PRACTICAL WIRELESS

www.radioenthusiast.co.uk

AUGUST 2021

THE UK'S NUMBER ONE AMATEUR RADIO MAGAZINE SINCE 1932

DEMO TIME! | Hilberling-coming to the UK this year

SWITCH OVER

An easy-to-build dual antenna unit

High Frequency

Where to find current info about DX activity on HF

Buying Boutique

The growth of the smaller manufacturers now online

HISTORY Exploring This Wartime Classic

The R1155 receiver and why it is regarded as an iconic model

REVIEW Editor Tests New Handy Multimeter

GQ EMF-390 EMF Multi-Field/Multi-Function Meter gets a once-over

Hamfest off!

Covid hits event for second year

Top Contest Tips

Using statistics to improve your chances

08
9 770141 085143 >

WARNERS

£4.99

Display until 12th August 2021

Contents

PRACTICAL WIRELESS

August 2021 Vol. 97 No 8
On sale: 8th July 2021
Next issue on sale: 12th August 2021

ISSN 0141-0857

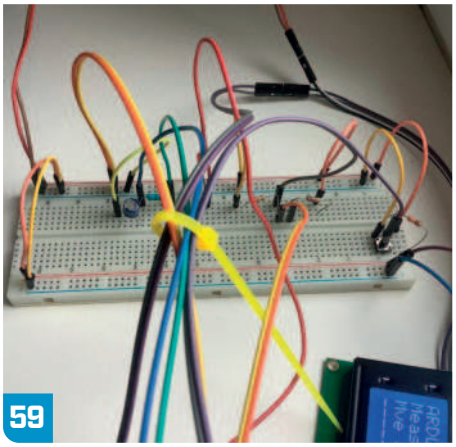
Practical Wireless
Warners Group Publications plc
The Maltings, West Street
Bourne, Lincs PE10 9PH
www.warnersgroup.co.uk
Tel 01778 391000

Editor
Don Field G3XTT
practicalwireless@warnersgroup.co.uk
Designer
Mike Edwards
mike.edwards@warnersgroup.co.uk
Advertisement Manager
Kristina Green
01778 392096
kristina.green@warnersgroup.co.uk
Production Manager
Nicola Glossop
nicola.glossop@warnersgroup.co.uk
Production Assistant
Charlotte Bamford
Charlotte.bamford@warnersgroup.co.uk
Marketing Manager
Katherine Brown
katherine.brown@warnersgroup.co.uk
Marketing Executive
Luke Hider
luke.hider@warnersgroup.co.uk
Publisher
Rob McDonnell
robm@warnersgroup.co.uk

Photocopies & Back Issues
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.

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

This publication is printed by Warners 01778 395111



Keylines

A couple of this month's articles brought back memories for me, which I thought I would share.

R1155

First, **Philip Moss's** *V&V* article about the R115, the receiver, as he says, that was used on all the UK's four-engined bombers during WW2. After the war many were sold off. I have two memories of those receivers. One is that we had one in my school Combined Cadet Force (CCF) unit, along with a matching R1154 transmitter.

My other memory is, again with the CCF, of going on an 'air experience flight' from RAF Gaydon on a Varsity aircraft that was being used for training RAF navigators (we just went along for the ride, which was four and a half hours flying a triangular course around the UK). Although this would have been in the mid-60s, this aircraft was equipped with an R1155 and matching direction finding (DF) gear for training purposes.

EMC Problems

The other memories were brought back by **Colin Redwood's** *What Next* feature where he talks about EMC cases he has had to deal with. Over the years most radio amateurs have accumulated tales of EMC problems they have had to face although, sadly, nowadays the problems are often in reverse with the radio amateur suffering noise of various sorts from the proliferation of household devices that emit unfiltered RF.

Actually, my earliest EMC complaint was not an EMC problem at all. A neighbour complained to my mother that I had been interfering with her TV. My mother took great delight in telling her that I was actually away at college so it couldn't have been me (it actually turned out to be a dodgy connector on her TV downlead). But that case highlights one of the problems we have as radio amateurs – our presence is advertised by our antennas and we then get targeted when any EMC problems arise!

