touch the radio during a pass, except to reduce transmitter power to the low (1W) setting.

"With the TM-541 on my trash bin, and my TH-D74 HT clipped to me to receive and record the 145.880MHz downlink, I have had an easier time getting through AO-92 when it has been in the L/V mode lately. Add in more stations trying AO-92 L/V with the Icom IC-9700 VHF/UHF transceiver, along with others who are either using the DJ-G7T or other older 23cm radios, the AO-92 L/V passes have been more productive than a year or two ago. The DJ-G7T will remain part of my kit, as it is a very portable option for an uplink radio. For FM satellites in the U/V (70cm uplink/2m downlink) or L/V (23cm uplink/2m downlink) modes, the DJ-G7T can work those satellites full-duplex as long as there isn't any RF interference around those frequencies".

Digital Voice and Internet Linked

Phil G0BVD has been listening to the Lockdown net at 0800UTC (9am) on Hubnet and says it's fun to listen to for an hour. Phil has also been using the Peanut application and making some interesting contacts around the world. He's still working on getting the IC-9700 working in D-STAR terminal mode but is making progress.

Digital TV

Graham Jones G3VKV (Cheltenham) says, "*I've been doing a bit of DATV with G4FRE and G4NZV but damaged my minitiouner receiver by dropping the BNC input plug on a 12V rail, which sent 10A through the receiver down the USB cable to the computer, which was earthed. The minitiouner supply was a wall plug so the case was floating, big mistake. It's a good job the USB interface is a plug-in board but it's a good way to lose £25 quickly! BATC are sending another (they only had one left)".*

And finally

That's it for this month. Thanks for all your reports and news – please keep them coming. Most importantly I wish you and your loved ones good health.

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Base-Loaded Verticals for the Low Bands

Steve Telenius-Lowe PJ4DX describes how to base-load a wire vertical for the 160, 80 or 40m bands.

Steve Telenius-Lowe PJ4DX
teleniuslowe@gmail.com

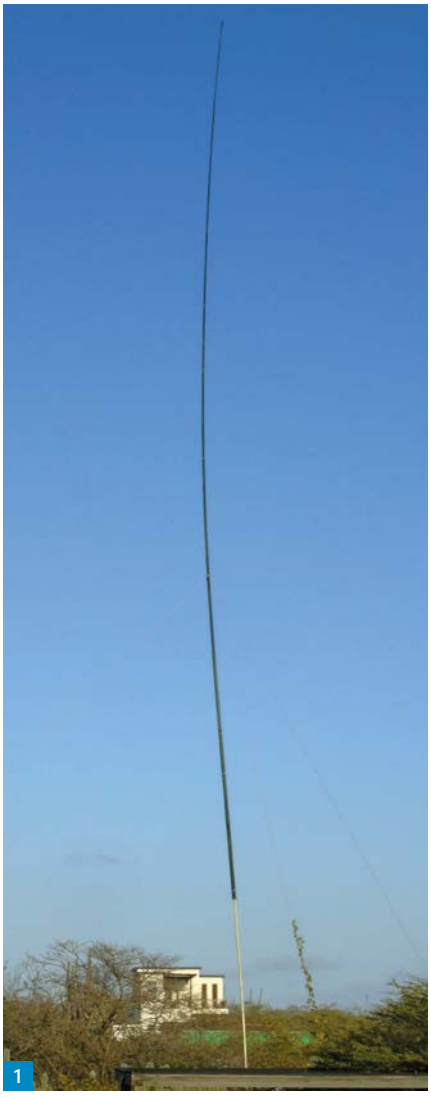
The antenna to be described here was born by necessity. Although the antenna made, **Fig. 1**, is for topband (the 160m/1.8MHz band), the techniques are equally valid for 80m and 40m, and examples are given for those bands.

The Requirement

For six years I used an inverted-L antenna on topband. Originally this was a 3/8λ long antenna with a few quarter-wave long elevated radials but results were disappointing and the antenna was soon modified to a quarter-wave design, **Fig. 2**, with about a dozen random-length radials lying on the ground. The vertical part was about 22.5m (74ft) high and the horizontal wire 18.5m (61ft) long.

This latter arrangement improved the performance considerably compared with the earlier 3/8λ design, allowing me to get to 110 topband DXCC entities confirmed on Logbook of The World, LoTW, **Fig. 3**, using only CW and SSB (no FT8 or other data modes).

Several people have asked me about the construction of the 22.5m/74ft vertical. It is quite simple. I used an 18m fibreglass pole made by Spiderbeam **[1]**, available in the UK from Nevada **[2]**, sitting on top of a 6m heavy-duty aluminium pole. A U-clamp fixed about half a metre from the top of the aluminium pole stops the fibreglass pole from dropping down any further. The aluminium pole is secured to a sturdy concrete pillar in the garden using two ratchet straps, while the fibreglass pole is guyed in three directions about half-way up, allowing the top part of the antenna to sway in the wind. I used a single length of insulated wire about 41m (134ft) long, wrapped loosely around the fibreglass pole and pulled out several centimetres away from the aluminium pole (to prevent potential arcing problems), with the end of the horizontal (or actually sloping) wire tied off with a long length of lightweight string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to a distant lamp post, **Fig. 4**.

However, disaster struck in February when after six years of flexing about in the wind the horizontal wire broke off at the top of the antenna. I was left with a quarter-wave vertical for 3100kHz (which is no use to anyone!).

The obvious thing to do would be to bring the pole down and replace the whole length of wire, but since the pole was put up the garden had grown considerably, making it difficult if not impossible to lower the pole without damaging many plants.

Loading Coils

A quarter-wave inverted-L is just a shortened quarter-wave vertical with top loading. An alternative to top loading is base loading, in the form of a loading coil, making the resultant antenna rather like a giant HF mobile whip.

Herein lay a problem, though. I had no idea what amount of inductance would be required to lower the resonance of the vertical from 3100kHz to around 1830kHz and, even if I did know the size of the inductance required, I also had no idea how physically large such a coil should be, nor how many turns of wire would be required. The maths required to calculate the necessary impedance from scratch was beyond my Applied Mathematics A level so I was in the dark and grasping at straws, but fortunately a couple of websites came to the rescue.

The first was M0UKD's amateur radio blog, which has a section called *'Calculators'* **[3]**. Within that, there is a *'Loaded Quarter Wave Antenna Inductance Calculator'*. This allows you to input your frequency of choice, the length of the vertical element, the coil position (i.e. its distance from the feedpoint) and the diameter of the wire used for the vertical. The program then calculates the impedance of the loading coil required.

I input 1.830MHz, a 22.5m long vertical, zero for the coil position (as it is at ground level) and 2.5mm for the wire diameter. The program calculated the required impedance to be about 35μH.

But how to make a coil of 35μH? This is where the second website came in – that of '66pacific.com resources for amateur scientists' **[4]**. This also has a *'Calculators'* section and within that a *'Coil Inductance'* calculator. In this case you input the number of turns, the diameter of the coil former and the length of the coil and it calculates the impedance in microhenries.

Not really having much of a clue as to how physically large the necessary coil would be, but also being aware that to keep losses as low as possible you need to use as large a diameter coil as is feasible, I

Fig. 1: The 22.5m (74ft) base-loaded vertical for 160m at PJ4DX. Fig. 2: Basic design of quarter-wave inverted-L antenna. Fig. 3: Excerpt from 160m Logbook of The World record. Fig. 4: The PJ4DX 160m inverted-L, prior to February 2020 (the horizontal or sloping part of the antenna wire has been drawn in for clarity).

bought a 3.8-litre liquid detergent bottle made of plastic (and as it will take months to use up all that detergent I had to decant the contents into several smaller bottles before I had a suitable coil former!). The bottle was 15cm in diameter and the usable (circular) part of the bottle was a maximum of 17cm in length. The only fixed dimension was thus the diameter.

A little trial and error revealed that 19 turns over a length of 16cm would provide an inductance of 35.1µH, definitely close enough to the 35µH that I was aiming for.

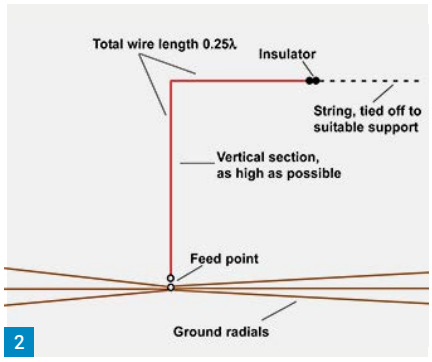
Making the Coil

Allowing for inaccuracies I put 20 turns on to the plastic bottle. I calculated that 20 turns on a 15cm diameter former would require 20 x 15π = 942cm of wire. Hard drawn copper wire is impossible to source on Bonaire but I did have a suitable length of insulated 2.5mm single-strand copper wire.

I cut a length just under 10m long and wound it tightly on to the plastic detergent bottle. To keep the wire secured and to stop it unravelling. I cut a tiny slit into the bottle using a Stanley knife and pushed a long cable tie into the slit. The wire just fits through the eye of the cable tie (with a bit of persuasion) and this was sufficient to keep the end of the wire anchored as I wound the coil. I stripped the insulation off the last three turns to allow for finding a tap for the best SWR. Another cable tie at the other end of the coil, over the bare wire, **Fig. 5**, kept the coil secure and reasonably neat. A turn of duct tape over the exposed eyes of the cable ties stops them from popping out of the slits.

Results

The coil was connected at the feedpoint at the bottom of the vertical wire. The first test was a bit of a disappointment. Using a RigExpert AA-54 antenna analyser I measured the minimum SWR point to be at around 1550kHz in the medium wave broadcast band – way too low in frequency. Even with the tap point at the top end of the bare wire, three turns higher (i.e. a total of 17 turns), the point of minimum SWR was still well below the bottom of the 160m band.



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The impedance of the coil was considerably higher than the 35µH expected, because I ended up making the coil with much closer spacing than the design called for. Cutting away a small length of plastic insulation a few turns higher and using a crocodile clip to find the best tapping point, **Fig. 6**, I eventually found a place where the minimum SWR was at 1830kHz, exactly as originally planned, **Fig. 7**. I ended up with only 15 turns, rather than the 19 calculated. In hindsight, and so as to make the coil as low loss as possible, I should have used more turns spread out over a greater length. Once you are close to the desired frequency, small adjustments to the frequency of the minimum SWR can be made by squeezing the turns closer together or spreading them a little farther apart.

The SWR at 1830kHz was 1.4:1 and the antenna had a 2:1 SWR bandwidth of 100kHz, from 1775kHz, below the bottom of the band, to 1875kHz (though this was measured at the end of a long length of RG-8X feeder, the effect of which is to 'flatten' the SWR curve. A shorter length of coax would have a narrower 2:1 SWR bandwidth).

I was anxious to try out the new antenna and waited impatiently for nightfall. The first station I heard on the band was **Max IZ4DPV** who was operating as D4F from the D4Z contest station in the Cape Verde Islands. He was calling CQ on 1845kHz SSB with a genuine 59 signal from the other side of the Atlantic, 4800km away (that his signal was so strong is not really surprising if you see the D4Z antennas and mountain-top location, **Fig. 8**). I gave him one call, we exchanged 59 reports each way and our names and that was that. The base-loaded vertical was clearly working fine.

With nothing to compare it against it is impossible to say whether the base-loaded vertical is working as well as the previous inverted-L had done. Theoretically top loading is more efficient than base

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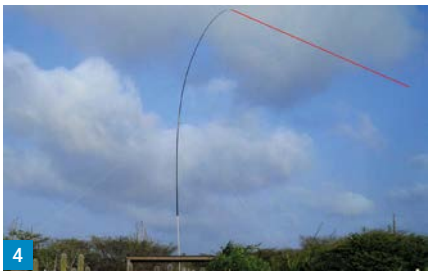
3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loading, so it's possible my signal is a dB or two down on before, but needs must and subsequent QSOs have given the impression that in fact there is little to choose in performance between the two antennas.

Other Bands: 80m

Not everyone will want to put up such a tall vertical in order to operate on topband, but the principles can be extended to other bands. Many amateurs in the UK with small gardens either don't operate on 80m at all or, if they do, it is with compromise antennas such as the half-size G5RV.

A full-size quarter-wave vertical for 80m is about 20m (65ft) high and is therefore out of the question for many people in urban or suburban locations. But one of the Spiderbeam **[1]** 12m-long poles is visually fairly unobtrusive and could easily be used to make a base-loaded vertical for 80m.

Using the two websites referred to earlier we can see that with 2.5mm diameter wire wrapped around a 12m long fibreglass pole, for a design frequency of 3800kHz you will need a loading coil of about 12.7µH. For the CW end of the band, at 3500kHz, the inductance would need to be about 16.5µH.

Taking the mid-band average of around 15µH, this could be achieved with a coil of 12 turns over a length of 14cm on a former 15cm in diameter. A smaller

Fig. 5: Using cable ties to 'anchor' the loading coil wire to the coil former. Fig. 6: Using a croc clip to find the tapping point for lowest SWR at the desired frequency of operation.
Fig. 7: RigExpert AA-54 screen shot showing SWR curve of 160m base-loaded vertical.
Fig. 8: The D4Z/D4F antennas on a mountain top in the Cape Verde Islands.

former (such as a glass wine bottle of 7cm diameter) would require 20 turns over a length of 10cm in order to achieve a similar inductance.

7MHz/40m

By the time we get to the 40m band loading an antenna is not usually necessary because a full-size quarter-wave vertical is only 10m high. But even this may be too much for some people in particularly sensitive or restrictive areas, so I looked at the possibility of using one of the very low-profile 6m-long telescopic poles sold by SOTABEAMS **[5]**, among others, to make a 40m base-loaded vertical.

Once again, using the M0UKD and 66pacific websites, we can see that for a design frequency of 7.1MHz and a 6m long vertical of 2.5mm wire, the inductance required would be about 7μH. This could be achieved with a coil of 14 turns on a 7cm diameter former (e.g. wine bottle) over a length of 10cm.

Summing Up

Calculating inductances had always been a bit of a mystery to me, so I was pleased to find the two websites that took all the hard work out of the mathematics needed to calculate the necessary impedance, and the size of coil required to achieve that impedance. They definitely de-mystified the subject for me and, thanks to these sites, designing and making simple loading coils to reduce the height of low-band vertical antennas to more manageable proportions is not an arduous task.

All the figures in this article are 'ball park' approximations. The spacing between the turns (i.e. the overall length of the coil) has a knock-on effect on the number of turns required, as I found when I made my 160m loading coil too 'short'. If you are using a different gauge from the 2.5mm I used for the vertical wire, you will need to increase or decrease the number of turns (or increase or decrease the spacing between the turns) as appropriate. There are several variables, all of which interact with each other, so experimentation is the name of the game!


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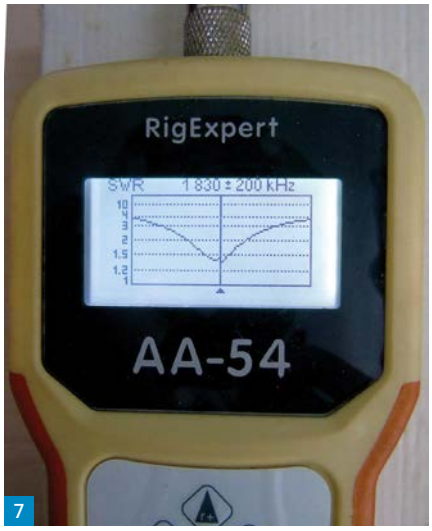

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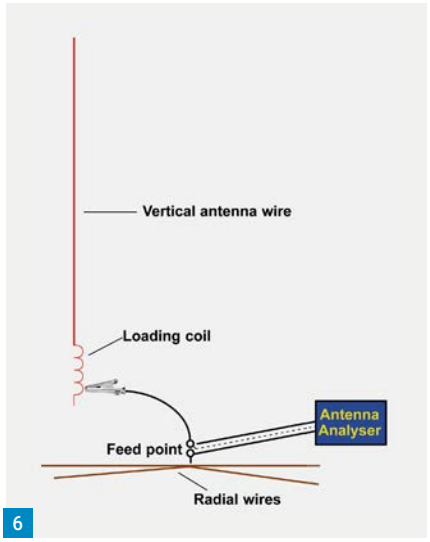
As with all quarter-wave vertical designs, a ground system of radial wires is necessary for base-loaded verticals to work properly. An article I wrote for *PW* a couple of years ago **[6]** offers some guidance on radials. Try to put down 16 ground wires of 0.1λ in length as a minimum.



6


8

As an aside, I have noticed that the 66pacific.com website often shows a *'Server Error in '/' Application'* page. I'm not sure why this is, but nevertheless the website does work most of the time.

References

[1] Spiderbeam fibreglass antenna poles: www.spiderbeam.com
[2] Nevada Radio: www.nevadaradio.co.uk
[3] Calculators section of M0UKD amateur radio blog: https://m0ukd.com/calculators
[4] Calculators section of 'Resources for amateur scientists' website: http://66pacific.com/calculators
[5] SOTABEAMS: www.sotabeams.co.uk
[6] 'Radials for Quarter-Wave Verticals – an Overview', Steve Telenius-Lowe PJ4DX, *Practical Wireless*, July 2018.

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It goes without saying all of us at ML&S wish each & every customer the very best in health for these troubling times & look forward to seeing you all fit and able in the very near future.

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British Science Week

Steve Hartley G0FUW reports on activities around British Science Week.

Steve Hartley G0FUW
g0fuw@tiscali.co.uk

"The Radio Communications Foundation (RCF) is a small charity established specifically to support people and projects where radio communications through the expertise of the radio amateur is the theme". The strategy of the Foundation is quite simple:

To bring the benefits of radio to young people; and to encourage the use of technology.

In support of those aims, the RCF has for the last two years sponsored events during British Science Week, using something familiar to schools and youth groups to provide a reason to explore radio. This year events took place at Bletchley Park and at Crompton House C of E School near Oldham.

The workshops were intended to help youngsters learn more about radio communications and electronics. They enabled the youngsters to better appreciate how radio is part of their everyday lives, to identify and select electronic components and to use a soldering iron to make a radio circuit.

While the kits and test sets used were funded by the RCF we had support from a number of others. Some parts were donated by **Graham Firth**, G-QRP Club Sales Manager, the PCBs were donated by Alfatronixs Ltd of Poole and RSGB Commercial Manager, **Mark Allgar**, arranged the printing of the instruction books. **Martyn Baker G0GMB**, the RSGB's man at Bletchley Park, and the Bletchley Park team, were also a huge help in making the necessary arrangements for those workshops.

The radio kit used for the workshops was the Spaxton Medium Wave Receiver by Walford Electronics. It is a very simple straight (TRF) circuit with just four BS170 FETs providing RF and audio amplification, with pre-wound inductors and a variable capacitor forming the tuning circuit. A Walford Electronics Spade test set was used to provide speaker level amplification and a keyed AM Morse signal.

All the young folk did really well and, according to the feedback, learned something and enjoyed themselves. The enjoyment being every bit as important as the technical learning!

1

Crompton House School

A request for schools to take part was picked up by RSGB President, **Dave Wilson**, who linked up the RCF with Crompton House School near Oldham. The school had run a Foundation training course and a number of pupils had passed their exams. A box of kits was supplied to the school and **David Haigh**, who runs the school's Robots Club, reported back as follows:

"It was a massive success. We took four hours in the end. I had two students that hadn't completed but one just needed to solder in his variable capacitor. The other needed 20 minutes more, due to a school soldering iron issue, which we did the following lunchtime using my solder station from home. His radio is ready to go through the final tests. The only issue we had was one faulty transistor, which I replaced for the student last night.

"The kids loved it and want more of the same. They asked to work through their morning break and lunch, which we did on build day. I didn't hear a peep all session, only great questions and 100% engagement. In club today they were all thanking me and asking if we can do more.