After a house move, I had a complaint about TV interference, only for the inspector to find that the family concerned were insisting on watching Sutton Coldfield (a vast distance away) rather than the local, Sandy Heath, TV transmitter (a huge signal with us) because Sutton Coldfield was playing Coronation Street at a more convenient time! Needless to say, I was given the all clear!

In my 34 years living in South Oxfordshire I had to deal with several EMC problems, most of which came down to unsuitable domestic appliances, ranging from an Amstrad PC, through a couple of ancient distribution amplifiers (which were 'wide open' and seemed to be amplifying everything from DC to light), to an antiquated video recorder. In all cases direct TV reception was fine but the complainants still held me responsible on the basis that when I wasn't transmitting, their problems went away. It's hard to argue with that one, unfortunately!

The only complaint that led to a visit from the RA (nowadays Ofcom) inspector was one of those distribution amplifier cases, where the complainant, instead of following recommended procedure, complained direct to our local MP and refused to let the inspector into his house to try to resolve the problem. It led to the only time I have legally run excess power. I had an amplifier capable of about 1kW (always a good idea, to avoid putting too much strain on the PA devices when, for example, running a high duty cycle mode such as RTTY). The inspector insisted I run as much power as I was able, checked the output with a spectrum analyser, declared my signals clean, and put a note through the complainant's door to that effect. That was last I heard of that particular incident.

Don Field
Editor, *Practical Wireless Magazine*

Newsdesk

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

Hilberling appoints ML&S as their only Factory Appointed Dealer

During a visit to the Friedrichshafen Radio Show in Germany back in 2006 Martin Lynch came across a new manufacturer that he'd never heard of. The company designs and manufactures products at the extreme end of the spectrum, not just for amateur radio but commercial applications too.

By extreme, Martin is referring to build quality and performance. He says, *"Wandering through the Hilberling stand I witnessed the newly introduced Hilberling PT-8000A HF-6-4m transceiver and was literally taken aback. The big three, Yaesu, Icom & Kenwood, produce some magnificent base stations but in my opinion, Hilberling is in a one-horse race all by itself. After almost 16 years of talking and negotiating with the factory in Germany I am very proud to announce my company is the very first dealer in the world directly appointed by* ***Herr Hilberling*** *for the sale of the PT-8000A transceiver and HPA-8000B 1kW HF-70MHz linear amplifier".*

Martin will have a demonstrator set up in the store that was due to be available towards the end of June.

For more information on these two remarkable top-end pieces of equipment see: **www.HamRadio.co.uk/Hilberling**

RSGB NATIONAL RADIO CENTRE REOPENS: The NRC was due to reopen on 28 May and be open each day, other than Wednesdays, until further notice. The RSGB is delighted to support Bletchley Park as it welcomes visitors again. Visitor and volunteer safety is the priority. While the radio room will be open for the demonstration of amateur radio, visitors won't be allowed inside the radio room and only NRC volunteers will be permitted to operate the GB3RS station. The RSGB also reserves the right to close the NRC at short notice should the Covid situation change so do check its website before travelling. Visitors to Bletchley Park need to pre-book and pay via their website so the Society is unable to offer its free entry voucher to RSGB members while that system is in place. The RSGB looks forward to welcoming visitors to the National Radio Centre again.
https://tinyurl.com/thr6u77y

EMF UPDATE: The RSGB's specialist EMF group has helped Ofcom customise its guidance for radio amateurs. This updated guide is much simplified from the earlier version and now comprises just four steps:

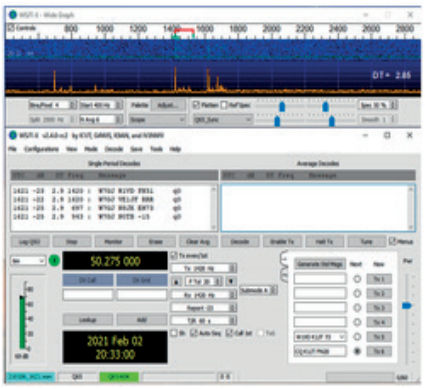
Step 1: Do I need to comply?
Step 2: Carrying out a compliance check
Step 3: Managing compliance
Step 4: Keeping an appropriate compliance record