"This is a huge thing as some of the kids asking to do more builds had shown no interest in electronics last year so dropped out of Robots Club very early doors. But now I have 16 students unanimously wanting more electronic builds. I think that because everything in their exam suddenly became relevant, that helped. So, if anything else comes up in the future, please bear us in mind.

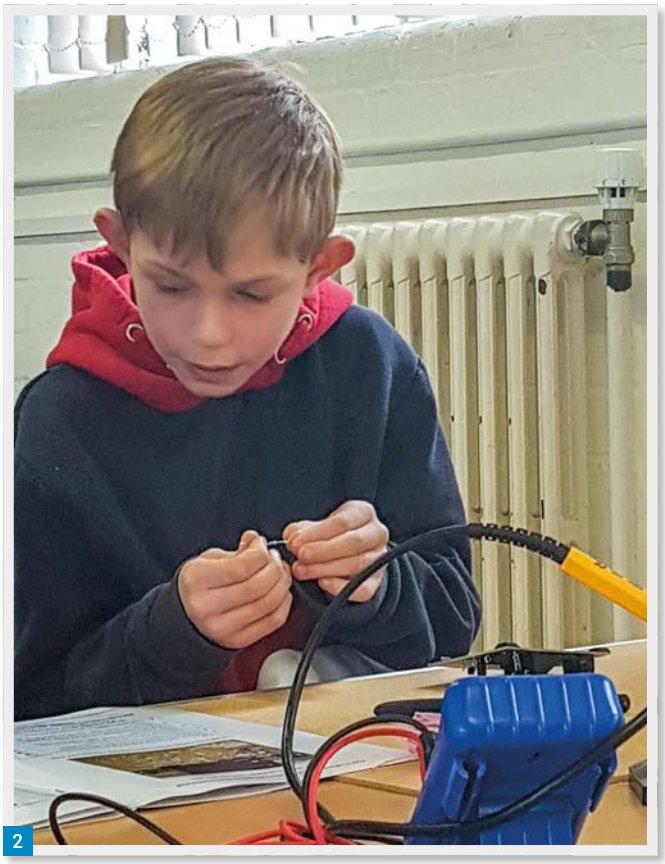
*"**Mr Reynerd** (Assistant Headteacher) was very impressed with the booklet and kit and agreed it was very high quality. His face when the first radio spluttered into life was a picture, with a grin from ear to ear. The kids were the same. Happy faces all round. Thanks ever so much for sorting this out for us."*

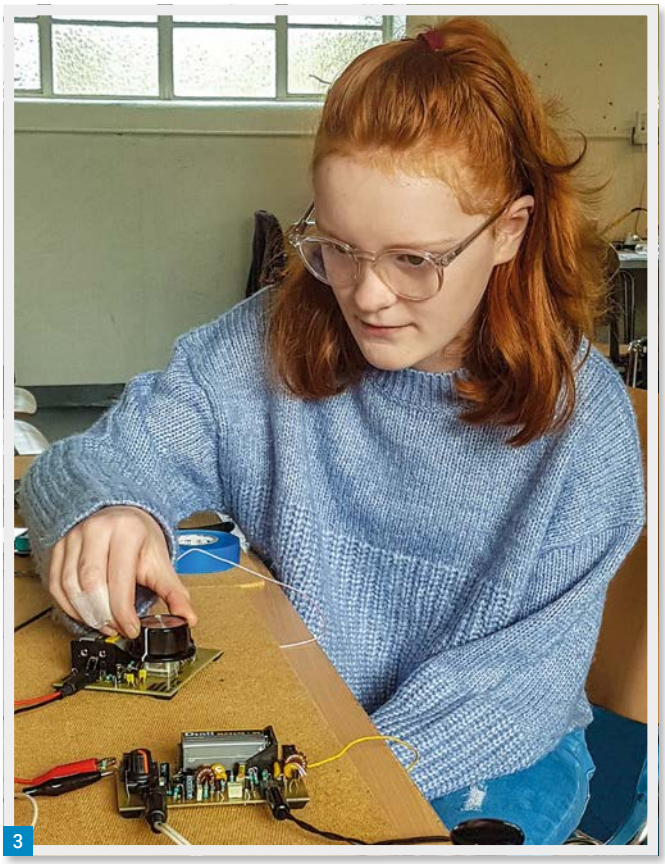
Bletchley Park

The Bletchley Park workshops were planned for half a day each with the youngsters and parents free to explore the Park, and visit the RSGB National Radio Centre, for the rest of the day.

Weblinks

- British Science Week
  www.britishscienceweek.org
- Radio Communications Foundation
  https://commsfoundation.org
- RSGB National Radio Centre
  www.nationalradiocentre.com
- Bletchley Park
  https://bletchleypark.org.uk
- Walford Electronics
  www.walfords.net
- Alfatronix Ltd
  www.Alfatronix.com
- G-QRP Club
  www.gqrp.com





1. The Spaxton Receiver 2. Oliver checking he has the right parts. 3. Pheobe was first to finish and her receiver worked first time. 4. Soma helping Rajiv with some receiver tests.

The workshops were aimed at ages 11-18 but those who attended ranged from seven and a half to 17 years of age; those under 16 were accompanied by a parent or grandparent. Some of the youngsters had built electronic circuits before but for many this was the first time they had ever seen a soldering iron. After a safety briefing and some quick tutorials, the kit building began. The concentration was amazing and some very neat soldering was witnessed.

Not everything went to plan. We had a few FETs 'pop' and a few parts needed to be switched around but all but one receiver went away working. One from the afternoon workshop had to be taken away for fixing because we just did not have time before the Park closed.

Lewis Thomas G4YTN, from the Bath Buildathon Crew, and **Soma Bola**, a STEM Ambassador, member of the RSGB Youth Group and a student at Swansea University, helped out with the kit building and fault finding. Soma said he had really enjoyed helping out and had learned lots himself. Lewis put it very succinctly: *"well, that was another successful Buildathon!"*

What about 2021?

The RCF has just a handful of Trustees and needs the help of others to make things happen. These radio building workshops show what can be achieved when different groups work together.

The experience from this year's workshops, and those held in 2019, shows that youngsters really do enjoy the practical side of radio communications and have a strong desire to learn more about this fascinating hobby.

Hopefully, we will be able to build on this success for British Science Week 2021. If you are interested in joining in, please do not hesitate to get in touch.

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HLA150V PLUS is an auto or manual microprocessor controlled band switching with 6 stage low pass filter on this solid state amplifier that will cover all the main Amateur Bands from 1.8-30MHz Suitable for all modes delivery 150W..... **£399.95**

KL703 is a new 500W linear Amplifier for use between 25 and 30 MHz, (developed for the 10m amateur radio band)..... **£399.95**

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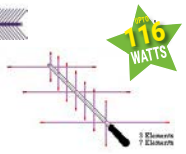

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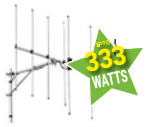

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MFJ-223 HF/6M 1-60MHz with colour graphic display.....**£399.95**
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MFJ-259C HF/VHF/UHF 530kHz-230MHz with analogue and LCD screen.....**£349.95**
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MFJ-864 Compact cross needle HF/VHF/UHF 1.8-60/144/430MHz 30/300W.....**£114.95**
MFJ-862 Compact cross needle VHF/UHF 144/220/430MHz 30/300W.....**£84.95**
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MFJ-393 are professional grade MFJ Boom-Mic Head-phone set is for contesting, DXing and traffic nets. Comfort designed leatherette padding lets you operate for hours at the rig. Superb inch thick padding on each ear and headband. The MFJ-393 is so super lightweight, you won't even know you are wearing them Available pre wired for ICOM, Kenwood, Yaesu.....**£74.50**
MFJ-392B is perfect for amateur radio and shortwave listening. Great for all modes -- SSB, FM, AM, data, and CW. Each earphone has an individual volume control. Superb padded headband and ear cushioned design makes listening extremely comfortable. High-performance driver unit reproduces enhanced communication sound. Signals never sounded so crystal clear!.....**£44.99**

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MFJ-260C 25W (300W peak) 30-650MHz with PL259.....**£49.95**
MFJ-260CN 25W (300W peak) 30-650MHz with N-Type.....**£59.95**
MFJ-250X 1kW (2kW peak) DC-400MHz with SO239 (need transformer oil).....**£69.95**
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These switches are built like a rhino, tough inside and out! A superior internal design lets them work for you for a long lifespan.

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MFJ-566M Micro CW keyer black with metal base.....**£49.95**
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MFJ
Cobweb Antenna

Restricted space spoiling your operating fun? MFJ Cobweb puts your call back on the map!

This six-band (20, 17, 15, 12, 10, 6 Meters) full half-wave Cobweb Antenna is perfect for restricted space or portable operation. Sky-gray fiberglass spreaders and nearly invisible wire elements (flat 9x9x1/2 feet square. 8 pounds), blend in with your surroundings while standing tough against nasty weather. Outstanding performance! Horizontally polarized for less local noise pickup plus solid gain over verticals will allow you to work DX easily -- even on QRP. Omni-directional. No radials needed! Works great at low heights. Low SWR is due to MFJ's exclusive Spider-MatchTM broadband network

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These panel connect devices with virtually no loss, feed-thru or cross-talk .Provides 8 or 12 Teflon SO239 coax feed thru barrel connectors to patch 8 coax fed devices together with short coax jumpers. This extremely high performance and versatile military/professional patch panel approach has virtually no loss, no feed-thru and no cross-talk

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MFJ-4706 6 position.....**£109.99**

MFJ
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Octopus antenna hub turns your ham-sticks into four fully balanced dipoles in minutes!

Mix and match any four HF/VHF/UHF bands. Example: screw in 80,40,20 meter hamsticks and a dual band 2M/440 MHz whip (two on each band) on opposite sides. Now you have an automatic band switching 5-band dipole! Rotate it for maximum signal and minimum QRM and noise with a small rotator like Hy-gain AR-500,

Works at any height, low for local NVIS and high for DX. At a fixed height, (say 20-30 feet) use 80-Meters for NVIS and 20-Meters for low-angle Exomoons on any mast up to 1-inch in diameter. Use a fiberglass pole on a tripod and you are on the air! Check out our MFJ-1919EX a perfect mount for the new Octopus Antenna. Perfect for casual portable operation, limited space, HOAs, field day, camping, and ARES during disasters. Single coax feed, built-in balun.....**£139.95**

MFJ-1234 RIGPI BASE JUST £349.95

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Two for the Price of One

Lee Aldridge G4EJB
leeG4EJB@outlook.com

Lee Aldridge G4EJB revisits the W3EDP antenna and looks at a Franklin oscillator circuit.

Well it took a lot longer than I'd hoped before I had an antenna back up. I'd flattened nearly all of my 9V batteries in my active amplifier (see *PW* April 2020) – not that it draws that much current (13.5mA). You may recall I was going to fit an on/off switch to the amplifier. Well, I duly did. The only reason for the flat batteries was forgetting to switch it off!

So, what antenna did I decide to put up? Once and for all I wanted to see how well the renowned W3EDP antenna really worked when at the same height as my previous antennas. My original attempt with the antenna was far from a comparative test. Could this serve as a respectable HF multi-band antenna at my location?

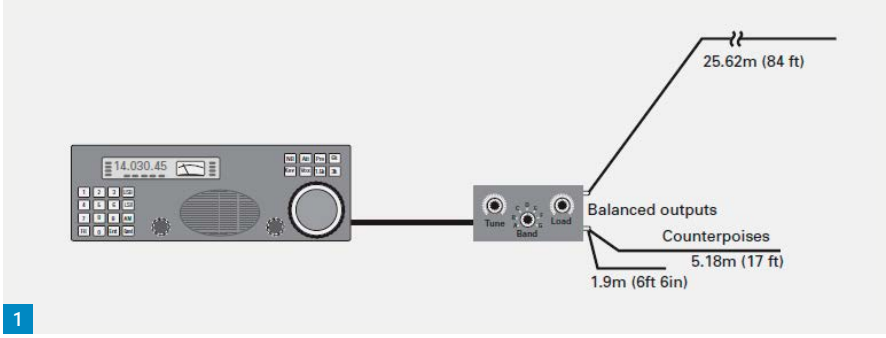
Since my first attempt with the W3EDP, I noted **George Dobbs G3RJV** had put together a *Carrying on the Practical Way* article (Feb 09) about the W3EDP antenna and a tuner.

First of all, here's George's description of the antenna: *"I have often used the W3EDP in its basic configuration of the 84ft wire and 17ft counterpoise and found it possible to tune on all amateur bands from 3.5 to 28MHz (80 to 10m).*

"The usual explanation for the success of the W3EDP is that it functions like an end-fed Zepp antenna. The Zepp antenna takes its name from the antennas that once trailed from Zeppelin airships. If this explanation is accurate, the counterpoise wire is part of the radiating system and is best not left trailing along the ground. The W3EDP antenna is shown in ***Fig. 1****."*

I stuck with the basic arrangement for the W3EDP antenna that George had described. Last year I had built the basic tuner he had shown in **Fig. 2** so it was pressed into use again**.** Full constructional details can be found in George's *QRP Basics* book available on the Radio Enthusiast website at:
https://tinyurl.com/t426wqr

Anyway, the G4EJB version of the W3EDP, **Fig. 3**, has a vertical section of 21ft from the feedpoint, and then is strung between my two wooden masts at a height of 26ft, with the remaining part of the wire as another vertical section of about



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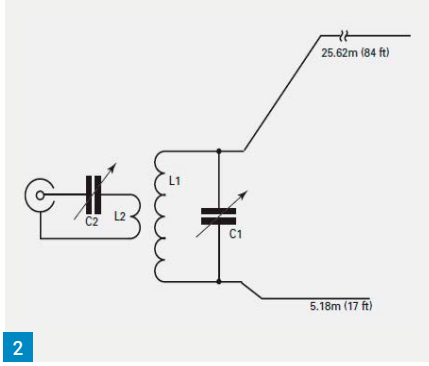

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16ft. The reason for this configuration is primarily because that's where the masts are and secondly, to stabilise the tops of the masts. I had to use the ancient method of using a counterweight on the end of the wire (I'd seen it in *Wire Antennas* by W6SAI & W2LX) – it works a treat. A pot filled with a little soil was used to start with – no expense spared here. I might be tempted to grow something in it yet.

I'd also found a short article in the GQRP Club *Antenna Handbook* on the W3EDP antenna by **Gus Taylor G8PG**. There was an interesting little note about the position of the 'counterpoise' – if possible, at right-angles to the antenna. That got my attention. So, I started out with 17ft of wire at about 5ft above ground around the outside of my shed and then later added the 6.5ft wire going the other way from my shed door, again at about 5ft.

I started on 40m with the 17ft wire, peaked the matching unit for loudest received signal before attempting to tune with my SWR bridge. Splendid, a 1:1 match was obtained. Taking a listen around the band, it seemed busy and there were plenty of strong European signals.


3

More Tests

Next day, I thought I'd try 30m with the 17ft wire. On my first attempt, I struggled to get the SWR down to something reasonable so I gave 20m a go. The SWR was around 3:1. Time for the 6.5ft wire. The receiver burst into life and the SWR was easily brought down below 1.5:1. A tune around

Fig. 1: W3EDP antenna arrangement described by G3RJV.
Fig. 2: G3RJV tuner circuit.
Fig. 3: The W3EDP antenna at G4EJB.
Fig. 4: The Franklin oscillator circuit.
Fig. 5: The Franklin oscillator being played with.

the band late evening was rewarding with good signals from Europe, North and South America. So good, I attempted to call a W3 with a good signal. No, 2W didn't cut it this time as I was competing against others and who knows how much power the W3 was using.

Eventually I sorted out 30m, the 17ft wire worked best after all. I must have mis-tuned the matching unit first time. Once I'd sorted out my radio netting, I made contact with a station in northern Italy. Conditions weren't brilliant but I received a respectable 559 with my 1W.

The RSGB website provides an insight in to the W3EDP antenna, including the original article at:
https://tinyurl.com/won762x

There are many articles online about this antenna, with various feed arrangements and how 17ft balanced feeder can be used for the W3EDP, particularly portable versions. **John Parkin WB6V** shares his experience of the W3EDP antenna on YouTube at:
https://tinyurl.com/yc54pjgc

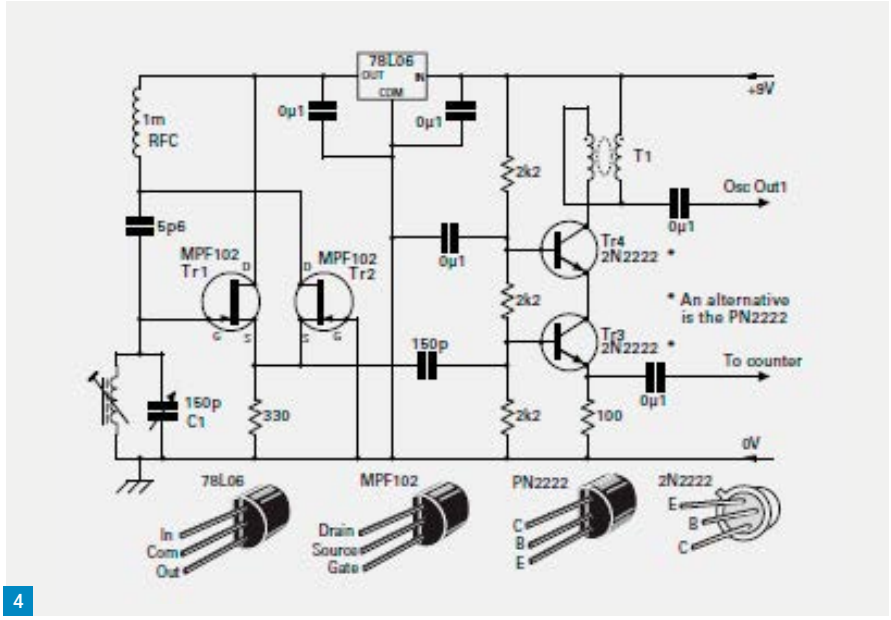
I found a more in-depth article on the W3EDP by **Charles Lofgren W6JJZ** on:
https://tinyurl.com/rgp7lwu

I noted his comments about the hand capacity effect with the tuner on 30m – I'd had the same.

I haven't had enough air-time yet but I can assure you that the antenna will stay up. I may make changes to the feed arrangement, but I'm impressed with how well it works. I know I'm fortunate to live in a quiet location and the antenna hasn't increased the background noise level. My next task is to build a Z-match so that I can really try it out across the HF bands – yes, you've guessed who penned that article.

The Franklin Oscillator

While waiting for decent weather to put up the W3EDP antenna, I had been busy building a mixer VFO for my old 40m Howes SSB Daventry/Rugby transceiver. Having built numerous types of oscillator, I'd recently come across a Franklin oscillator design in the G-QRP *Sprat* by **David Smith G4COE**. I built the oscillator and it worked very well. But while looking through George's work in *PW*, I saw his



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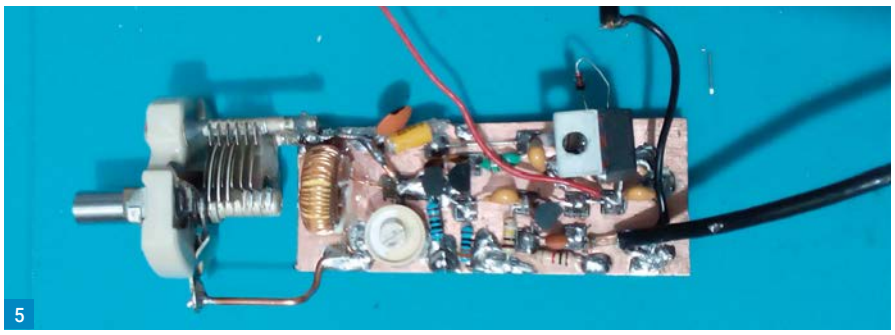
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Feb 2011 article and decided to see how the oscillator originally devised by **Andrew Woodfield, ZL2PD** compared as it used one less capacitor (more cost cutting). See **Fig. 4**.