The revised guidance document *What you need to know as an Amateur Radio user* has been released and the Ofcom EMF calculator updated. Links to all of the documents and calculators can be found on:
www.rsgb.org/emf

PORTABLE OPERATORS CHALLENGE: The second year of the Fox Mike Hotel Portable Operations Challenge, which pits Fixed stations against Portable ones, will be 4/5 September. The Portable Ops Challenge levels the competitive playing field between the Big Guns and the Little Pistols who operate a portable station. Unlike many contests,the POC has a formal theory guiding the way competition is scored. Bill Lippert AC0W, who revised this year's Rules document added: *"We are using kilometres-per-watt as the basic score for a contact. But to additionally level things, we based multipliers on the difficulty of transmission mode such as phone get a higher weight than those using the less difficult modes of CW and digital. Being a portable station will receive an additional multiplier, especially when contacting another portable station."* The scoring system is based upon the golf metaphor of the handicap index used to equalise the opportunity for all players to win when they have unequal ability and play on courses with varying levels of difficulty.

The rules etc are located at:
foxmikehotel.com/challenge

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



WSJT-X VERSION 2.4.0 NOW AVAILABLE: WSJT-X version 2.4.0 is now available in general release. According to co-developer Joe Taylor K1JT, WSJT-X version 2.4.0 includes the new digital mode Q65. This protocol is designed for two-way contacts over especially difficult propagation paths, including ionospheric scatter, troposcatter, rain scatter, TEP, EME and other types of fast-fading signals.

WSJT-X version 2.5.0-rc1 (beta) has also been released. According to the Release Notes, in version 2.5.0, *"the Q65 decoder has been enhanced to measure and compensate for linear frequency drift in Q65 signals"*.

Q65 uses 65-tone frequency-shift keying and builds on the demonstrated weak-signal strengths of QRA64, a mode introduced to WSJT-X in 2016. Q65 offers user message and sequencing identical to that in FST4, FT4, FT8 and MSK144. It includes a unique tone for time and frequency synchronisation. As with JT65, this 'sync tone' is readily visible on the waterfall spectral display. In addition, Q65 provides a sensitive 'sync curve' near the bottom of the waterfall window.

Testing showed that Q65 will enable stations with a modest Yagi and 100W or more to work one another on 6m at distances up to around 2,000km on most days of the year, in dead band conditions.

For the complete announcement, see the WSJT-X website:

https://physics.princeton.edu/pulsar/k1jt

NEW ON 60M: Kyrgyzstan is the latest DXCC entity to arrive on 60m. The Union of Radio Amateurs of Kyrgyz Republic (ARUKR) announced that the Kyrgyzstan Telecommunications Regulator made a new amateur secondary allocation of 5351.5 to 5366.5kHz available to Kyrgyz hams at a maximum power of 100W.

G-QRP CONVENTION 2021: In April the G-QRP Club ran a survey to gauge support for a physical Convention this year. The results showed that the vast majority are not yet willing to meet in person and would prefer another virtual Convention. The Committee thought long and hard about hosting a small gathering for those who would like to meet up but decided to leave it until 2022. So, the G-QRP Club Convention 2021 will be a virtual event over the weekend of 5/6 September. The Committee are now working on matching up the wish lists of topics and suggested speakers to bring you another great QRP (remote) gathering.

The plan is to join up with the Telford Hamfest once again next year and have a physical Convention that can be enjoyed remotely by those unable to attend in person.

National Hamfest Cancelled

This announcement appeared in June: *"It is with much regret that the organisers of the National Hamfest have decided to postpone the event planned for 24/25 September 2021 until September 2022.*

"A number of factors have made the organisation of the event impossible to predict in 2021. At this point we cannot therefore reliably commit to successfully and safely holding an event which takes upwards of three months continuous effort to organise. The organisers not only wish to act in a responsible way towards our large team of volunteers who staff the event and make it possible every year, but also the visitors and our partner organisations, all of whom make the event such a success each year.

FOUNDATION GRANT FOR EUROPEAN HAMNET: Amateur Radio Digital Communications, a private foundation based in California, has provided its first international grant to assist in expansion of the European HAMNET, a high-speed amateur radio multimedia network. The funding, which will go through the Deutscher Amateur Radio Club in Germany, will provide sponsored hardware for radio links to make use of the Amateur Packet Radio Network IP space in Europe.

With this grant, DARC becomes the first non-US organisation to be given an ARDC grant.

ARDC president Phil Karn KA9Q issued a statement saying that ARDC's goal has long been to give grants like this to qualifying non-profit organisations outside the US. DARC president Christian Entsfellner DL3MBG issued a statement adding: *"We are highly excited that with this grant we can give the European HAMNET project a huge boost."*

WN1M SK: ARRL Volunteer Curator of ARRL's historical collection, Michael Marinaro WN1M, of South Glastonbury, Connecticut, died on 17 May. An ARRL member, he was 84. *"Michael loved the history of radio and had volunteered at ARRL for the past 15 years"*, said recently retired ARRL Product Review Engineer Bob Allison WB-1GCM. He authored historical articles for *QST*, *RadCom*, and *The AWA Journal*, where he was a contributing editor. And, of course, contributed a number of times to the *Valve & Vintage* column here in *PW*. Licensed since 1951, Michael was active on HF.

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

RADIO ENTHUSIAST BOOKSHOP

The War Against the BBC

How an Unprecedented Combination of Hostile Forces Is Destroying Britain's Greatest Cultural Institution... And Why You Should Care

The BBC is our most important cultural institution, our best-value entertainment provider, and the global face of Britain. It's our most trusted news source in a world of divisive disinformation. But it is facing relentless attacks by powerful commercial and political enemies, including deep funding cuts - much deeper than most people realise - with imminent further cuts threatened.

£10.99 PLUS P&P

RadioUser 2020 Archive CD

All issues of Radio User published in 2020 available on a handy CD Rom.

£39.99 plus p&p

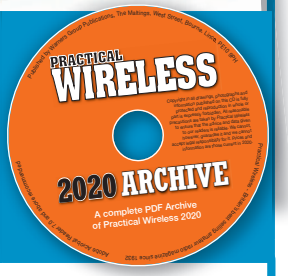
Subscriber price £19.99 plus p&p

Practical Wireless 2020 Archive CD

All issues of Practical Wireless published in 2020 available on a handy CD Rom.

£39.99 plus p&p

Subscriber price £19.99 plus p&p



NEW TITLES

Radio Hitler: Nazi Airwaves in WWII

Following the life of Deutschlandsender, the Nazi equivalent of BBC Radio 4, and its sister stations that transmitted to Germany and the world at large.

£18.00 plus p&p

The Magic Bands

The Six Metre (50MHz) and Four Metre (70MHz) bands are known as the 'Magic bands'. This book provides a comprehensive guide to these fascinating bands

£15.99 plus p&p

Transnationalizing Radio Research

A theoretical and methodological guide for exploring radio's multiple "global ages", from its earliest years through its recent digital transformations.

£32.99 plus p&p

The Remarkable Tale of Radio 1

Robert Sellers draws on archive material and first-hand interviews with DJs and key personnel to capture the extraordinary story of Radio 1.

£17.99 plus p&p

BEST SELLERS

World Radio TV Handbook 2021

This great directory continues to offer the most comprehensive guide to broadcasting on the planet.

£35.00 plus p&p

Radio Listener's Guide 2021

This is the 33rd edition of the UK radio listeners annual guide.

£7.00 plus p&p

Behind the Enigma

Famed for its codebreaking achievements during the Second World War, GCHQ also held a critical role in both the Falklands Conflict and Cold War.

£27.00 plus p&p

The BBC: Myth of a Public Service

The BBC is one of the most important institutions in Britain; it is also one of the most misunderstood

£9.99 plus p&p

Subscriber rate:

£7.99 plus p&p

SUBSCRIBER SPECIAL OFFERS

Battle of Britain Broadcaster

In 1936 Charles Gardner joined the BBC as a sub-editor in its news department.

£25.00 plus p&p

Subscriber rate:

£22.99 plus p&p

Radio and Radar Astronomy

A comprehensive introduction, with everything you need to start observing at radio wavelengths.