George's insight: *"The Franklin oscillator was the brainchild of **Charles Samuel Franklin** (1879 – 1964), a notable British radio pioneer who published his work as C.S. Franklin. Franklin trained at Finsbury Technical College in the 1890s and spent his entire working life with the Marconi Company and was credited with the invention of the variable capacitor (patented in 1902).*

"The Franklin oscillator is capable of a wide frequency range, the only frequency determining components being a tuned circuit consisting of an inductor and capacitor with one end grounded. The capacitors and resistors in the oscillator circuit remain the same regardless of the frequency being generated. It is a truly universal variable frequency oscillator (VFO) circuit".

Well, I found the oscillator worked fine but mine appeared to have slightly distorted output. I was puzzled by the lack of a diode in the gate of Tr1 and being a meddler with circuits, I added a 1N4148 as a clamp diode to ground as instructed by W7ZOI and W1FB in numerous of their articles on FET oscillators. The distortion was removed. I even went a stage further by adding a 100kΩ resistor, hoping it didn't affect the oscillator stability – it didn't. I also lowered the supply voltage to the oscillator to see if it would reduce the warm-up time – it didn't. I did replace the buffer amplifiers of George's circuit with a very basic FET follower to present the oscillator with a high impedance (again reading W1FB's *Design Notebook*). See photo, **Fig. 5**.

The biggest issue for me now is, to fabricate a metal case to enclose the VFO with separate compartments for the NE602 mixer and crystal oscillator.

The almost final words from George, *"'I feel sure I will come back to the Franklin oscillator again!"* Sure enough he did, as can be found in *PW* May 2011.

The *Carrying on the Practical Way* CD is available from the Radio Enthusiast website at:
https://tinyurl.com/sbaqkd2

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My First Steps with Satellites

Daimon Tilley G4USI describes his journey into satellite operation.

One of the things I love most about the hobby of amateur radio is the sheer variety of new things to experiment with. For any amateur with an enquiring mind and a willingness to learn, there truly is no excuse to ever get bored with our hobby.

Having been licensed a while now I had, of course, been aware of amateur satellite working but I had never seen it in action, known an amateur who did it, or tried it for myself. In fact, while I always considered it interesting, my lack of knowledge shrouded the subject in a bit of mystery, and I suppose I always felt it was a bit specialised or out of my reach.

However, in June last year, I had a conversation with **Stuart GM7VEC** via Yaesu Fusion and CQUK. During our conversation Stuart mentioned his interest in satellite working and we discussed this at some length. Stuart very kindly followed up on this conversation with an e-mail outlining various commercial and home-brew antenna options, websites for further information and a 'screen shot' of how he had programmed FM satellite frequencies into his handheld.

I was intrigued and decided to do some more research. The school holidays were fast approaching, however, so I did not have time during the summer, but I revisited the subject in the autumn and began more detailed research.

While I found a number of websites on the subject, including the UK and American AMSAT sites, among others, I could not help but feel that there was not a single site that really provided everything I needed to know as a beginner in a single place. I did manage to cobble together various bits of information from around the web, but it was a slow laborious process. Even getting a definitive 'beginners' guide to what satellites were actually available was tough!

Interestingly, almost at the end of the journey I describe here, I did come across what I consider to be an excellent book providing many of the answers I sought – *Amsats and Hamsats* by **Andrew Barron ZL3DW**, and this book is subject of an accompanying Book Review.

Starting Out

I began by seeking out some satellite prediction software, so that I knew when to listen. For other reasons of necessity (to use my favoured SDR transceiver software) I was making the transition in the shack from Linux to Windows 10, and I think I must have downloaded all of the free satellite prediction software I could find. However, I didn't really like any of it, until I discovered that it was possible to run GPredict on Windows as well as Linux. I had been using GPredict on Raspberry Pi for a little while and liked it. Having got that working in Windows and having identified the satellites I wanted to start with, I loaded them into the software. I began with the FM amateur satellites and the ISS, as I intended to operate, at least initially, by using my handheld with a homebrew handheld Yagi, from the garden.


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Having identified the FM satellites I wanted to try, and their frequencies, I began listening on 2m FM to some of the satellite downlink frequencies. The FM satellites have uplink and downlink frequencies on different bands, typically 2m and 70cm. As can be seen from **Table 1**, most downlinks are on 2m FM with the uplink on 70cm. One notable exception is SO-50, which reverses that.

I quickly became aware that the satellites are really quite busy. Exchanges are quite perfunctory and businesslike, as a satellite is often only overhead for less than ten minutes or so, and many operators want to use it. Callsigns, signal report and Maidenhead squares are often the only information exchanged. Extensive listening from the shack on my vintage TS-700 using the homebrew 5/8th-wave vertical ground-plane antenna mounted on my eaves, was time well spent.

Having listened for a while to 'get the feel' of the nature of use, my interest was sufficiently piqued to want to have a go for myself. I wasn't set up for operation from the shack, with no desk-based 70cm rig and no beam antennas. In order to operate I was going to have to use my handheld FT-70D and a handheld beam, operating from the garden.

The Rig

I will deal with the rig first. Many sites recommend a full-duplex facility where you can hear both your uplink and downlink. This can either be achieved through a full duplex rig, or by perhaps using two handhelds. This makes a lot of sense – you can be sure you are accessing the

Fig. 1: Drilling the tubing to take the extension.
Fig. 2: The extended tubing, with join.
Fig. 3: Bending the tubing.
Fig. 4: The completed dipole end.
Fig. 5: Drilling the boom.
Fig. 6: Using copper tape for the joint.

satellite, because you can hear the net result. While I had access to a second handie, I decided to keep things simple, just using the one. Now the first issue that arises here is dealing with Doppler shift.

Doppler shift is an effect caused by the relative velocity between your location and the satellite. A common example often cited is that of a police car with sirens. Although the frequency emitted by the siren is constant on each tone, as it approaches you, the frequency of the siren sounds higher, and it sounds lower (relatively) as it moves away from you. The same happens with radio frequencies used when talking through satellites, and the higher the radio frequency, the greater the Doppler effect observed. An interesting side effect of this, is that, of course, the Doppler effect at 70cm will be more pronounced than that on 2m. So, to keep things simple, what most people do for FM satellite work is to merely adjust the 70cm frequency for Doppler shift, leaving the 2m frequency alone. Note that on SSB work, the Doppler effect is more important and both uplink and downlink frequencies on SSB satellites must be adjusted.

Let me use AO-92 (also known as Fox-1D) as an example, as I am listening to that downlink as I write this article.

AO-92 has an uplink frequency of 435.350MHz and a downlink frequency of 145.880MHz. In practice we tend to ignore the Doppler effect, which is less noticeable, on 2m FM, and use that single frequency for the downlink. For the uplink however, the Doppler shift is more noticeable and if you do not change your transmission frequency to match the passing of the satellite overhead, you will not maximise your use of the window of opportunity above the horizon nor have a great deal of success.

So, for programming the handheld, I set up some memories for this particular satellite. The memories looked as shown in **Table 2**.

Memory 3 holds the published uplink frequency. We start transmitting at Memory 1. Remember that Doppler shift means that, to the satellite as it is approaching us, our frequency sounds higher than it actually is, so we transmit


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lower to accommodate this, then after the relative velocity between us has come close to nil, and it moves away, our frequency sounds lower from the satellites perspective, so our uplink frequency is adjusted higher to compensate.

What you are trying to achieve, as you track the satellite through the sky, is a change in your uplink frequency to compensate for the Doppler effect. You will start transmitting on the first frequency, be on the published frequency when the satellite is at the mid-point of its pass, and end with the last frequency. It is purely a matter of judgement when to change, and the full duplex facility suggested here should help with that, but I have not personally tried that. Some experimentation is required, along with a dose of experience, which I am still trying to gather!

Antennas

Once we have the handheld sorted, it is sometimes possible (although I haven't tried it) to communicate with the satellite with a whip type antenna. There are examples of this being done on YouTube, for example. But results will generally be much better and reliable with some form of gain antenna.

These fall into two broad camps – a crossed element dual-band Yagi or a log periodic antenna. Two very popular commercial antennas for this purpose are available from Arrow Antennas and Elk Antennas, respectively.

I like building stuff, both for the satisfaction and learning, as well as the


6

money saved. I had never built a Yagi before, so I opted to build an 'Arrow Style' Yagi. There are quite a few designs on the internet but having reviewed them, I decided on the design by **Bertrand Zauhar VE2ZAZ** and available here:

https://tinyurl.com/vfk65e3

This has three elements on 2m and six on 70cm, and is fairly easily built as long as you can measure and cut accurately. The basic antenna consists of a length of PVC conduit as the boom, approximately 30in long and in his case, Bertrand made the elements from 1/8in brass rods. In my case, I had a number of 6mm aluminium tubes (from a UK DIY store) left over from another project and decided to use those. I noted that using thicker elements can tend to lead to the need for making adjustments to the published element lengths, although a number of Yagi calculators I tried didn't seem to show a difference at these frequencies, but more of that later.

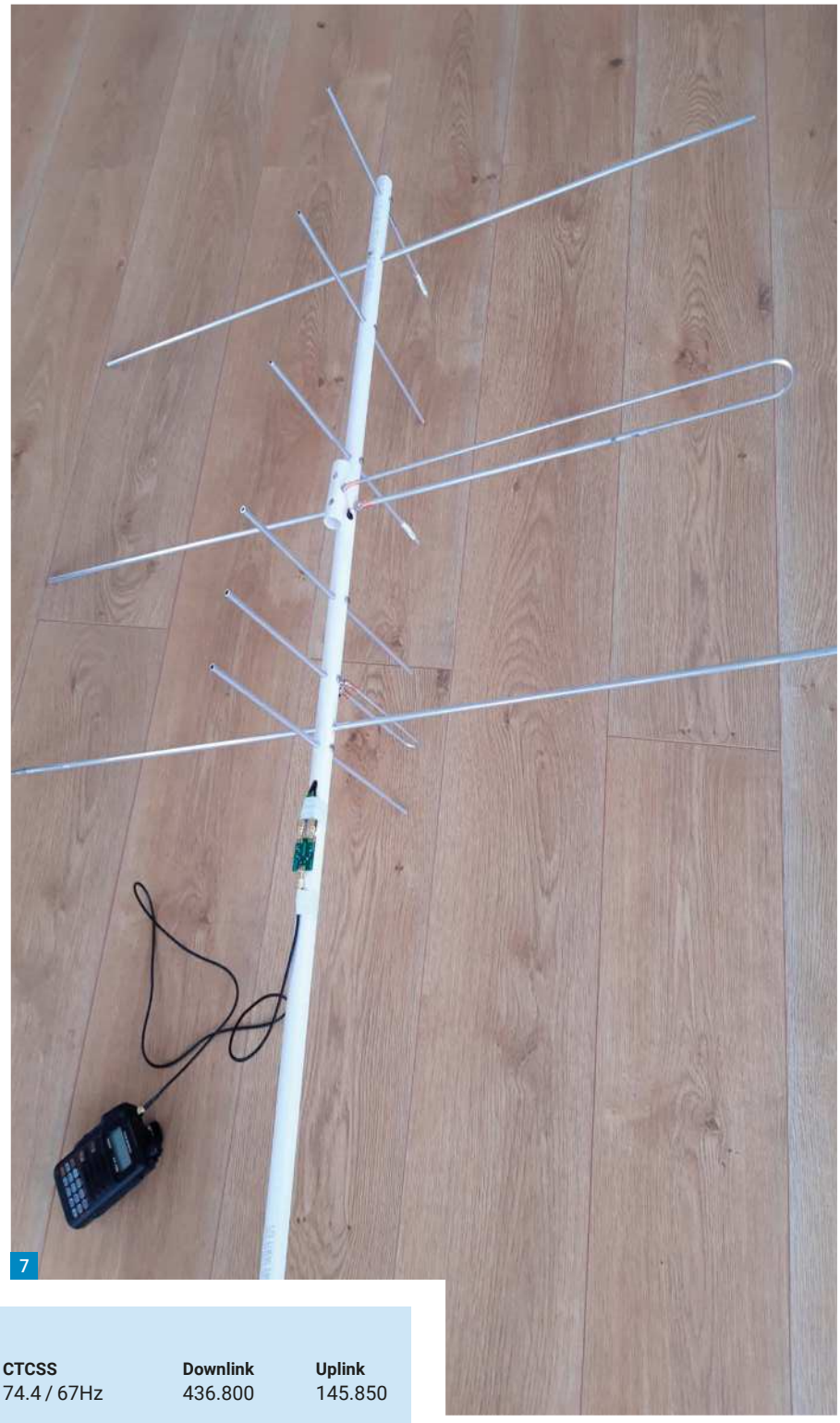
I won't reproduce his excellent instructions here, but I did make a couple of modifications to make my own design work. Most lengths of rod and tube at

these diameters come in 1m lengths, but the reflector and driven element for 2m are a bit longer than 1m so the tube needs extending. In my case I did this by inserting a solid aluminium rod into one end of the tube. To do this, I had to very slightly widen the tubing aperture with a drill, **Fig. 1**, file a taper on the rod, and connect with a fair bit of pushing and twisting, **Figs. 1, 3 and 4**. The materials are too delicate to risk a hammer, so I used brute force and then used a centre punch on the tube at the overlap with the rod to add a crimping effect in two places 90° apart. The result appears robust.

Having cut to length each of the reflectors and parasitic elements, I then carefully bent the two driven elements, **Figs. 2** and **4**. These elements are straight on one side and folded back on themselves on the other, in a semi-folded dipole approach.

The single most difficult part of the build was drilling the circular tubing so that the holes were parallel and in the same plane. I followed Bertrand's suggestion of screwing the tubing to a wooden batten and using a drill press. Even despite this, the results were not perfect, but they were close enough that with minor tweaking, all elements could be properly aligned. The elements slid through the boom neatly but despite careful drilling, **Fig. 5**, I considered the interference fit was insufficient to stop the elements moving, so I then used self-tapping screws, one per element, to secure through the boom into the individual elements.

Another hurdle to overcome was the connection between the coax and the aluminium tubing, which is notoriously difficult (is it even possible?) to solder to. Bertrand's solution is to solder his coax to his brass rods but that would not work for me. I considered mechanical connection using 'choc-bloc' electrical connectors,



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Satellite	Mode	CTCSS	Downlink	Uplink
SO-50 SaudiSat	FM	74.4 / 67Hz	436.800	145.850
AO-85 (Fox-1A)				
Daytime only	FM	67Hz	145.978	435.180
AO-91 (Fox -1B)	FM	67Hz	145.960	435.250
AO-92 (Fox-1D)	FM	67Hz	145.880	435.350
PO-101	FM	141.3Hz	437.500	145.900
Taurus-1	FM	67Hz	436.760	145.820

Schedule for PO-101 at https://twitter.com/Diwata2PH Note that for SO-50, the 74Hz tone is for opening up the transponder, and once open (by you or someone else) the 67Hz tone keeps it open during the pass.

Table 1: Some readily available satellites.

Memory	RX Freq	TX Freq	CTCSS
1	145.8800	435.3400	67Hz
2	145.8800	435.3450	67Hz
3	145.8800	435.3500	67Hz
4	145.8800	435.3550	67Hz
5	145.8800	435.3600	67Hz

Table 2: Programmed memories for AO-92.

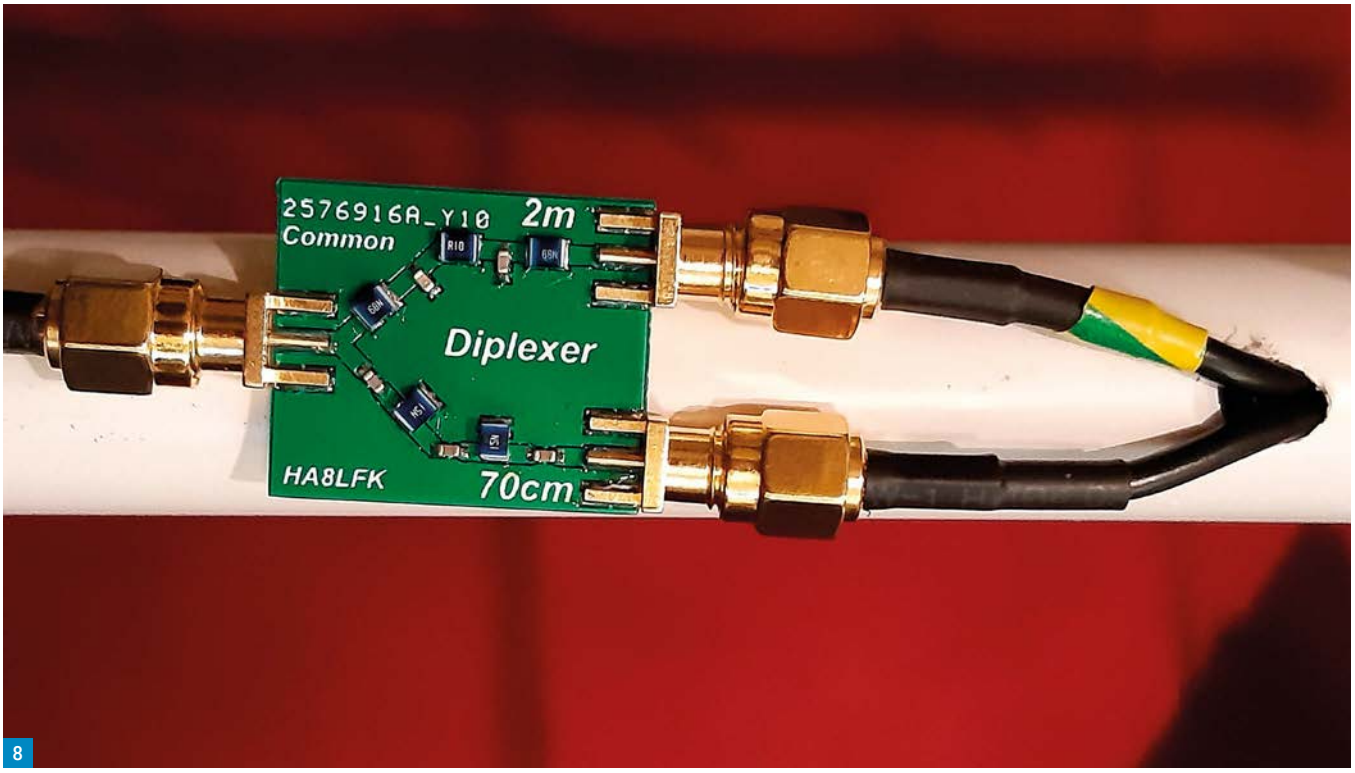


Fig. 7: The completed antenna.
Fig. 8: A view of the diplexer.

but in the end discovered that there is self-adhesive copper tape available with conductive adhesive. I promptly ordered some and tested it out and it worked beautifully with a good electrical connection made. Soldering to the tape was easy too. So, I wound some tape on the elements and soldered up some lengths of RG174, **Fig. 6**.

The final step was how to feed the antenna (shown complete at **Fig. 7**). If I used two handhelds, I could merely connect one antenna to each radio, but I just wanted the one so a diplexer was required. I did consider making one of these too. Designs are available on the internet, but I settled on a commercial one by HA8LFK for only $15. This is beautifully made, **Fig. 8**, small, neat and professional, and can be found here:

https://tinyurl.com/rcxhnvg

If I were to operate outside in the rain, I should take steps to waterproof my coax connections and the diplexer, but I don't like the rain so I didn't bother! The diplexer was fitted to the boom using cable ties and has SMA connectors for connection to the rig and antenna(s.)

On connecting my Nano VNA analyser, SWR for the 2m band was good to go, but it was high on 70cm and the driven element needed trimming to compensate – perhaps that was the impact of the larger diameter elements? A slight trim solved the problem.

Time to Operate

So, I had my FT-70D programmed for the FM satellites, taking account of Doppler, and I had my homebrew Arrow-style Yagi – time to go into the garden!

I used GPredict and looked at the time of passes that day. There were passes coming overhead for SO-50 and AO-92 in the next hour or so. I double-checked my frequencies, watched the clock tick by, and made a mental note of where in the sky the satellites would rise, reach maximum elevation, and recede.

For the first few passes, I listened only, to try to get the feel of the operating style and the antenna tracking. The next day, I set out to operate for real. I identified the relevant passes to me and headed out into the garden. At the appointed hour I was able to acquire a satellite and within a few minutes had made my first ever satellite QSO with a station in the Spanish territory of Melilla, just on the Eastern Moroccan coast. A few short minutes later and a second satellite was acquired and this gave me an Italian station.

It was when I ventured into the shack, I realised that I couldn't put these station 'firsts' in my log because I had already forgotten their callsigns! One of the issues with this style of satellite operating is that you just don't have enough hands to write things down. Many amateurs therefore record the audio of a pass, and their QSOs, to aid later logbook entries. You could use your mobile phone but I have a tiny digital dictaphone I haven't used in ten years or more, and a fresh battery soon saw this back in action, hanging unobtrusively around my neck.

Sadly, it was around that time when the British weather took a turn for the worse, so since then I have not made any further contacts, with the odd fine day being taken up with any outside chores that had been stacking up.

I definitely enjoyed it though and will be back for more as soon as I can. If I continue to enjoy it, I may well take the plunge and invest in a shack-based setup in time for the winter, but that will require a reasonably significant investment in time and money to purchase a dual-band duplex rig (essential for SSB satellites) and a Yagi antenna system. If I go ahead, hopefully you will read about it here!

Reflecting back to my initial conversation with Stuart GM7VEC, it really is easier than you might think – why not give it a go yourself?

Additional Resources

https://amsat-uk.org
www.amsat.org/two-way-satellites
www.work-sat.com/Home.html
Book: *Amsats and Hamsats*, Andrew Barron, ZL3DW, RSGB

Amsats and Hamsats

Daimon Tilley G4USI recommends a very handy starter book on the topic of working through the amateur satellites.

Daimon Tilley G4USI
practicalwireless@warnersgroup.co.uk

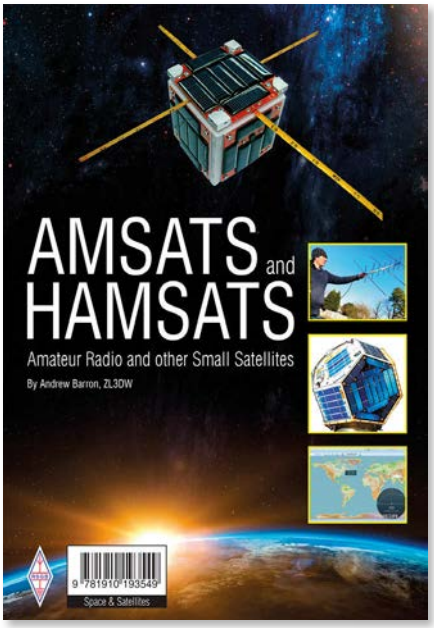
As I began to want to take my first steps into working satellites, I resorted, as usual, to the internet and conducted lots of searches. I found a good amount of information from various sites, but I came across two key issues. It didn't all seem to be particularly up to date, and there were still plenty of gaps in my understanding. I was completely unable to find a single authoritative source of information, despite lots of research.

I resorted to the RSGB bookstore and found a few titles. The one that caught my eye as being close to what I needed was the one reviewed here, so I duly ordered it just before Christmas, and spent hours poring over its every word.

Wow! This is a really good book, that did exactly what I needed – gave me all the information I could possibly want, and more, in one place. The book runs to a little over 350 pages. It really does live up to the blurb - *"This book is simply the most comprehensive guide available……"*

HAMSATs

Let's take a look at the title first, as it may be slightly misleading. Andrew defines an 'AMSAT' as those constructed by amateur (not necessarily radio amateur) teams, and even though some may carry radios, they are not designed for use by the wider radio amateur community. Examples might include satellites built by University teams for scientific purposes. 'HAMSAT' on the other hand, refers to those satellites that can be used by amateur radio operators to communicate with others on amateur radio frequencies.



The range of subjects covered is extensive, and there are over 40 chapters. It is not possible to list them all here but I found the book very well written. It gives you a limited amount of information to start off with, so that you can get on the air quickly and with the minimum fuss, and then fills in the knowledge gaps to a quite deep level of understanding.

Contents

The first chapter or two set out very clearly how to get started on the FM satellites in a detailed checklist format, and then moves into the use of linear (SSB/CW) satellites. It then touches on the biggest satellite of all, the moon, working the International Space Station (ISS), how transponders and repeaters work in space, monitoring weather satellites, and very helpfully covers the mistakes that Andrew himself has made, to help us not repeat them!

Then he really starts delving into details. Topics such as Doppler shift, feeder lines, link budgets, antennas and masthead preamplifiers are covered in a good depth. Also included are sections on satellite tracking and prediction software, CAT control of your radio, automated rotator control, differing types of spacecraft orbit, history, satellite designations, and even sections on vector mathematics, if you are feeling brave.

I found myself gobbling up the information, and even though some of it was not relevant to my intended use of satellites, I still felt compelled to read it and really felt that I learnt a lot.

To be honest, some of what I learnt was stuff I partly knew already, reasonably basic amateur radio concepts about coax cable losses, noise levels, etc, but all explained in a way where, even then, I found myself gaining a new insight on an old subject.

What more can I say? Well, only one thing really – if you want to learn more about working or listening to satellites, then buy this book – it is brilliant!

Amsats and Hamsats is available from the RadioEnthusiast bookstore for £14.99. https://tinyurl.com/y9hyly39

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Oscar-100 - LNB

Mike Richards G4WNC
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Mike Richards G4WNC has an update on his QO-100 installation before moving on to a 0dBm calibrator and more on the iGate node.

Just as I was completing this column my new Bullseye high stability LNB arrived from Othernet (website below). This new LNB has been designed to minimise the drift problems that occur with other LNBs when trying to receive narrowband transmissions such as those from the geostationary Oscar-100 satellite. In **Figs. 1**, **2** and **3** I've shown how I've disassembled it ready for fitting to my QO-100 antenna system. In addition to providing the down-converted IF signal, the Bullseye has a second F socket that carries the 25MHz reference signal, which may well be useful for monitoring. Next month I'll report on its performance.

http://othernet.is

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0dBm Calibrator

I recently noticed that **Makis SV1AFN** has introduced another of his very useful project modules. This time it's an RF power meter head using the Analog Devices AD8310 device, **Fig. 4**. The AD8310 is a fast, demodulating, log amplifier/detector with a 95dB dynamic range and a slope accuracy of ±0.4dB between DC and 440MHz. The input power range is a useful −78dBm to +17dBm (28µV to 1.58V rms or 16pW to 50mW!). My main interest in this unit is its conversion of RF power to a proportional DC voltage. The output voltage changes at a nominal rate of 24mV per dB throughout its linear range, making it ideal for use as the detector head of a power meter or SWR bridge. I also decided that it could form the basis of a simple 0dB RF calibrator.

Those who have been following my musings on RF signal generation and attenuators will be aware that 0dBm is a useful starting output level for a low-cost signal generator. If you're using a modified FeelTech function generator or similar device, the main problem is setting an accurate 0dBm output. This is because most, if not all, the cheap function generators display their output in volts pk-pk into a high impedance load, which is not very helpful. This is where a simple power head such as the AD8310 can be used very effectively.

Within its linear range, the output voltage from the AD8310 can be calculated by this formula: $V_{out} = V_{slope} \times (P - P_{int})$ where P is the input power and P_{int} is the AD8310 intercept (default is −95dBm). If we substitute for real values, we get $V_{out} = 0.024 \times (P - (-95))$ where P is the power we want to calculate in dBm. From this, 0dBm should produce an output voltage of 2.28V. If you have a reasonable quality 20, 30 or 40dB attenuator to hand you can improve accuracy by measuring the slope of your device. Here's the step by step guide to measuring the slope:

Apply an RF source with a power level of between 0dBm and -30dBm, the accuracy of that level is not important for this test.

Make a note of the output voltage (V1) from the AD8310, **Fig. 5A**.

Connect your attenuator between your signal source and the AD8310, **Fig. 5B**.

Measure and record the output voltage (V2) from the AD8310.

You can use that information to calculate the slope of your AD8310 with this simple formula: Slope = (V1-V2)/ attenuator value in dB

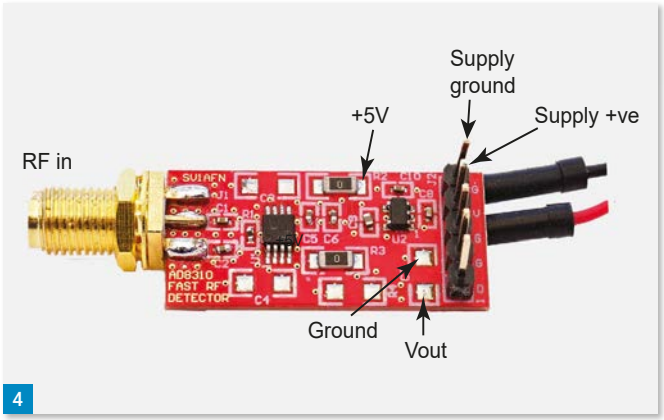
The answer should be close to 0.024V or 24mV. You can further increase the accuracy if you have access to an accurate signal source. Maybe the club or a colleague has a calibrated source you can use. With an accurate 0dBm signal applied to the AD8310, measure the output voltage. The intercept point is:

Intercept = V_{out}/slope

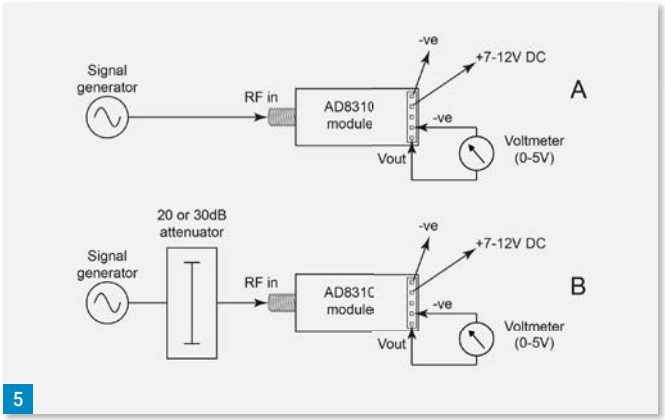
Where V_{out} is the DC output from the AD8310 with a 0dBm signal and the slope is the calculated slope we've just measured. In **Fig. 6**, I've plotted a graph showing the output voltage of my AD8310 module. Rather than having to check the AD8310 for a precise output voltage, we could add a few resistors to make a bridge circuit, so we can simply measure a voltage null at 0dBm. This is much easier to measure and doesn't require an accurate voltmeter. In addition to the AD8310 chip, the SV1AFN module features a LP2985 low drop-out linear regulator that produces a very accurate 5V supply for the AD8310. We can take advantage of this to create our accurate bridge. I've shown the circuit of the final design in **Fig. 7**. If you've already completed the calculations for the intercept and slope, you will be able to calculate the output voltage for a 0dBm signal and you could replace the resistive divider chain (R1-R3) with a pair of selected value resistors to provide a fixed reference voltage that matches the 0dBm output of the AD8310. If using the trimpot design, you should apply an accurate 0dBm signal and adjust the pot for a voltage null. Once calibrated, the unit should be very stable

2

3



4



5

because the AD8310 is fully temperature compensated and the LP2985 output voltage is maintained to better than 1% over a wide temperature range.

You may be tempted to buy a cheap AD8310 module from eBay for around the £5 mark. However, you should be aware that the bulk price (250+ units) of genuine AD8310 chip is around the £6 mark so the eBay units are highly likely to be counterfeit or out-of-spec devices. I recently bought some cheap Chinese AD8318 units and they were all out of spec with a very poor low frequency response. When buying from Makis SV1AFN, you can be sure you're getting a genuine device that will meet or exceed the specification:
https://tinyurl.com/ycscn7bx

APRS Receive Only iGate Node

This month I'm starting this section with a correction to the install instructions for the Dire Wolf Packet radio software from last month. It seems the change to the Buster release of Raspbian has caused a few issues with Dire Wolf. The solution, at least for now, is to build Dire Wolf using the development version. This is easy to do but requires installation of a few prerequisites. The following commands will install RTL-SDR, Dire Wolf and all the prerequisites on a new Raspbian Buster disk:

```
sudo apt install -y rtl-sdr libasound2-dev
cmake
git clone https://github.com/wb2osz/
direwolf.git/
cd direwolf
git checkout dev
mkdir build
cd build
cmake ..
make -j4
sudo make install
```

You still need to create the custom config file as described last month and save it as aprs.config in the Pi home directory. Don't forget to update the config file with your callsign, iGate passcode and your lat/lon. This code will run on any Pi from the original model through to a Pi-Zero and the Pi-4. Two important points to note:

You must install on the target Pi. By that I mean that you can't install on a Pi 4 and then move the card to a Pi-Zero or Pi-1 because the build will be different.

Whichever Pi model you use it must have an internet connection. If your Pi model doesn't have onboard Wi-Fi or LAN, you can easily add a USB Wi-Fi dongle or a USB LAN adapter.

Fig. 1: Bullseye LNB from Othernet.
Fig. 2: Bullseye LNB with outer case removed.
Fig. 3: Bullseye LNB with the horn antenna removed ready for installation on my waveguide.
Fig. 4: AD8310 power detection module from SV1AFN.
Fig. 5A and B: Measuring the detection slope of the AD8310.

At this point the installation is complete but it is not running as a service because we haven't enabled it. Before we do that it's worth checking that the basic installation is working. The first action is to reboot the Pi and then test the RTL-SDR dongle. To do this, open a terminal session (Ctl-Alt-T) and enter:

```
rtl_test
```

This will provide console messages indicating that the dongle has been found and will probably show a few lost packets. Providing the lost packets don't continue printing, your receiver is fine and you can press Ctl-C to end. Next, we can try running the full iGate application with the following command line:

```
rtl_fm -f 144.80M - |/usr/local/bin/
direwolf -c aprs.conf -r 24000 -D 1 -
```

This should start the iGate node and start reporting details of received APRS signals. To finish this test press Ctl-C.

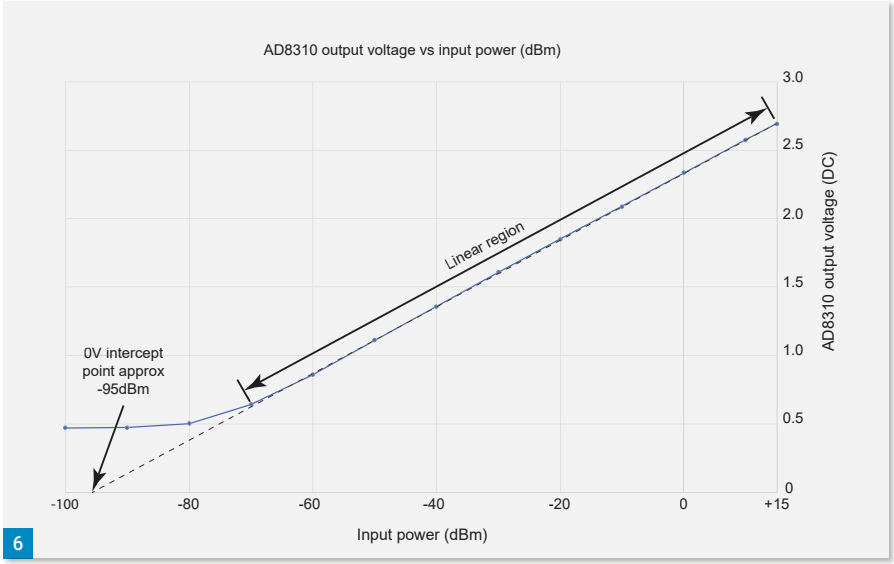
Once you've added your details and

connected, you should have a working iGate receive node that's contributing to the APRS network. The next step is to configure the Pi so that the software will run on boot. It would also be useful if the software would automatically restart if it should crash. The best way to achieve these objectives is to run the iGate node as a service on the Pi. By running it as a service, it becomes easy to start and stop the service should we need to plus we can also get status reports. To run any software as a service on the Pi we make use of Systemd. This is a software suite that provides system and service management for Linux computers and has become the standard that's used across most distributions.

To run a program as a service we need to create what's known as a Unit file. This is basically a configuration file that tells Systemd all it needs to know to run our software. As the network is vital for our application, we can use the Unit file to delay running our software until the network is up and running. Here's the Unit file we need to create for our iGate node:

```
[Unit]
Description=iGate Rx Node
Wants=network-online.target
After=network-online.target
[Service]
ExecStart=/bin/sh -c"/home/pi/rtl_fm -f
144.80M - |direwolf -c aprs.conf r 24000
D 1 -"
WorkingDirectory=/home/pi
StandardOutput=inherit
StandardError=inherit
Restart=always
[Install]
WantedBy=multi-user.target
```

To create this file in the correct location, open a terminal session (Ctl-Alt-T) and enter the following to create a new empty file. Once it's open, enter the unit file text I've just described.



sudo nano /etc/system/system/iGate.service

When you've finished creating the file press CTL-X followed by Y then Enter to save and close the file.

Let's now test our new service with the following command:

```
sudo systemctl start iGate
```

This won't produce any output so we need to open another terminal session and take a look at the system journal. The journal is a very powerful logging tool that reports all the systemd activity. In our case, we only want to see messages from the iGate service and we can do that with the following command:

```
journalctl -u iGate -f
```

The -f suffix limits the output to real-time reports, and this should reveal details of received APRS data. If you want to view historic messages you just omit the -f suffix.

Assuming everything is working, the next step is to enable the iGate service so that it is controlled by Systemd. To do that use the following command:

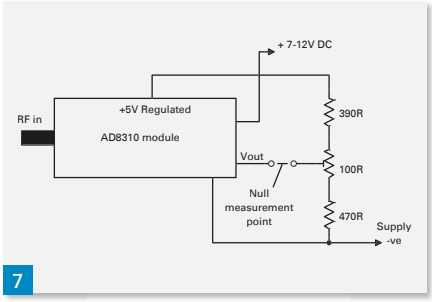


Fig. 6: The plotted slope of my AD8310 module.
Fig. 7: Schematic of a 0dBm calibrator.

```
sudo systemctl enable iGate
```

That completes the setup and you should now have a fully working iGate receive node.

I know some of you may want to avoid building the software so I now have pre-configured iGate SD cards available from my website:

https://g4wnc.com/shop-2

The cards are supplied with printed instructions and I can give support if you get stuck.