£22.99 plus p&p

Subscriber rate:

£21.99 plus p&p

Writing the Radio War: Literature, Politics & the BBC, 1939-1945

Wartime British writers took to the airwaves to reshape the nation and the Empire'Writing the Radio War'

£75.00 plus p&p

Subscriber rate:

£67.50 plus p&p

Radio Empire

Created to counteract broadcasts from Nazi Germany, the BBC's Eastern Service became a cauldron of global modernism and a nexus of artistic exchange.

£108.00 plus p&p

Subscriber rate:

£97.20 plus p&p

ORDERING IS EASY

at: www.radioenthusiast.co.uk/store/bookshop

or call 01778 395161

Browse the newest releases at: bit.ly/latestbooks20

Don Field G3XTT
practicalwireless@warnersgroup.co.uk

The GQ EMF-390 EMF Multi-Field/ Multi-Function Meter

Don G3XTT takes a look at this handy meter but uses the opportunity for a wider discussion about the new EMF regulations.

A lot of attention has been focused recently on matters EMF, with the changes to the licence resulting from Ofcom's desire to apply ICNIRP guidelines to all radio transmitters in the UK. While the RSGB/Ofcom spreadsheet is based on simple calculations using transmit power, antenna type and distance from people, it is understandable that some radio amateurs would want to know more about the levels of radiation not only from their amateur radio equipment, but from other local sources. This is where the GQ EMF-390 comes in. Indeed, this semi-professional meter has already been selling well since Moonraker included it in their product portfolio.

Overview

So, what is an EMF-390 and what does it do? Here is the explanation from the downloadable manual (which, incidentally, is a 'must' – the leaflet that comes packaged with the device does no more than give an overview):

The GQ EMF-360V2/EMF-360+V2/EMF-380V2/EMF-390 advanced multi-function digital EMF meter is designed and developed by GQ Electronics, Seattle, USA. It is designed to be a portable and convenient device. It can be used as regular EMF, EF and RF radiation detection. This high sensitivity meter lets you check EMF/RF radiation easily. Examples: computer mouse, car remote key, cell phone, cell tower, cordless phone, static, electric field, WiFi, computer laptop, microwave, electric heater, hair dryer, vehicle engine, light, outdoor power line, monitor the WiFi signal, smart meter signal, spy wireless video camera signal, even track radio signal in air.

The meter features multiple sensors to ensure maximum scale/range measurement and highest accuracy:

- *Three axis Electromagnetic Fields*
- *Electric Field*
- *Radio Frequency*

Additionally, the testing features include:

- *Radio Spectrum Power Analyzer (EMF-360+V2/380/390 only)*
- *Real-time (every second) data logging (EMF-390 only).*

The meter is able to identify the common source from EMF/RF measured, such as Power Line, WiFi/Cellphone, Cell Tower, Microwave etc. It also comes with built-in audible and visual alarm. The device can be used for EMF, EF and RF detection and monitoring, both indoors and outdoors (the unit must be protected from rain), as well as in other similar environments. The device also features a high contrast black/white LCD module and one front LED indicator. The unique GQ RF Browser feature allows to visualize the RF radiation precisely with an on-screen graph. With the RF Browser, the user is able to see the Digital RF equivalent in bytes as well as an RF power spectral histogram.

When the device is connected to a PC, in addition to charging, the free companion PC software can be used to:

- *Monitor the measurements on the computer screen*
- *Download the history data recorded through the EMF-390's data logging feature and convert it into a standard .csv file for further analysis.*

Specifications

- *EMF (Electromagnetic Field)*

Triple axis (X, Y, Z)
Range: 0.00~500mG, 0.00 to 50μT
Resolution: 0.1/1 mG or 0.01/0.1μT

- *EF (Electric Field)*

Range: 0V/m to 1000V/m
Resolution: 1V/m
Frequency independent

- *RF Field (Radio Frequency Field)*

Range: 0.02μW/m² ~ 9999mW/m²
Resolution: 0.01μW/m², 0.1μA/m, 0.1mV/m, 0.001μW/cm², 1dB
up to 10 GHz

The RF field can be measured up to 10GHz although as a spectrum analyser, measuring power, its use is limited to five bands as below. It is clear that these are by no means focused on the amateur radio bands but intended to cover the main VHF broadcast bands along with cellphones, WiFi, Bluetooth and other devices likely to be encountered in the home and elsewhere.