Visit our Book Store at www.radioenthusiast.co.uk

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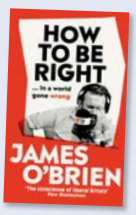

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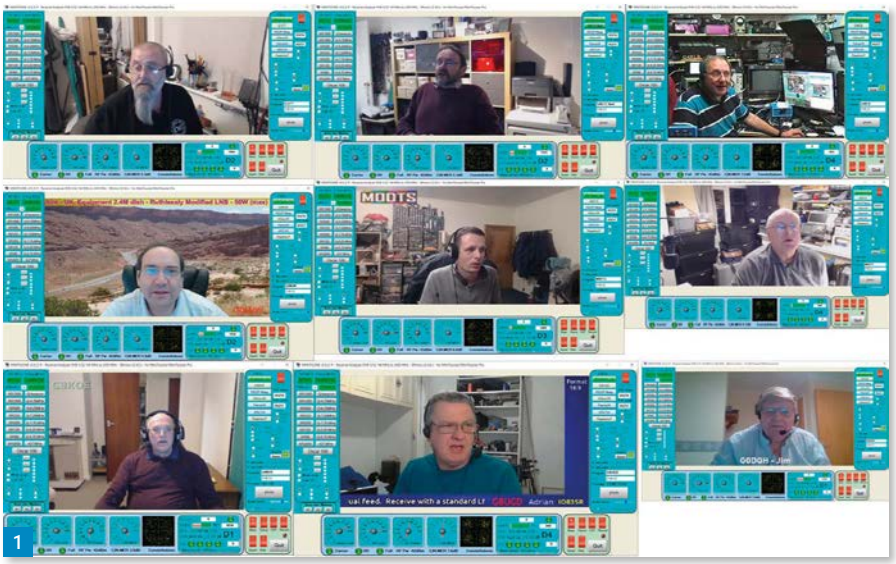
Coronavirus

Colin Redwood G6MXL looks at ways radio amateurs can productively use the period of isolation resulting from the Coronavirus



I am writing this *What Next* column in very early April, and I'm aware that it will be several weeks before it appears in print. So please accept my apologies if it is somewhat dated by the time you read this. Nothing here is intended to suggest that you put yourself or others in harm's way, so please treat my suggestions with caution in applying them to your own particular circumstances.

There are numerous things we can do individually during the period of isolation. I'll start with clubs and societies.

Extra Nets

Many clubs are organising additional nets for members and others to participate in. My local club has added a net on the evening of what would normally be our weekly meeting and an additional weekly afternoon net. These can be used for keeping members in contact with one another. The British Amateur Television Club (BATC) have gone much further and have an amateur TV net on the Oscar 100 satellite on Thursday evenings at 2000, **Fig. 1**.

Phone Calls

Older members living and isolating on their own may be glad of a chat with a familiar voice. Perhaps your club's membership list could be split between committee members and each member contacted from time to time to make sure that they are OK. Please don't rely on on-air QSOs – you shouldn't expect people to discuss their personal circumstances on the air.

Help

Many amateurs in the UK are not in the best of health and less able to do jobs on their outside antennas than they used to be. Imagine if you were self-isolating on your own but unable to continue with your hobby due to damage to your antennas perhaps due to the winter storms. If you have such amateurs in your local club, then perhaps you can offer help to get them back on the air. You'll need to avoid sharing tools, so you'll want to take your own tools with you. Please take particular care not to cause more damage or injuries – the local hospital won't want to see a string of injuries from inept do-it-yourself activities!

Club Meeting Venues

Most clubs don't own their meeting places and pay the owning organisations to use the premises. I cannot comment on individual arrangements, but the owners such as youth groups and churches are going to lose a significant chunk of their income if every organisation stops paying to rent the premises for several months through no fault of theirs. Depending on the relationship your club has with the organisation, it may be an idea to offer to pay, say, 50% of the usual charges. They will still have the costs of insurance, council tax, upkeep, and security for the premises. At the end of the day, it all comes down to your club's relationship going forward.

Skype & Zoom etc.

These days most radio amateurs have access to the internet. This means that it is possible to continue with virtual meetings and presentations using Skype, Zoom and similar technologies. One club is trying a 'Show and Tell' session via Zoom, for members to show their latest construction project with other members, and seek help and advice as necessary. Others, such as the Norfolk Amateur Radio Club, have been embracing modern streaming technologies such as Skype for some time. This enables them to bring speakers from all over the world into their physical club meetings. They are planning to bring an online meeting to members every week, a round up and encourage new on-air nets and training such as CW.
www.norfolkamateurradio.org

Exam Training

Some clubs are using Skype and other ways of presenting over the internet to continue delivering training for the various amateur radio exams. The tutor shares what is on their computer screen with those logged on. This has the advantage that the tutor will be familiar to their trainees. You can also offer others to participate. It may be an idea to send out any handouts by e-mail in advance. If your club doesn't provide training, now could be a great time to prepare some training material so that your club can do so in the future.

For those studying for the Foundation exam, additional ways to study or refresh what you may already have covered include making use of the online training available from Essex Ham and from **William McFarland GM6DX**.
https://tinyurl.com/yambdmon
https://gm6dx.thinkific.com

With the agreement of Ofcom, the RSGB have announced that they will be taking bookings for online exams that will be remotely invigilated via webcam. Priority will be given to candidates that

have completed all practical elements of the course, followed by those who have partially completed the practical elements, and finally those who have not completed the practical elements. Initially this will be limited to Foundation exams but if successful, Intermediate and Full exams are likely to follow.

Something New

The period of self-isolation could provide the ideal opportunity to try something new within our wide-ranging hobby. Some amateurs have decided to use the enforced break to learn Morse code or increase their speed. Others are going to explore some digital voice modes or some data modes. I know of one amateur who is going to participate in a contest for the first time, while another keen VHF contester who usually operates from hilltops has set up an inverted-V dipole in his back garden to operate on 20m and try FT8 for the first time.

The UK Microwave Group (UKuG) that I mentioned last month, have recently published a leaflet that is an excellent introduction to the microwave bands. If you've never thought about microwaves, then I'd certainly recommend downloading it and having a read, but please bear in mind there won't be much aircraft scatter available at present!

https://tinyurl.com/y96eph9d

There must be hundreds of amateurs who have always thought it would be a good idea to learn Morse code but have never got around to doing so. Half an hour in the morning and the same in the afternoon could be just right. You might be able to do this over the air with the aid of a local amateur, have a look at the Learn Morse Code (CW) Online website or join the Lockdown Morse course:

https://lcwo.net

https://youtu.be/RWDqg8bCSqM

Videos

The internet is awash with videos showing various aspects of the hobby. Just type some key words into your favourite search engine. As with so much on the internet, I'd exercise a degree of caution – I've seen some that are, frankly, plain wrong or in a few cases positively dangerous. If I'm looking for help to tackle something, I try to find several sources and see if they agree. I think most readers will find something of interest from among the sources I have listed below.

The RSGB have an archive of talks given at their annual conventions over recent years. I'm sure that many readers will find at least some of these of interest:

https://tinyurl.com/whg24g7

Richard Newstead G3CWI of SOTAbeams has launched a range of YouTube videos covering mainly antenna and portable operating topics. These are very practical and can certainly be recommended:

https://tinyurl.com/vo7zhch

Peter Waters G3OJV from Waters & Stanton has an ongoing series of videos which will appeal to a wide range of amateurs. They feature many topics, including some suggestions for antennas in various locations and some product reviews. I really like Peter's friendly presentation style – almost like having a chat with a friend at your local radio club. To find them, I suggest pointing your browser at YouTube and searching for Waters & Stanton:

www.youtube.com

From the States, the Fair Lawn Amateur Radio Club have videos of speakers at their meetings and their activities going back several years:

http://youtube.FairLawnARC.org

If you're into DXing, then I suggest typing DXpedition into YouTube. You'll find numerous videos of DXpeditions from all over the world going back many years.

Promote the Hobby

This period of isolation means that you may have a captive audience to explain your hobby to. These might, for example, be household members directly or others via Skype or similar. If you have a child in the house who wants to communicate with a local friend, why not get them a pair of low power PMR handhelds. It's only a small step later to move them on to amateur radio. For children of suitable age, you could ask them to sort through a pile of resistors and put them into the various values with the assistance of a printed resistor colour code sheet or a digital multimeter or to sort some outgoing QSL cards.

QSL

Perhaps you could catch up with sending replies to QSL cards you've received? I know I have some from some portable activities over recent years. You might even explore electronic logging and electronic confirmation of contacts (e.g. Logbook of the World, eQSL). You might consider converting some older contacts in paper logbooks into computer records for uploading to LoTW, **Fig. 2**, Club log (see below) and eQSL.

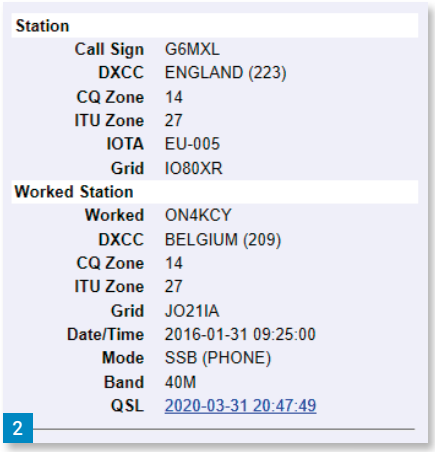


Fig. 1: Some of the participants on the BATC Net on Oscar 100. Courtesy of Dave Crump G8GKQ.
Fig. 2: A recently matched contact on Logbook of the World made January 2016.
Fig. 3: The recently introduced Cabin Fever Award. Courtesy of Dave Brooks G4IAR, Worked All Britain Awards Manager.

Club Log

Since March 21st 2020, the computing resources of Club Log have been primarily dedicated to research into COVID-19. This activity has a higher priority than Club Log's amateur radio features. As a result, uploads may take slightly longer. Read more about the Folding@Home project on the Club Log website, from where you can also contribute to this effort (Team Club Log: 246763):

www.clublog.org

Awards

If you enjoy collecting awards, you could check the requirements of various awards, and perhaps apply for some. A number of award schemes such as Worked All Britain (WAB) and **H**uMPS **E**xcluding **M**arilyns **A**ward (HEMA) have stopped giving credits for contacts made /P or /M. In order to keep activity alive, the Worked All Britain (WAB) scheme has come up with a new Cabin Fever Award, **Fig. 3**, for working fixed stations. It will be available for fixed stations for contacts made from April 1st 2020 for the duration:

https://tinyurl.com/ya6s4dze

Fig. 4: Tape used to identify the elements on the boom of a 6m Yagi.

Home Construction

Many keen home constructors have a number of incomplete projects. The enforced isolation could be a great opportunity to finish at least some of them. One club is piloting a 'Show and Tell' session via Zoom, for members to share their latest construction project with other members of the club, and seek help and advice as necessary. You could also have a go at repairing some older equipment that you have been meaning to get around to when you have time. Many amateurs are using the time to build and maintain antennas. Please be particularly careful not to injure yourself when working on any of these projects. If you need components, a number of larger suppliers remain operational for online orders but warn that delivery may be slower than usual. The editor also tells me that he would welcome some constructional articles suitable for publication in *Practical Wireless*.

Maintenance

After what seemed like continuous rain and wind of the last winter here in the British Isles, there can't be many external antenna systems that wouldn't benefit from some maintenance. If you operate portable, then it might be a good idea to check your antennas and feeder for when we can get back out in the field – there are a number of little things that I've been putting off. For example, I replaced the insulating tape on the elements of my 6m Yagi, which were starting to peel off, **Fig. 4**. I've also applied a little grease to the various threads on the antenna brackets. You may wish to check that the plugs on the end of feeder runs are soundly attached and the feeder itself is in good condition.

Contests

If you're planning to enter a contest, I would strongly suggest that you check the rules. Any operation away from home is unlikely to be considered acceptable. The RSGB HF Contest Committee have introduced a weekday 90-minute Hope QSO Party (contest) using different times and modes each day. You don't have to be a member of RSGB to enter. Full details can be found at:
https://tinyurl.com/u85olsal

Update Programs

It is very easy to forget to update the various computer programs that we use in our hobby. While keeping up to date is not usually essential (the main exception being WSJT-X), it makes sense to keep reasonably up to date to get the benefits of the additional facilities in the latest versions. Latest versions of contest logging programs will often incorporate the parameters of new contests for example. These may also change during the Coronavirus outbreak.

Special Callsigns

If you enjoy DXing, you might like to know that amateurs in New Zealand have been permitted to use the prefix ZM in place of their usual ZL prefix for the duration. In quite a few other countries certain stations have been authorised to use the suffix STAYHOME or similar. See this month's *News* pages for details of an associated award.

Radio Round-up

THE SPIRIT MORSE KEY: AF6L.com, a new home-based company formed to develop modern-looking Morse keys, announced recently that they have successfully launched a campaign on Kickstarter for their new Spirit Morse Key.
The founder of AF6L.com, David Oakes AF6L, developed the Spirit Morse Key after searching for a key that would not only provide a consistent, crisp feel at a reasonable price, but also fit alongside his new radio equipment.
www.AF6L.com

13 COLONIES SPECIAL EVENT 2020: G4EUZ Durham and District Amateur Radio Society (DADARS) is privileged to be participating as one of the bonus stations in the hugely popular 13 Colonies Special Event. The special callsign GB13COL has been issued for this event and will run from July 1st 2020, 1300UTC to July 8th, 0400UTC. The primary focus of the event will be the HF bands, but also including VHF and UHF, using SSB, CW, FM and various digital modes.
The 13 Colonies event began in 2009 as a way of celebrating American Independence with the original 13 colony States. Since the UK was a major historical player in the Revolutionary War, GB13COL will present an added positive flair, historical significance and a challenge for radio amateurs to contact. This event has rapidly become the premier amateur radio on-air activity in North America and beyond. In 2019, there were over 169,884 QSOs logged.
This year's 2020 QSL cards have been kindly sponsored by Martin Lynch. A warm thank you to Martin and the gang for this.
Ken Villone KU2US (K2A operator) is the creator and manager of the event. Every year there is a different certificate theme for amateurs who make contact with either one or all participating stations, including the bonus stations. Ideally, amateurs taking part aim to get a 'clean sweep' of all 13 stations: K2A (NY), K2B (VA), K2C (RI), K2D (CT), K2E (DE), K2F (MD), K2G (GA), K2H (MA), K2I (NJ), K2J (NC), K2K (NH), K2L (SC), K2M (PA), plus WM3PEN and GB13COL operating as a bonus. Contacts made will be endorsed on to the certificate along with your own personal callsign. The theme for 2020 is the 'The Symbols of Freedom'. There is also an opportunity to exchange QSL cards with all participating stations. For further information, please visit the website at:
www.13colonies.us

HF during Lockdown

Steve Telenius-Lowe PJ4DX reports that while DXpeditions have been in short supply, the HF bands have nevertheless been buzzing.

Steve Telenius-Lowe PJ4DX
teleniuslowe@gmail.com

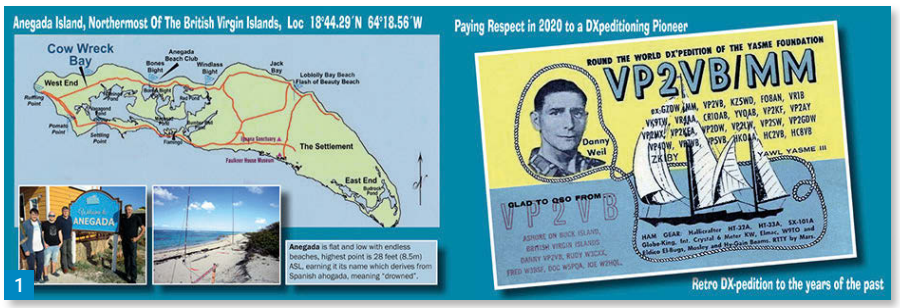
As this column is being written in mid-April the whole world is being affected by the coronavirus pandemic. As radio amateurs we have a distinct advantage over most others in that we have an absorbing and time-consuming hobby that we can practice from our own homes while in self-isolation. Golfers, weekend footballers, anglers and the followers of many other pursuits aren't so lucky.

As with all the summer activities – Wimbledon, Glastonbury, the Olympics (and, yes, even the Eurovision Song Contest!) – that we have been looking forward to during the dark winter months, almost all planned DXpeditions have been cancelled. Although there's less DXing taking place I'm sure I'm not the only one to have noticed an increase in general activity on the bands as amateurs sit at home with little to do other than operate radio. This was particularly the case during the *CQ* WPX SSB contest at the end of March when there were immense levels of activity from North America and Europe.

This column has never been exclusively about DXing although, during normal times, DXing provided a major part of the overall level of activity on the HF bands and that was obviously reflected in this column. If you're missing the DXpedition activity, why not look into an aspect of amateur radio you might not have explored before? If you are mainly a CW operator dust off that microphone and have a chat on SSB for a change. Or if you have never learned Morse code, try listening to the CW ends of the bands and see if you can identify some callsigns. Perhaps give FT8 a try.

If you are really missing the DXpeditions, though, why not see how long it takes you to work 100 DXCC entities by contacting only permanent residents of the countries concerned – no CEPT or other 'portable' activity allowed!

There's so much to amateur radio in general and to HF operating in particular to explore. So get on the air, make some contacts – and please continue to send in news about your HF operating to this column!



1

DXpedition Run-Down

It may be quite a while before we can report on future DXpeditions, so here's a quick review of the last ones remaining on air before we went into lockdown. There were three DXpeditions running simultaneously then:

9J2LA, a Norwegian-organised operation from Zambia, made over 35,500 contacts and finished operations on March 15th.

TO7DL, the German DXpedition to Reunion in the Indian Ocean, went QRT on March 17th after making 35,660 contacts, interestingly a very close number to that of 9J2LA. The team's flight home via Mauritius was cancelled but they were able to change to Air France and fly via Paris instead.

Finally, VP2VB, **Fig. 1**, was an operation by KO8SCA, OH2BH, **Fig. 2**, OH2GEK and VE7NY from the British Virgin Islands commemorating the legendary British DXpeditioner **Danny Weil** (SK), the original holder of the **VP2VB** callsign. Danny was active between 1955 and 1962 while sailing around the Caribbean and Pacific on his yachts called *Yasme*, after which the Yasme Foundation was named.

www.yasme.org

After making almost 18,000 contacts between March 11th and 16th, the non-American team members also had difficulties returning home after their USA visas were cancelled by presidential decree. Their story, and also that of Danny Weil (with some fascinating links), is told on the VP2VB QRZ.com page:

www.qrz.com/db/vp2vb

Readers' News

Owen Williams G0PHY wrote *"Here's my latest report, the first during these extraordinary times. I managed to work the German DXpedition to Reunion and the Scandinavian team in Zambia, probably the last DXpeditions for some time. I found conditions were interesting during the CQ WPX phone contest. 21MHz was open to Spain, Portugal, South America and Reunion, while 28MHz was also open to Spain (I managed a contact using my 14MHz dipole). The signal from FR4QT was particularly strong. With people self-isolating and a number of special event stations using the 'Stay Home' suffix there has been plenty of activity on the bands."*

Tony Usher G4HZW, *"being of a certain vintage"*, is self-isolating with his wife *"for the duration."* In addition to his amateur radio activities Tony is a keen bird-watcher and a member of the Knutsford Ornithological Society. *"Being only a short walk from open countryside makes us luckier than many folk. I am usually all over the place at this time of the year searching for ornithological DX but now we must make do with local walks (it's like being forced to use only 2m!)"* Tony reported that *"7MHz again open 24/7, the 50W and vertical reached out as far as New Zealand, so I'm quite content playing with the hand I've been dealt. 182 contacts in 34 DXCC entities. 28MHz: good openings to South America on the 20th March, occasional ones thereafter. 56 contacts in 18 DXCC entities."*

When **Kevin Hewitt ZB2GI** wrote, Gibraltar had been in lockdown for two weeks. *"We are following the same procedures and precautions as England. I was due to fly to England on the 22nd [March but] decided to stay on the Rock... The ARRL International DX Phone contest was held on March 7th and 8th and generated much activity on the bands. I did not enter the contest and only replied to stations calling CQ*

for around an hour on both days. I replied to 65 stations, working 22 states and four provinces." He received this direct QSL from XL3A in Canada, **Fig. 3**. Kevin also operated on FT8, when he used a Yaesu FT-450 with an *"Outbacker multi-band antenna with a 2.5m counterpoise wire. The Outbacker was clamped to a broom handle stuck out of the window."* Look at 'Around the Bands' to see how successful such a setup can be when using FT8.

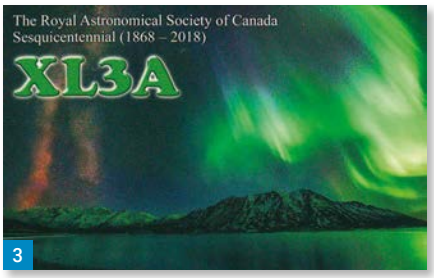
Victor Brand G3JNB managed his by-now 'traditional' DX QSO with famous DXpeditioner **Nigel G3TXF**, who had travelled to Mauritius as 3B8XF for the Commonwealth Contest ('BERU'). *"Great to hear the bands opening again, allowing me contacts on17m with T6AA, CT/DL3KWF and then, best of all, RST 439 from **Wald XQ6CF** working simplex from Osorno on the Pacific coast of Chile. BERU weekend arrived and, unfortunately, the SFI had dropped to 68. Saturday morning was very poor but late afternoon and evening propagation improved with a lively 40m yielding Nigel again, Ghana, Australia* (VK6VZ, **Fig. 4**)*, Grand Cayman and Turks and Caicos. Even JT1CO somehow crept into my log from a different contest! 20m was chock-full of Canadians. However, thereafter all went quiet for days. Then cometh the 'plague'! Along with nearly everything else all DXpeditions cancelled and we 'Old Timers' totally isolated... HF propagation remained poor and the few DX stations I could copy were swamped. Still, eventually OX3XR Greenland on 30m CW, PP5KR Brazil on 40m and even UA4NE Kirov on 80m, all obliged. Recently, **Murtada 9K2MU** Kuwait had proved unworkable on 17m until, switching from the 17m helical to my 10m general coverage vertical, he came back first call."*

Kevin Stock M0YRX sent in news on behalf of the '10m UK Net'. *"Small openings were noted on [March] 2nd and 3rd into Italy and Spain respectively before ZD7FT made an appearance late in the afternoon on the 13th and heralded a sustained run of days with propagation on 10m SSB. South America, Africa and Asia (Middle East) as well as Europe were worked from the UK throughout the rest of the month with the 24th, 25th, 27th and 28th being the most active. **Iain MM0TFU** noted that the opening on the 24th was the best to South America from his location for several years and over the month had 95 QSOs working 19 DXCC."*

Reg Williams G0OOF wrote *"I continued listening for VP8PJ... I only heard them briefly on 18MHz SSB late one afternoon. I was disappointed not to have worked them on at least one band, but all was not lost. They appeared on FT8 so I did work them on 10 and 18MHz (as well as 14MHz the previous month)... The beginning of the month was the ARRL SSB contest. Very enjoyable and great for collecting [US] counties. The best DX was N7TU in Arizona on 14MHz. In between contests I made some FT8 contacts with a few new prefixes and grids worked, including Thailand, Guantanamo Bay, South Africa and New Zealand. At the end of the month was the CQ WPX contest, which I always enjoy taking part in. I think more busy than usual due to radio hams taking part in the contest with more time than usual on their hands due to the present situation. I engaged my usual 'search and pounce' method: I would not have stood a chance calling* [i.e. 'Running' – *Ed*] *with my modest station... Conditions were fairly good with some long openings on 21MHz on the Saturday and another not so long opening on the Sunday. This year again most contacts on all bands were mainly Europe and east coast North America."*

Fig. 1: Back and front of the four-sided QSL commemorating the activity of intrepid British operator Danny Weil, the original VP2VB (image: Martti Laine OH2BH). Fig. 2: Martti OH2BH, one of the operators on the March VP2VB DXpedition. Fig. 3: QSL from XL3A in Ontario received by Kevin ZB2GI. Fig. 4: Steve Ireland VK6VZ (formerly G3ZZD) is a regular in the Commonwealth Contest.

2



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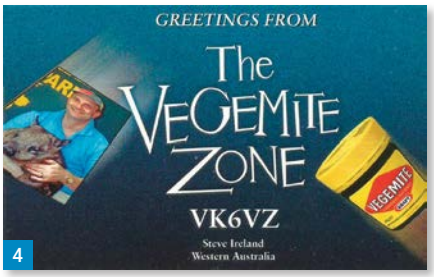


4

Etienne Vrebos OS8D/ON8DN reports from Belgium that *"Lockdown keeps me and my wife at home of course, no motorcycle riding any more. But I'm sure we are very lucky to have a huge garden in a splendid forest with wild animals coming out to see what has happened with the humans: wild ducks, peacocks,* **Fig. 5***, even a small deer and a lot of squirrels. Strange how nature comes back after three weeks of lockdown and it's great to be a spectator... I'm quite happy I got my [new] equipment before the lockdown as I fear there will be some problems to get what you wish in the next months. I ordered the new SDRplay DX from ML&S to have a look at short wave. I was a very active SWL in the 70s, broadcasting and utility on HF. I wanna try it again and listen to short wave with that gear. I'm curious especially to see differences between my new FTdx5000 and this small box SDRplay DX as I can switch easily the antennas from my desk."*

Martin Evans GW4TPG said that *"operation has been patchy here, to say the least"* due mainly to ongoing house improvement projects. However, he *"noticed propagation on the higher bands seemed to be much better (i.e. present!) around the 24/3 and 25/3, much EU was worked on 12m. It tailed off from the 26/3 and is back to normal now for this point in the solar cycle."* One side effect of the coronavirus lockdown is that Martin says he has now given up his monthly jaunt to the newsagent to buy *PW* and has *"invested at long last in a subscription!"* Martin sent in a QSL, **Fig. 6**, confirming a 2008 contact he had with yours truly when I was living in East Malaysia – more than a dozen years ago, though it seems more like yesterday...

Around the Bands

Owen G0PHY reported **7MHz SSB:** UN9L. **14MHz SSB:** 5T5PA, 9J2LA, A41NN, D41CV, HI3CC, HZ1HZ, KW7Y, PY4BZ, S01WS, TO7DL. **21MHz SSB:** FR4QT, PV2P.

Tony G4HZW 7MHz FT4: 9K2HS, AA2T,

Fig. 5: Nothing to do with radio, but nature returning after three weeks of lockdown. A peacock checks out the OS8D/ON8DN shack.
Fig. 6: 9M8Z QSL received by HFH regular contributor Martin GW4TPG.

5

CM2RSV, EK1RR, K1KA, K4NYX, KC3RN, KE8JNT, LU8HF, TF1OL, VA3CTX, VE1CNS, ZL4AS. **28MHz FT8:** CE2SV, LU3DW, LU8FGF, LU9FVS, LW1DZ, LW2DAF, LW5DR, PP5CFL, PY2TMV, TR8CA, TT8SN, VP8A, ZD7JC.

Kevin ZB2GI used **7MHz SSB:** CF3A, K1KI, K3LR, VA2IA, VO1KVT, VY2TT, WU2X. **14MHz SSB:** 8P6NW, AA3B, AA9A, CF3A, K1KP, K3KC, K4AB, K8AZ, KP4KEY, KU2M, N6AR, PY2MN, VA5DX, VE3DX, VY2NX, W0EWD. **18MHz FT8:** KN4QLH, W8KEN, W0QQ. **21MHz SSB:** K3AB, NA8V, NO0E, NV9L, W2CG, ZW5B. **21MHz FT8:** 4X4MF, AB9CN, CU2AP, K4CVL, N7WEJ, PY2EW, W1KG. **24MHz SSB:** PU2WDX. **24MHz FT8:** HC1E, P41E, PU1JDX, PU2MVE, PU7ASP, PY4EV, WP4G. **28MHz FT8:** HK3PJ, PY2XU.

Victor G3JNB worked **7MHz CW:** 3B8XF, 4J3DJ, JT1CO, PP5KR, VE1OP, VE3EJ, VE9ML, VK6VZ, VK4CT, VO1HP, VP5O, VY2ZM, ZF2CA. **10MHz CW:** OX3XR, TO7DL. **14MHz CW:** 9G5XA, 9J2LA, 9K2HJ, CF3A, VA2RAC, VE1OP, VE3EJ, VE9CB, VP8PJ, ZW86LABRE. **18MHz CW:** 9G2HO, 9K2MU, T6AA, VP8PJ, XQ6CF. **21MHz CW:** 3B8XF.

Kevin M0YRX sent in reports on behalf of the '10m UK Net' from himself and three others. He worked **28MHz SSB:** 5R8UI, 5T5PA, PX2A, PY4BZ, PY5QW, ZD7FT. **Iain MM0TFU** offered **28MHz SSB:** CE6TK, CX2DX, LU5HA, PP5AK, PY1VOY, PY4BZ, ZD7FT, ZP5DBC, ZZ2T. **Tony M0IQD** worked the following DX on **28MHz SSB:** 5T5PA, HZ1SK, LU6FOV, PP1WW, PT5J, PX2A, PY3EW, PY4BZ, ZD7DL. Finally, **Gary G0FWX** had 43 **28MHz SSB** QSOs including 5R8UI, 5T5PA, CX2DK, HZ1SK, ZD7FT, ZP5BDC.

Reg G0OOF reported **3.5MHz SSB:** KC1XX, WW2DX. **7MHz SSB:** CF3A, KP3DX, N7TU, R8TT. **7MHz FT8:** VP8PJ. **10MHz FT8:** CO6ABP, HC1E, KG4NE, VP8PJ, ZL3GAV. **14MHz SSB:** 5T5PA, OY9JD, PY4BZ, R9MM, UA9MA. **18MHz FT8:** E24PUX, HK3JJX, VP8PJ, ZS6ZA. **21MHz SSB:** LU5FC, PY7XC.

Etienne OS8D / ON8DN reported **14MHz SSB:** 3V8MN, D41CV, EX0QR, EY7AD, H33K, J68SS, JA6GCE, JO3JIS, JT1CO, UK8FAI, UN7ID, VK2BY, YB1DNF. **18MHz SSB:** TO7DL, TR8CA. **21MHz SSB:** YB2DX, ZP5DBC.

Martin GW4TPG reports **10MHz CW:** TZ4AM. **10MHz FT8:** 9V1XX, VP8PJ. **14MHz SSB:** 8P5A, ET3AA. **14MHz CW:** 5H3DX, A92GE, E29TGW, T6AA, TO7DL. **14MHz FT4:** HI8S. **14MHz FT8:** 9G1AA, EK1KE. **18MHz CW:** 9J2LA, TO7DL. **18MHz FT8:** A45XR, J69DS, KP4JRS, VP8PJ. **21MHz SSB:** V26M. **21MHz CW:** 3B8XF. **21MHz FT8:** 9M2TDX, CE1LEW, V51MA, YC6JRT, YD2ULK. **24MHz FT8:** 7X2KF, C31MF, PU2WSQ. **28MHz CW:** TT8SN.

6

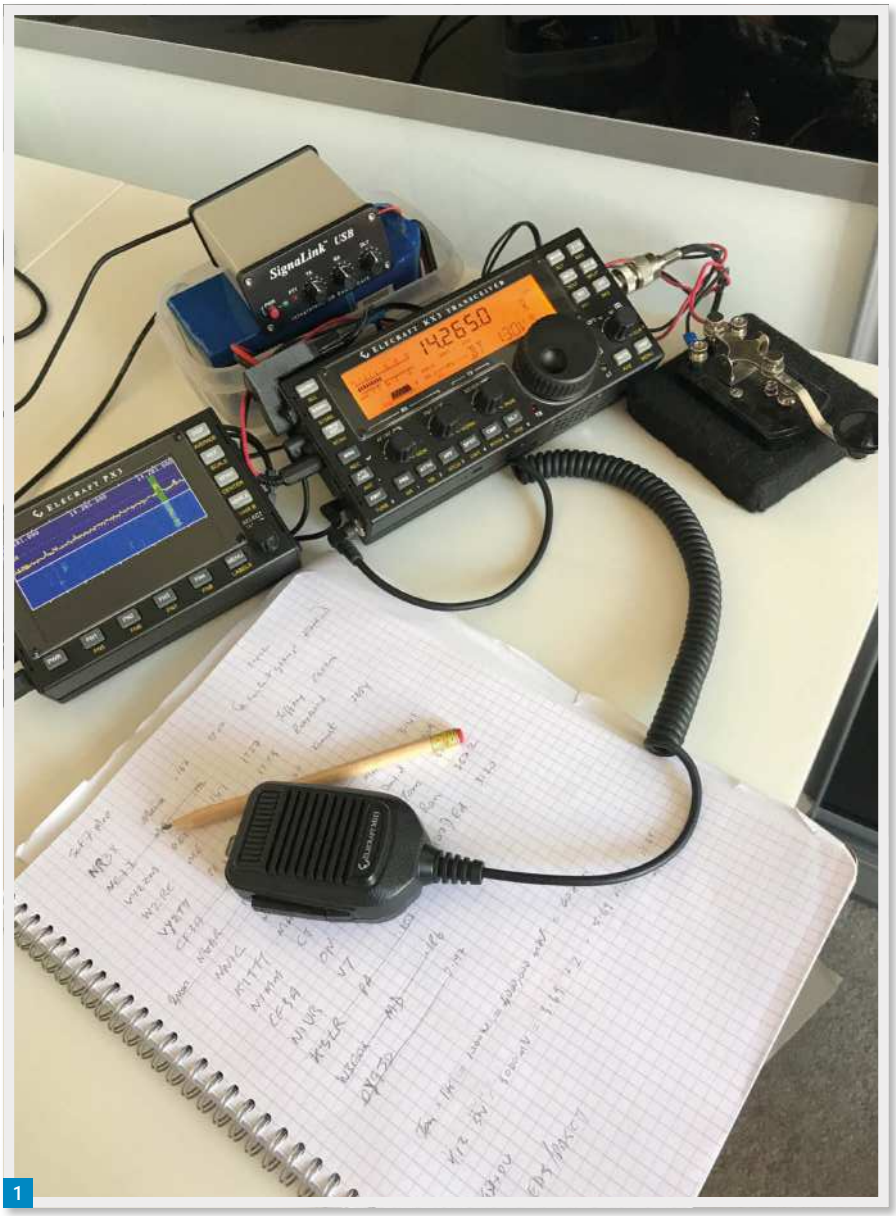
Signing Off

Thanks to all contributors. Please send all input for this column to **teleniuslowe@gmail.com** by the 11th of each month – photographs of your station or activity would be particularly welcome. For the August issue the deadline is June 11th. 73, Steve PJ4DX.

What can be done with a Small Station?

Joe Chester MW1MWD
mw1mwd@gmx.com

Joe Chester MW1MWD explains how, even with a modest station, some great QSOs are possible.



1

How did you do in the ARRL SSB contest? This is one of my favourite weekends in the radio calendar. The airwaves are full of stations, and it's a chance to work a few North America operators. Propagation was reasonable this year, despite the solar minimum conditions. This contest attracts some of the biggest stations in the world – putting the lie to the 'the bands are empty' cries.

So, I expect you got a few thousand contacts, if not more, then? I know of several stations that did very well. As an example, I had an e-mail from **Everett N5MZX**, who made 45 contacts (33 countries), operating QRP from Columbia, Tennessee. My score? – 8! And these eight contacts made me very happy! As you know I'm not in it to win it, just to have a bit of fun. *"But surely you could have done a bit better than that"*, says your man. But how many times do I have to say *"59 5"* to be satisfied? My small station is working well. At any time of the year, other than during a contest, I could have a chat with **Tom N1MM**, or **Ed N1UR**, or **Marty NN1C**, or any of the others. My signal is being received well enough, and I'm hearing these guys really well. For a US based station, the contest exchange is signal report (always 59!) and US State. For all others, its 59 and power.

Yeah, 59 5! I was using 5W from a battery powered KX3, into a 19.8m long inverted-L wire, up at about 10m, strung from a telescopic fishing pole into a tree. Last time I made contact with Tom I was using 10W to a dipole in my bungalow attic. He responded with a 'wow', clearly heard by my visitors here that day. So, this year I thought I'd make it more difficult for myself. I halved my power to 5W. When Tom heard this he said *"OK I have to hand it to you"*. Now this is neither a cry for more QRP, nor an electronic pat on the back. Nor am I trying to make it difficult for the serious contesters.

My situation is typical of many thousands of radio amateurs around the world. We have had neither the foresight nor good fortune to have several acres in the open countryside on which to erect sizeable antenna arrays. We live in suburban estates, with neighbours who frown on towers and beams, which, they claim, spoil their view of their environment. Many live in city apartments, making things even more difficult. The real joy of amateur radio is finding a way to overcome these difficulties and make QSOs.

Link Budgets

I'm so curious about these contest contacts, that I decided try to work out a link budget. This, basically, is a way to look at the gains and losses in a communication path. Two stations in contact makes a communications system. Yes, the design of each end is important, but it's the overall system performance that makes the contact work, and this includes the transmission path. The link budget equations are used critically for contact between, say, NASA and remote interplanetary spacecraft, and also by

1. The author's QRP station.
2. The modest antenna at the MW1MWD end.

those who play with microwaves. It's not normally used for HF, because of the variability of atmospheric propagation. But turn this the other way around. The fact that I made QSOs with stations 3000 miles away using only 5W tells me something about the path of the radio wave between the two stations, in other words the state of the propagation between, for example, Connecticut and Wales at the time of the QSO.

A link budget is simple a way to calculate the received power in a communications system. It is the sum of all the gains and losses between a transmitter and receiver. It includes transmitter output power, and antenna gain, and the receiver antenna gain, minus the losses caused by, say, transmission lines, and most importantly the path loss. It's the latter that creates the problem for HF communications. If we imagine an efficient line of sight communications system (such as might be the case in for example 4G or wi-fi signals), then the path loss can be approximated as the free space path loss, for which the equation is:

Loss(dBm) = 32.44 + 20×log(F(MHz)) + 20×log(D(km))

(I got this formula from **Frank PA3GMP**, who wrote an excellent primer on link budgets – see URL below). However, propagation through the atmosphere, where long haul paths are subject to variable refraction, reflection and absorption, makes calculating the exact path loss almost impossible. I want, though, to turn this equation on its head. What I want to know is what the actual path loss was between Tom and me.

https://tinyurl.com/qmffmus

To do this, I have to make a few assumptions about Tom's transceiver and antenna, and mine too. For Tom, I'm assuming a top of the line system, with a 120ft tower, with a monoband Yagi for 20m. I have a KX3 and an inverted-L up at 10m. The calculations for the equipment are relatively straightforward. Tom's 1kW transmitter (that's 1,000,000mW or 60dBm) and 10dB antenna (it might be better than this, so this is a guesstimate!) give him an ERP of something like 70dBm (maybe a bit more). My system on receive has a loss, due to cable losses, of about 4dB, and my antenna has a 2dB gain. Add all this up, and you get 66dBm. But now we have to subtract the path loss. The line of sight equation given above, for 14MHz, and 3000 miles comes out at −125dBm. So if I add these two together I get a link budget (power received) of −59dBm. For the reverse path, from me to Tom, the figure is nearly −101dBm. This is about half the power that I am receiving. So how on earth are we hearing each other?

The answer is the noise floor of our receivers. For modern receivers this is typically around −140dBm (the KX3 is −138, and an FTdx101 is −141, all dBm and from the Sherwood engineering tables). So, my signal is exceeding his receiver noise floor by 39dBm, and this is also enough to overcome the atmospheric noise floor at his QTH. Of course, he was a genuine 59 with me, possible even +10 briefly. And if I stop playing silly games(!), and light up my 100W, his S-meter will see a big difference. But this is not the point. Clearly, the actual path loss between us could have been substantially more than the calculated free space one, especially when propagation is very poor. But the path loss can't have been that much bigger, because I would have been lost in the noise.

Now, a gentle warning. All these figures are approximate. It would take far more sensitive equipment than I possess to measure these numbers much more accurately. The basic rules apply – antenna height has a significant impact on gain, and more power makes the contact easier, from the viewpoint of the path losses involved. In effect, it's Tom's fantastic and powerful station that is doing the hard work here (lucky man!). But it's still a good experiment. I persevered with my 5W for an hour on Sunday afternoon, hitting both Canada and the USA. I feel like I've just entered a big game fishing contest with a piece of string and a bent pin, but still managed to land a few fish.