- Frequency band 1: 50 MHz -65MHz (FM Radio)
- Frequency band 2: 65 MHz -76MHz (FM Radio)
- Frequency band 3: 76MHz – 108MHz (FM Radio)
- Frequency band 4: 240MHz – 1040MHz (Cell phone, Wireless phone Smart meter, etc.)
- Frequency band 5: 2.4Ghz – 2.5GHz (WIFI, Bluetooth, Microwave oven, Smart meter, etc.)

Why not more? Well, the manual says that the unit includes specific hardware sensors for these bands, and by limiting its use to these frequencies, it contains the cost of the unit.

The unit also includes a real-time clock for accurate data logging.

In Use

I started with the all-in-one display mode to get an idea of what the device could tell me. This shows electric field, RF field and overall EMF, both average and peak. Any one of these can be selected as the main (right-hand) measurement. The device quickly showed the background level in my home and identified it as WiFi/Phone, **Fig. 1**. This certainly made sense and the reading increased substantially when I put the unit next to my WiFi router.

Some may be confused between the function of RF Browser and RF Spectrum Analyzer of GQ EMF-390. A quick answer would be the RF Browser is to detect the total amount of RF radiation, from all sources that have the frequency bands between 0.01GHz to 10GHz. The Spectrum Analyzer feature focuses on what the manufacturer considers to be the main bands of interest.

I took the meter outside and stood below my 6m Yagi (see also the discission later). I measured 0.2mW/m^2 when transmitting, though this was on FT8, so the duty cycle across 6 minutes would be less than half that. In contrast, close to my cellphone, the measurement was about 1.7mW/m2 – somewhat more concerning given that we use these devices close to our heads (but, naturally, Ofcom give a dispensation

2

Fig. 1: Background EMF reading at the author's QTH. Fig. 2: Some of the display options with the EMF-390.

to cellphones!). Next to my WiFi router the reading went to over 200 and the green warning light started flashing!

As for the microwave oven, the reading went to 500+ closed by and dropped to about 20 four or five feet away.

I was actually quite surprised by the power reading below my 6m Yagi. Draw a sphere round the antenna and at 9m away, the surface area of the sphere is about 1000m^2, so if the radiator was isotropic, I would have expected, with, say 200W at the antenna (I have a run of about 70m of coax!), anything up to 200mW/m^2. But, of course, we are talking here about a 6-element Yagi with the majority of the radiation going off towards the horizon rather than emanating from below the antenna.

Time to try it on my 80m dipole. Running 400W at 50% duty cycle (i.e. sending a string of dots from my keyer), the reading was around 30mW/m2 with the meter almost touching the end of the antenna, but this fell to below 2 when less than 6ft away. Given that the ends of my antenna are about 6ft above ground (albeit it in the middle of my garden), I guess I need to ensure no one is likely to be standing immediately below them when I am transmitting (the Ofcom rules accept that there is no case to answer if no one is in the vicinity). Look on the RSGB website or at the article in the May issue of *RadCom* (page 26) and you'll see a diagram that illustrates this nicely – the measurements I made support the 'red' exclusion zone below either end of the antenna shown in the RSGB diagram.

I won't go into all in the ins and outs of the EMF-390 here because it is a well-featured and versatile instrument. I show in **Fig. 2**, for example, just some of the display modes it supports. And, as I mention later, you can also download the data to a PC for later analysis.

Ofcom EMF Regulations

To put the discission of the GQ EMF-390 into context, I need to say more about the new requirements from Ofcom as they apply to radio amateurs.