2

So, a plea to those whose HF activity is like mine, limited due to antenna problems. You can still get on the air, even with a modest piece of wire. Don't get too ambitious – leave the rare DX to the big guns. In April's *PW* **Maurice (Moe) GW0UGQ** did a very nice job of explaining how he got on the air from the window of a tower block. Good work! There is plenty of advice out there for those with restrictions on what you can string up. But this doesn't mean you can't make QSOs. But you have to get on the air to make QSOs! Don't let the propagation forecasts, or the state of the DX Cluster, put you off. Modern equipment is so well designed that it can demodulate a mere whisper! Many operators are using FT8 because of the weak propagation but the ARRL SSB contest proves that you can still make contacts on SSB, despite the solar minimum conditions. And don't be afraid to get on the air during a contest and make a few contacts. I'm delighted to discover that the 3000 mile path loss for my 5W is still small enough to produce a readable signal on the US east coast. It's fun and isn't that what it's all about!

Harry Leeming G3LLL
HARRYG3LLL@gmail.com

Signal Levels & Other Standards

Harry Leeming G3LLL has another cornucopia of hints, tips and anecdotes.

1

If you want to check the accuracy of a tape measure, your car's Speedo or your multi-range test meter, you should have no difficulty in finding something you can cross check it with. Alternatively If you want to check the accuracy of your frequency counter you can easily check its reference oscillator against the broadcasts of international frequency standard stations, but checking the accuracy of the RF level output of signal generators is not so easy because not many people have access to professional standard signal generators, and a simple diode probe loses about half a volt due to the forward resistance of the diode.

When I acquired a £25 second-hand Marconi generator, I wondered how to do this, and then I noted that it had a very wide frequency range, which extended from VHF down to 10kHz. A quick look at some of my other test equipment revealed that both my AVO Model 8 multi-range test meter, and my Heathkit audio voltmeter's specifications indicated that they were both accurate at the low frequency end of the Marconi's range so I could use them. I really only needed an accuracy of around ±20% for setting 'S' meters and checking sensitivity, and reasoned that if I checked and if necessary reset the output meter of my Marconi generator to be accurate into a 50Ω load on the 1V range at 10kHz, it would be 'near enough' on the other ranges and frequencies. In actual fact, after trying it, it proved to be 'spot on' without any resetting so the generator took pride of place in my workshop, and proved to be a very useful tool. I also acquired a cheap second-hand professional VHF/UHF generator, and was able to confirm that the output level of this was acceptably accurate, by comparing it with the Marconi on its VHF range. They looked to customers very expensive and impressive, for a total cost of around £50, **Fig. 1**.

Setting 'S' Meters (When 'Right' is 'Wrong')

Having obtained my signal generator, and confirmed, and double checked, that its output level was correct, I checked the 'S' meter on a few rigs I was repairing. They were not terribly accurate so, until I learned better, I started resetting them. While the agreed standard for an 'S' meter is that S9 = 50μV, very few seem to be set at this level, and resetting them resulted in complaints of rigs being 'insensitive'. Many meters are non-linear, and setting S9 at 50μV seems to sometimes throw the lower readings completely out. In the end I found that setting the meters so that about 20μV gave a reading of S9 seemed to give the best compromise on most rigs and kept everybody happy.

An Odd 'S' Meter Reading

Some years ago, after I had got rid of much of my test equipment but while I was still doing the odd repair at home, a Yaesu rig was brought into me by Tom with the complaint that it was 'A bit deaf'. He also told me that his mate had had a look at it, but it was no better. I switched the crystal calibrator on and it read 'S9' at the 14.2MHz calibrator point as normal, and with my dipole connected the 40m broadcast stations pinned the meter over. At first glance there didn't seem to be anything wrong, and yet there was not much activity on the amateur bands. I tried adjusting the pre-selector on 10m, and not only were there no signals, but the background noise did not peak up. My next move was to switch back to 20m and poke the antenna in via a capacitor after the antenna fuse, and at the input gate of the RF FET. It was no better. It looked as though the RF FET might be faulty so I tried feeding the signal to the FET's output, and found the set then performed better, without this stage of amplification. The FET was faulty, and when I replaced it the receive sensitivity shot up, and the 'S' meter pinged hard over to full scale when the calibrator was switched on.

Why previously then did the meter read S9 at the 14.2MHz calibration point? Tom's friend had obviously thrown confusion into the job, by turning up the setting on the 'S' meter while trying to cure the low sensitivity. After I had reset the 'S' meter, and peaked up the alignment, all was well.

Intermittent Faults on Hi-Fi Amplifiers

The family business was quite big in Hi-Fi at one time, but this became unprofitable, with the expense of a town centre shop and showrooms, and the advent of discount houses and the internet. Brenda and I then set up in our own smaller shop, concentrating on amateur radio equipment, and while we stopped selling Hi-Fi equipment, we still got equipment brought in for repair from our old customers.

Joe came in with an amplifier, which he said would occasionally become distorted on the left-hand channel. This had happened on both the gramophone and radio inputs, and at first he thought that he had a faulty speaker. He tried swopping the speaker connections over on

Fig. 1: A not so expensive piece of test equipment.
Fig. 2: Close the door and it is a room heater.

the back of the amplifier, but the next time the fault occurred, however, the distortion then came from the right-hand speaker so he knew the fault was definitely in the amplifier. Tracing intermittent troubles that only occurred when equipment had been running for a length of time was always difficult, but 'soak testing' an amplifier for a fault of slight distortion that only occurred occasionally at high volume was going to present an extra problem. We were now in a small shop where I was trying to carry out other repairs, and serve customers, while Brenda was doing the mountain of paperwork that small businesses are landed with, all in the same room. I could, of course, have connected the amplifier to a couple of 8Ω resistive loads and an oscilloscope; but would I have noticed if one output suddenly became slightly distorted while I was doing something else?

I could hardly turn long-established customers away so I used a useful dodge I had learned many years previously. I fed a signal into both channels from a mono FM radio, with the output set to deliver a few watts into two 8Ω loads. I then connected one speaker between the amplifier's two live speaker output terminals. All I had to do then was to adjust the amplifier's balance and tone controls until the output from each channel of the amplifier was precisely the same. There was then no sound from the speaker, even at high volume settings, while everything was working correctly, although it would burst into life when a fault occurred on one channel because the balance was then upset. Eventually I was able to trace the fault without causing too much disruption.

An Efficient Electric heater

One effect of age – I am now in my 80's – is that acquired experience and disappointments makes you more sceptical of advertisements. A leaflet dropped through my letter box offering a 'Highly Efficient Electrical heater'. Now If you think about this, it would be just about impossible to make an electric heater that was not highly efficient at the basic task of converting electricity into heat. One of problems with designing most other pieces of electrical equipment, is to try and stop them converting electricity into heat. Try and think of many pieces of electrical equipment that do not convert over 90% of


2

their electrical input to heat, and you will struggle. My computer for instance would qualify as very efficient, (but expensive) heater, and so would a standard 100W light bulb. Even a fridge sucks heat out of food and dumps this, and most of the electrical energy it uses, **Fig. 2**, as heat into the room!

In for Repairs

Last November I had to go into Lancaster Royal infirmary for my second hernia operation. While the NHS may be hard pressed to keep up with demand, kindness and consideration from the staff and nurses was definitely not in short supply. The surgeon **Mr Crighton** explained that I would be 'repaired' by a piece of plastic mesh. This sent my thoughts back 50 years, and I explained that I had installed and repaired the Hi-Fi equipment of **Doctor Brian Mercer**, the inventor of 'Extruded Plastic Mesh'. As I was now going to be repaired by his invention, Mr Crighton agreed to show me a sample.

Blackburn, where we did business, was at one time was the world's leading textile weaving town, and everyone from **Ghandi** downwards came to it to learn about textiles. By the 1950s, however, Blackburn had 'exported' its skills, and cheap imports from the Far East were having an effect. Dr Brian Mercer, who ran a cotton mill, realised that a new material was needed. Prior to this if you wanted flexible non-airtight sheets of any kind of material, you had to perform some sort of weaving or knitting action (nylon stockings for instance). He, however, invented 'extruded plastic mesh' and formed a new company 'Netlon' to market it. No weaving was necessary. Plastic went in one end of his machine, and the mesh came out the other. He patented his invention and licensed the process to companies all over the world. This made Dr Mercer a millionaire and earned him an OBE and many other awards.

While the Camera Shutter Speed Tester, and the G3LLL RF clipper I made in the 1970s did sell in modest quantities in the UK and USA, I never managed to turn any of my ideas into millions. Marketing ideas gave me considerable satisfaction, though, and promoted the business via free favourable reviews published in UK and USA magazines.

David Tong, however, did rather better. He was a Leeds schoolteacher, who started Datong by building amateur radio accessories at home at around the same time. Datong is now a multi-million pound 'Hush-Hush' electronic security organisation, about which even Google does not seem to know very much. It possibly mushroomed out from David's Amateur Repeater Jammer Tracer, which seemed to disappear not long after it was announced, Looks as though someone high up decided that this could be a very useful item. I wonder, did any reader manage to buy one?

So, follow your dreams – you never know.

Preparing for Your Exam

Tim Hier G5TM
practicalwireless@warnersgroup.co.uk

Tim Hier G5TM, a teacher, recommends how best to prepare for your amateur radio exams.

Exams can bring back many memories, for many these are not necessarily fond ones! However, in order to progress and of course, to even begin in our great hobby, you need to tackle the spectre of the exam.

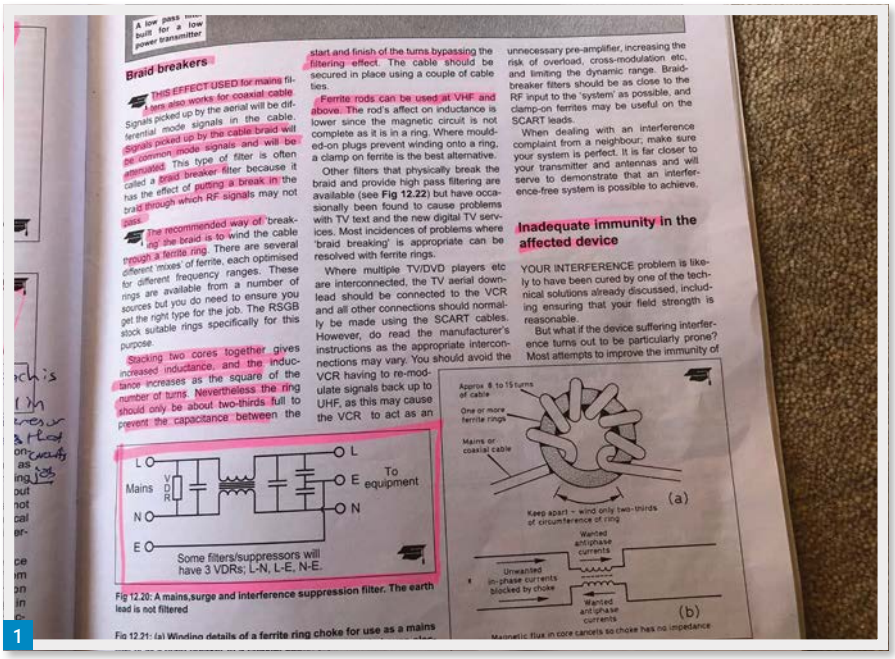
I approached my preparation for each of the three radio exams I have attempted in the past three years armed with the useful insight my day job provides – working as a teacher to help students in preparing for and studying towards examinations in Further Education. So I thought it may be useful for those who might be dreading, or at least feeling a tad apprehensive about even the thought of having to attempt an exam, to provide an outline of how I approached my preparations for my Advanced Licence exam last summer. (Please note this syllabus has now been updated.)

Just to confirm, this guide will focus on revising materials in the lead up to the exam date and can be used for any licence level. Therefore, whether you are, or plan to attend a course taught by a club or self-study at home, the approach I will outline can still be used, whatever the level of licence you are seeking to secure.

Step 1 – Devise a strategy to take control – become familiar with the syllabus

The prospect of studying towards the Full licence exam troubled me greatly. My only previous experience of electronics came during an ill-fated attempt to study GCSE Physics over 30 years previously. I hated physics with a passion, failing it miserably. The prospect of grappling with capacitors, diodes and resistors filled me with dread. Then I took a look at the syllabus and the dread began to recede a little. I noticed that out of the 62 questions to be asked, 12 were covered by the Technical Aspects section. Suddenly it dawned on me that 80% of the paper would avoid this aspect of the syllabus. The pass mark of 37/62 (60%) suddenly seemed attainable.

A look at other parts of the syllabus showed that I certainly needed to revise but that an average of 7/10 in these sections, plus a handful of correct answers in the Technical Aspects section, would see me home.



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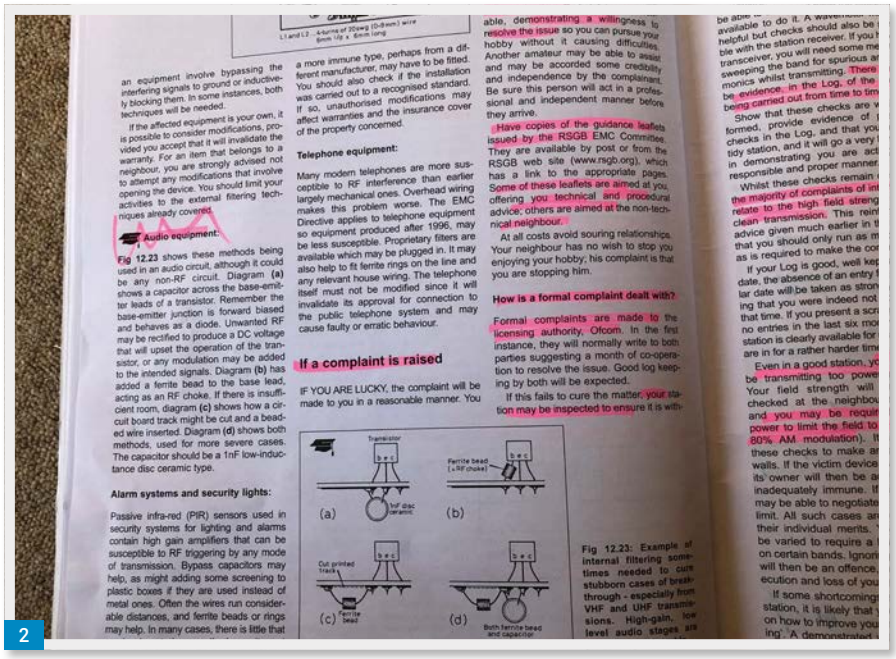

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My strategy therefore was to initially focus on revising the sections other than Technical Aspects and focusing first of all on the largest of these and then progress to the smaller ones in terms of the number of questions each section would be asked in the exam. So, Transmitters and Receivers was my starting point, knowing that my 7/10 strategy was the way forward.

Step 2 – Boil it down!

So, you have bought the study guide book. Probably around 70-100 pages long. Most pages are two to three columns per page of fairly tightly packed text, with some pictures. Sounds familiar? The first gold-

Figs. 1 & 2: The main study book with relevant bits highlighted of the 2 pages in question. Fig. 3: shows such a reduced version (each page of the original study book contains on average 500 words). Fig. 4: note just how much those two original pages have been reduced to.

en rule is to resist the temptation just to plough in and remember each section verbatim. This will soon lead to headaches, frustration and a severe loss of motivation.

Treat your main textbook as the beginning of a process where you will reduce the amount of words you need to read and remember by a whole lot! Here's my suggestion using two pages from the study guide covering part of the EMC topic:

Take one main topic at a time and a section of each topic at a time.

As the book is probably your copy, buy a highlighter and begin to underline key bits of information. For example, formulae or definition, **Figs. 1** and **2**.

Once you have done this then write down a short version of each bit you have highlighted, **Fig. 3**.

Then, go back to your shortened version and try and boil it down a bit more to something near to being an 'at-a-glance' set of notes, **Fig. 4**.

Now guess what? The fact you have taken the time to read (and highlight), then reduce it down, then down again, all means that you have begun to have some of this soak in to your brain, even before you try to properly memorise what you have taken the time to read over.

Why does this work? Well think about it, we pick up skills and knowledge very often by completing tasks. The task in this case was to produce a quick and easy set of notes. By doing so you have, perhaps a little subconsciously, read information that has started to stick in a little bit.

Complete this approach for each section, read over your notes as often as you can, even if for only 15 minutes at a tea-break or when picking up the kids from school, it will all help.

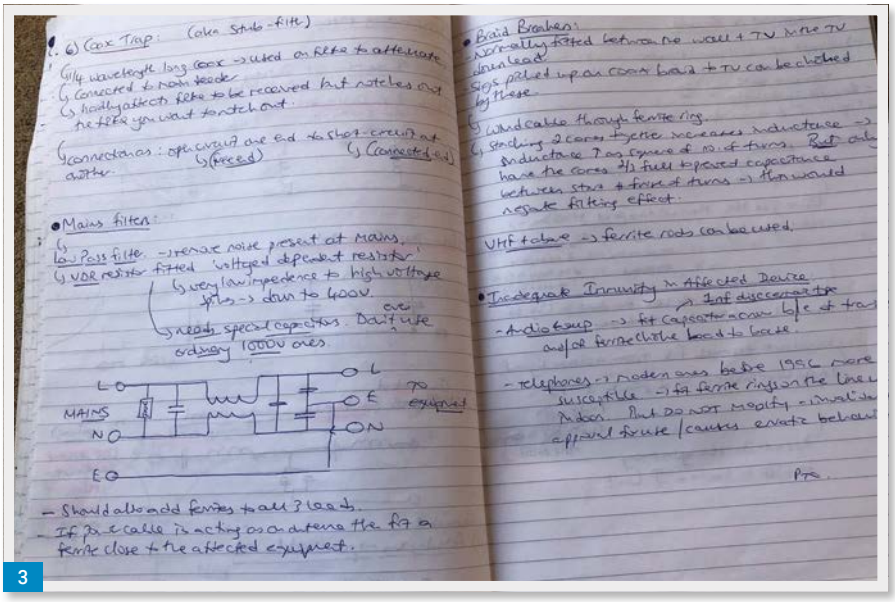
Step 3 – Plan your revision – a little often

You alone will really know the pace you can study at and the time you have available to fit your radio studies into your busy life.

Take your time to read over your notes and use the practice questions often provided in your book, the mock papers on the RSGB website and some other learning materials often found online.

Once you begin to become familiar with the types of questions asked and start to recognise a familiarity with the answers, you will become even more confident and in feel in control of your studies.

Do not be tempted to try and cram everything into one big session the night before. Build your confidence gradually and use the few days before the exam just to review and reinforce the knowledge you have gained.



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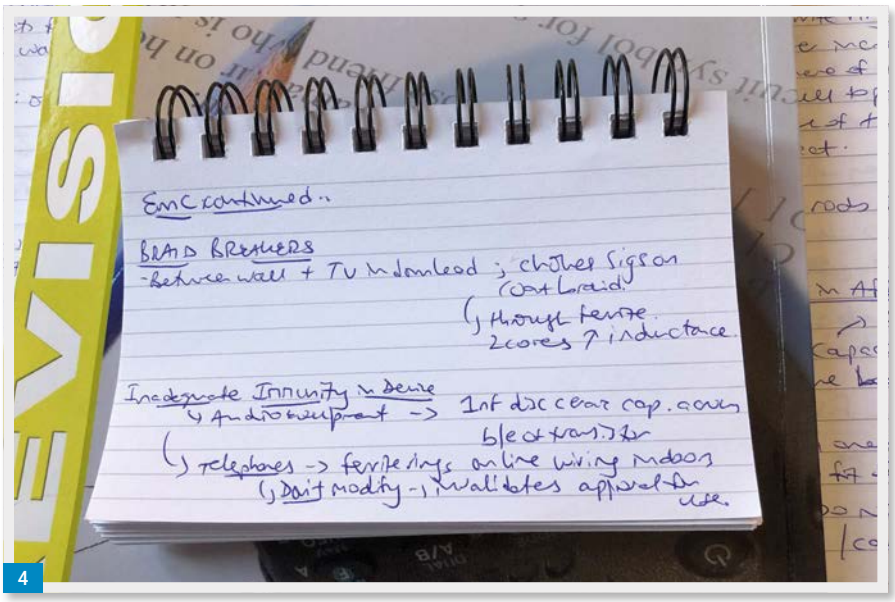

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Step 4 – Practice!

In the final week or so try a couple of mock papers. Make a note of the questions you definitely know the answers to; the questions you maybe know the answers for and the questions that you haven't a clue about! For the questions you were unsure about or did not have a clue about, make a note about which ones they were on that mock paper.

Remember, the order in which the various topics appear in your exam will be the same so you will not only become familiar, and less anxious about the exam itself but you can also focus your energies on the areas (questions) you did not get correct in your mock(s) so you can easily fix these by revisiting your notes. Try the same paper again in a few days but only the questions you did not get correct the first time. Then you will find that mark creeping up!

Use various online materials. There are some very good YouTube channels in the UK that have posted some great questions for the Full Licence. This is based on the old syllabus but, much of it will apply to the new one.

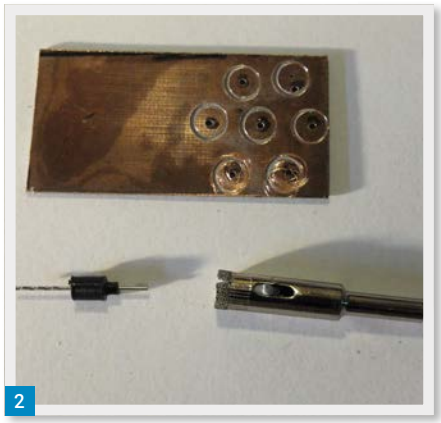
Hopefully you will find these tried and tested tips useful and good luck with your next exam!

Resistive SWR bridge & Archimedean drill

Geoff Theasby G8BMI
geofftheasby@gmail.com

Geoff Theasby G8BMI suggests building a copy of an original antenna impedance meter.


1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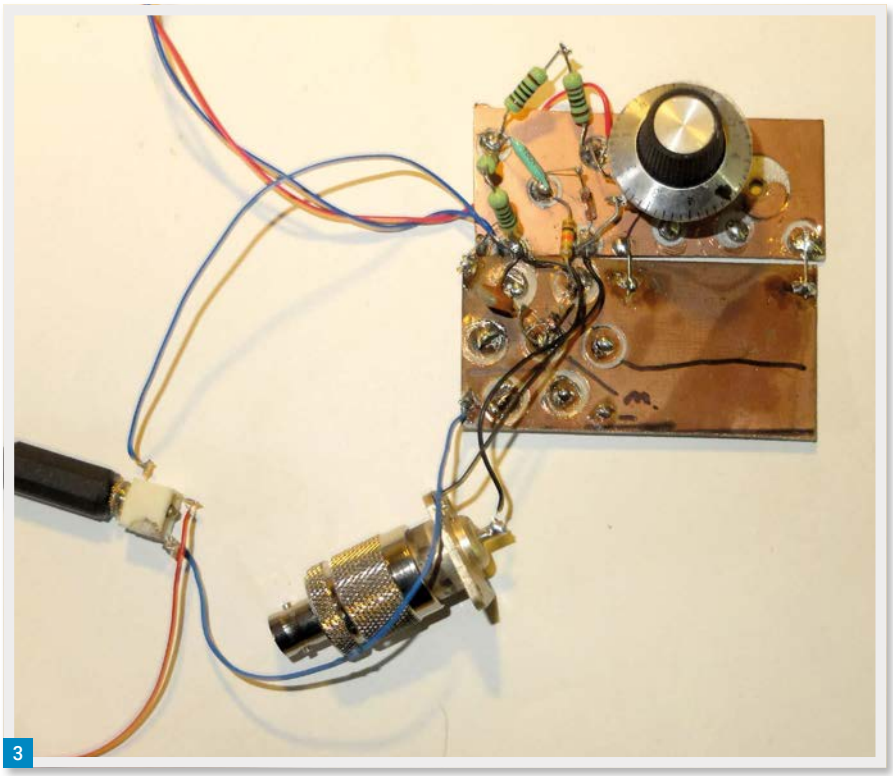
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Fig. 1: Pilot drilled.
Fig. 2: Prepared PCB, with pilot and hole saw.
Fig. 3: In development.

I found thixs circuit quite by chance, the Heathkit AM-1 Antenna Impedance Meter. I had never heard of it, but when I read it I was intrigued. It also gave me a chance to try out an idea I had early one morning as I slowly clambered out of my overnight repose. The circuit seems to have originated with W2AEF in 1950. I could obtain a copy of his article if I bought a day access ticket from the relevant website, which I was about to do when I found that the device, used in conjunction with a GDO (Grid Dip Oscillator) was known as an Antennascope. As **Douglas Adams** said (I paraphrase), knowing about something is easier if you have a name for it, and so it proved. I found four articles after a few minutes internetting and had all the details I needed, including the original Heathkit manual (*easily found by a Google search – **ed***.).

The 'Manhattan' idea of gluing small pads of unetched PCB material to a base board to create isolated islands, between which components are soldered, gave rise to my idea, which is to use a small hole saw to create such islands in the unetched board directly. I decided than 10mm was a good start, and built the circuit, **Figs. 1** through **3**. Make sure a complete ring of copper is removed in every case – test with a meter to verify the complete isolation of each. My circuit would not work until I discovered quite by chance that I got a reading on the AC scales of my test meter. Fitting a second diode before the meter, I was rewarded by a good deflection of the pointer. I tried replacing the first diode with no improvement, so I carried on. I used the 45dB attenuator (*PW* March 2018) with a dummy load and my 10W uBITX transmitter instead of a GDO. I was able to get a good null reading, which, compared to that obtained using a 50Ω termination, suggested that my 40m dipole was resonant in the band and presented an impedance of 50Ω.

I made an extender board using a modified hole saw (The original had no pilot drill), which again worked well. I made a plastic plug, by turning to size in my lathe a piece of scrap acetal bar. This plug was blind drilled to hold the pilot, and both were a friction fit, making the job easy. It would be simple to make a plug in the chuck of a hand or cordless drill, and cross drill for a small grub screw giving positive holding if required.

Archimedean Drill

I always have difficulty drilling holes in the correct place for flange mounted BNC sockets etc, but I bought a cheap Archimedean drill, and, fitted with a suitably sized twist drill, it can be used through the mounting holes to start off holes in the right place. Engineers call this 'spotting through' and it works very well indeed!

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Your Letters

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

Electronics Books

Dear Don,
I have just started reading my latest *PW* and I noticed people requesting sources or electronics books. I am sure you are aware of the American Radio History website but many readers may not be. **americanradiohistory.com** holds thousands of radio related magazines covering construction, shortwave, electronics and other radio and technical based topics.

I am just scratching the surface of the contents of this site but most interestingly they hold many electronic and radio construction books for beginners up to advanced. Their search facility is effective too. All free to access and print your chosen article if desired. Be warned, one could get lost in this site it is so comprehensive.
David Seymour 2E0EYR

Dear Don,
M0ISK et al express concern about a perceived lack of electronics books, suggesting it is now a case of having to trawl through old bookstores for out-of-print texts. I'm not at all sure this is true.

Searching for the term 'electronics' on just one leading online retailer's site returns over 20 pages of book title results. Admittedly, not all are suitable for radio hobbyists and curious youngsters, though a very large number are.

The likes of Raspberry Pi and Arduino have provided a mass audience with appealing and extremely popular products offering the opportunity to learn about electronics. There is a whole industry publishing books in support of these types of devices.

In the end, I suspect the concern over a lack of books on 'messing about with electronics' is simply a symptom of nostalgia and not keeping up with recent developments. Those who have used a certain type of equipment for years without fault may well suddenly find it difficult to find modern equivalent components. We may feel that things 'aren't the same anymore'. But that doesn't necessarily equate to youngsters not having an interest in electronics, and certainly not to there being no books to encourage and help them.

Books, though tactile and traditional, are, in the end, only one means – and quite an expensive one – of disseminating information. Books remain popular, often increasingly so in many subject areas. But the internet now permits us to benefit, instantly, from the collective wisdom and experience of countless people, no matter how niche the topic of interest or problem. That is something that books, with limited shelf life in technical areas and long periods between reprints, always struggled to achieve.

It may or may not be the case that there are fewer people taking an interest in hobby electronics or radio. But any claim that there is a lack of information about these topics, and even on repairing 'legacy' equipment is, I suggest, to ignore what's available, for free, online.
John Rowlands MW1CFN
Anglesey

Dear Don,
I have just read the letter from **Barrie Eggleton** in the April issue of *PW* and admire his dedication in getting his grandson to learn about electronics. I was of a similar age to his grandson when I first started to take an interest spurred on by the **Rev George Dobbs** Ladybird book about building a transistor radio (I still have it) and later a Phillips electronics kit (I think it was an EE 1050 but without going into the loft can't be 100% certain).

Anyway, some books that Barrie might like to consider for his grandson are:

1. *Adventures with Electronics*. **Tom Duncan**.
2. *Starting Electronics*. **Keith Brindley**.
3. *Electronic Circuits & Fundamentals*. **Mike Tooley**.
4. *Getting Started in Electronics*. ??? Mims. If I remember correctly this was a sort of hand-written book. More a collection of notes rather than a textbook.

Some may be a little advanced but I'm sure that with Barrie's help and encouragement his grandson will grow into them. Even today as a CEng I still refer to Mike Tooley's book!

Also, don't forget websites such as All About Circuits. There are many excellent electronics tutorials in here.

Earlier, I mentioned the Phillips electronics kits. Sadly, these are no longer available as new but can sometimes be obtained from a well-known auction site – at a price! I have seen similar modern-day kits available in certain shops but I can't vouch for their quality or what they include.

Finally, if it's simple circuits that Barrie is looking for to get his grandson to build, he could try looking on the previously mentioned auction site for old issues (from the 1970s & 80s) of electronics magazines such as *PW*, *Practical Electronics* and, for simple circuits in particular, *Everyday Electronics*, all of which absorbed a sizeable chunk of my pocket money and paper round money! But it all paid off in the end and I've had a successful and enjoyable career in electronics.

Good luck to Barrie and his grandson.
Chris Murphy M0HLS
Derby

M5 Calls

Dear Don,
I read the letter in my *PW* to say M5+2 are reserved for ex-seagoing Radio Officers with PMG or MRGC certificates. I got my *PW* today 9th April. Look at that month again, APRIL. I suspect that this letter is an April fool letter as some M5 calls already exist for 'normal' Amateurs.

Nice try.
Ross Bradshaw G4DTD/G4SKS
Ex Marconi R/O with MRGC and DTI radar ticket.
Cornwall
*(**Editor's comment**: I think the idea was genuinely meant Ross but I now discover you are correct – M5+2 calls have been issued quite widely)*

Bruneval

Dear Don,
Further to the mention of Bruneval in your April *Keylines*, back in the mid-seventies, the 30-year rule had finally allowed much previously confidential Government

information covering the Second World War to be released into the public domain. **Professor Reginald (RV) Jones** who, at that time gained much publicity for the things he was finally able to talk about, referred to the Bruneval raid. They were Commandos of course, (the SAS was developed from the Long Range Desert Group in early 1942 in North Africa). Prof. Jones tasked the Commandos with recovering the frequency generating device, the magnetron, from the Knickebein Radar, which he was then able to investigate in depth and hence 'bend the German navigational beams' and develop further inventions such as 'Window'. He certainly acknowledged that the Germans were well ahead of us in radar development, having studied the 'blind landing system' of a captured Heinkel earlier in the War. The story hasn't 'just emerged'. It's been known about for over 40 years.

Simon Pryce G0EIY
Shrewsbury

Dear Don,
Reading your *Keylines* in the April edition reminded me of a passing comment made by one of our local amateurs **Reg G0LGW** some long time ago. He had been on a raid to dismantle a radar station in France and bring it back to UK. Unfortunately, I didn't think to ask further questions about what had happened and like you was under the impression that Watson Watt was the father of Radar. How little we know.

Gordon Cadey

PW

Dear Don,
I have been a *PW* reader, on and off, for many years, possibly too many! I can recall the give-away plastic tuning tools and the 13-valve monster combined radio and domestic 'hi-fi' – except that the phrase hi-fi was not really current in 1963!

So why the letter? Well it is a genuine bit of feedback. I feel that *PW* is better now than it ever was, striking a good balance between articles for the newcomer and those for the 'longer' established enthusiasts.

The recent article on the Ionosondes was an excellent example, a topic that I had heard about, vaguely understood but never actually read any detail on. The *Making Waves* was a darned good read. I'll need to find some more information as that piece has obviously whetted the appetite.

I am certain I'll continue to enjoy *PW*.

John Fitch G8EWG
Eastbourne

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The Other Man's Station

Dear Don,
First my *Marconi Challenger* article. Anyone trying to contact me regarding the Challenger story, please note that my email address is shown incorrectly at the head of the article. It should be **michael@gb2mop.org**. My apologies to anyone who has tried unsuccessfully to contact me via the wrong address.

I was drawn to **Geoff Voller's** letter in the April issue of *PW*. In his comments Don mentions the *Short Wave Magazine* series: The other Man's Station. I had just been leafing through a handful of early to mid-1960s issues of *SWM* and amongst other things I was amazed to find the full address of the station given – something that I doubt we would see nowadays! A couple of examples are attached.

I always find copies of old publications interesting. It is amazing both how advanced amateur stations were then and also how much things have changed since those days. Last but not least: the adverts. Who could turn down a complete brand new 19 set in packing case with accessories for £4.10.0? Mind you shipping was another 15/-. Quality stuff like an AR88 would still have cost you about £35 in 1960. Does anyone remember Tiger Radio of Bournemouth? In 1960 they were advertising the Tiger TR100, a 100W phone, 120W CW 6-band transmitter for £100. Guaranteed TVI proof! Those were the days – or were they?

Michael Jones GW7BBY/GB2MOP
Llangeler


Volume XXIV THE SHORT WAVE MAGAZINE 289

THE OTHER MAN'S STATION G3TXW


Volume XXIV THE SHORT WAVE MAGAZINE 755

THE OTHER MAN'S STATION G8HX

GB2SM

Dear Don,
I read with interest the letter from **Geoff Voller G3JUL** – now I know who to blame for my lifelong interest in amateur radio and my career in electronics!

When I was a young teenager (early 1960s) I haunted the Science Museum in London throughout my school holidays. Easy to take a train from my home to South Kensington and there I was in the heart of museum land. The major attraction for me was GB2SM – I was there watching and listening whenever it was on the air. All I ever wanted was to become licensed and communicate with the World. All that lovely equipment with the curved console and the Labgear (?) rack-mounted transmitter was the stuff of teenage dreams (well almost).

The loss of the amateur radio station was, to my mind, a very short-sighted action by the museum authorities. I visited recently and the only real sign of the old days of amateur radio was the Morse key (very badly ad-

Continued on page 70

Continued from page 69

justed until somebody I know tweaked it) on a display of why clock time was made universal over the railways.

Oh, the memories of youth – but I will always be grateful to those who operated that station – it led to my degree and a lifelong interest in amateur radio.

Thank you G3JUL and all the others who operated there.

Barry Horning GM4TOE
Banff, Aberdeenshire

Dear Don,

I saw the letter from **Geoff G3JUL**, *PW* April 2020, and could not resist writing to thank him for giving me a good start in amateur radio. I was one of the 'volunteer' operators that assisted at GB2SM. As a fairly newly-qualified operator I learned a lot of good operating practices from Geoff.

However, the event I want to mention is when I was tuning up the old Collins 30-L linear at the start of a Sunday afternoon session. My fellow operator **Wayne**, now **NQ0RP**, was with me: and as I did the 'grid and dip' the needle made a momentary swing and return from near zero. So, I said to Wayne, *"What was that?"* As quick as a flash he replied, *"Probably a sparrow!"*

A lady in the gallery started to rebuke us for not preserving wildlife! She looked a little sheepish when Wayne pointed out he was only joking and that I was 'matching the valves' to the output.

It's a shame that there is nowhere in the Science Museum for demonstrations of amateur radio. Sadly, the management preferred the LEGO Exhibition, or the latest fad. And so, the station was dismantled, and operations ceased. Science lost out to commerce. But I will always be grateful to the tutoring, often by example, that Geoff gave to me – even if perhaps he does not remember me.

Tom Morgan ZS1AF, also ZT1T G0CAJ
Robertson, S. Africa

Roger Bip

Dear Don,

"Golf Fower Golf X-ray Oscar, Golf Fower Golf Lima Mike responding to your submission (May Letters). Amateur radio already has a protocol for signifying the beginning and end of transmission ('wrapper'), as demonstrated in this over of our QSO. G4GXO, G4GLM."

NASA did not design an end-of-transmission (EOT) 'Roger' tone for ground-space communications, although this became a secondary benefit of the system. The Earth and spacecraft are in constant relative motion, so it takes several geographically-distributed ground radio stations to keep the spacecraft in view.

Project Mercury was crude in comparison with later developments. Each ground station required its own Capsule Communicator (CapCom) radio operator, who only knew what to do according to instructions passed to him from Mission Control by other radio and/or teleprinter links.

For Gemini and Apollo the ground stations became unmanned relays, controlled remotely by one CapCom located in the new Mission Control room at Houston.

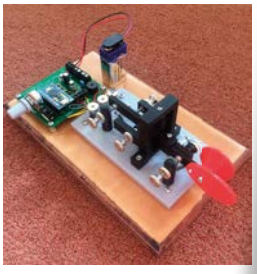
There was only an audio link between Houston and each relay outpost, no separate PTT line, so a tone control system was devised by the Quindar company. When CapCom pressed the transmit (PTT) button, a quarter-second 2525Hz tone was sent down the voice line to key the remote transmitter. Viewers at home heard everything, the astronauts only heard what was transmitted after this tone had finished. On releasing the PTT, a 2475Hz tone was sent to put the remote relay back to receive. As the transmitter was still live, this closing tone was heard by the astronauts and hence became a surrogate EOT bleep.

There's no concept of remote control of the transmitters in the spacecraft or suit, so no tones were sent from space/Moon to ground. Such tones would be unsuitable for voice operated switch (VOX) control, since pauses between words (when the astronaut is breathing hard due to exertion) would trigger frequent but misplaced bleeps.

Godfrey Manning G4GLM
Edgware

Next Month

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



REVIEW: NANO VNA: Don G3XTT takes a look at a cheap but effective tool for antenna analysis and more.
REVIEW: THE HYENDFED PORTABLE ANTENNA: Tim Hier G5TM takes a look at a handy antenna for portable operation.
DOING IT BY DESIGN: Eric Edwards GW8LJJ brings readers a low-cost microphone processor.
ROTATOR RENOVATION: Steve Telenius-Lowe PJ4DX sets about repairing and renovating a rotator.
SEMI-AUTOMATIC BUG KEY: Martin Waller G0PJO creates his own bug key.
A MIDSUMMER ANTENNA: Mark Foreman G7LSZ/SA6BID has a midsummer antenna challenge for readers.
There are all your other regular columns too, including Carrying on the G3RJV Way, HF Highlights, World of VHF, Notes from a Small Station, In the Shop, The Morse Mode, Making Waves, What Next and Data Modes.

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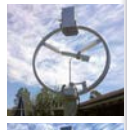

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