Ofcom have published their final decision on changes to the Wireless Telegraphy Act licences requiring all spectrum users (including all radio amateurs) to comply with the ICNIRP general public limits on EMF exposure. Compliance is required after November 18th 2021 for frequencies above 110MHz, after 18 May 2022 for frequencies above 10MHz but below 110MHz, after 18 November 2022 for frequencies below 10MHz. More information can be found on their web page:

ofcom.org.uk/emf

But without going to the Ofcom pages, the RSGB have collected together all the relevant documentation on their website, accessible to all. Included is a down-

loadable calculator, based on the Ofcom spreadsheet, but with a 'front end' specifically for amateur radio users. There is also a video on how to use the calculator.
https://tinyurl.com/353e6948

Assessment Options

In May 21 *RadCom*, **John Rogers M0JAV** and colleagues set out the assessment options open to radio amateurs and that are acceptable to Ofcom.

The first is to transmit at power levels below 10W EIRP (effective isotropic radiated power). Easy one but most amateurs will want to run more power than this.

Second is manufacturer's instructions. This applies mostly to handheld radios where the manufacturer has provided guidelines on how to meet ICNIRP criteria.

The third is to use the RSGB EMF Calculator. There was some resistance to this in the early days, probably because the RSGB spreadsheet was still under development. So, others came up with solutions of their own. But, having used the RSGB spreadsheet myself to assess my own station (more below), I can say that it is very straightforward. What's more, the front-end overlies Ofcom's own spreadsheet and, as a result, if you are deemed by the RSGB spreadsheet to be compliant, then that will satisfy Ofcom.

Fourth is to use other EMF calculations, for example by way of a recognised antenna modelling program. This, though, is probably beyond the abilities of many amateurs, at least in terms of doing the calculations to a level at which Ofcom might be satisfied.

Finally, the RSGB is developing a library of 'pre-assessed station configurations. In other words, they effectively do the calculations for you if your station matches (near enough) one of the configurations they have modelled.

You will have noticed that nowhere is it satisfactory to make your own measurements of electric or electromagnetic field. This is because doing so with anything other than laboratory calibrated specialist equipment is considered not to be satisfactory. So, where does that leave the GQ EMF-390?

And at this point I can do no better than quote reader **Roger Dixon G3SNT**, who writes: *Delighted to see that you intend to review the above instrument. Coming from a background of Science Education (now retired) and overseeing the implementation of COSHH Assessments/regulations in the 90s to a less than enthusiastic large number of 'respondents', I see a direct parallel with the required changes to meet the new Amateur Licence regulations from OFCOM. My experience tells me that to help ensure adoption, it has to be simple, meaningful and ideally, seen as a useful exercise – not just box ticking or remote from reality. This to my mind is the huge benefit of direct measurements with this meter. I purchased the above meter and cannot overstate its useful broad-based functionality not only to produce real/live assessments inside the 'shack' but of course in the vicinity of antennas. Together with the accompanying PC/Windows software and facility to both read and log/download RF data and 'see' it graphically etc, the process of assessment becomes both interesting and meaningful, especially to radio amateurs who have an embedded interest in where the RF is going! I have a fairly typical 'shack' and selection of HF/VHF transceivers and a number of vertical and horizontal antennas. My live assessments using up to 200W maximum output in the HF bands have revealed no adverse levels of RF radiation both in the shack and at distances as small as 25cm from the radiating elements of antennas outside the shack. As a bonus to owning such a device it is possible to locate and measure the 'noise' being generated by a host of devices in and around the home – a very useful detector for helping the fight against electrical QRM. My assessments to date confirm that I need not worry about any undue 'warming effects' to visitors as a result of my transmissions, however I would perhaps urge them to keep a respectful distance from the kitchen microwave if I am making them really welcome!*

Assessments suitably annotated and available for scrutiny would not substitute for an RSGB/OFCOM calculator, or using 'Pre-assessed station configurations'. However, I think you will find when you use, test and review this meter it undoubtedly reinforces:

1. That, in use, amateur radio transmissions do produce 'EMF' and it can be seen as a 'real' variable and quantifiable product of our activity – not imagined from otherwise a series of complex calculations
2. That it can be measured in real time, in situ and is very useful data for subsequent analysis
3. The measurements may well enlighten users to take precautionary measures or conversely conviction that compliance is being achieved – some conviction that what we are being asked to do is not just a paper exercise
4. Almost like the Grid Dip meter of old (now replaced by the increasingly common VNA), it is a very useful addition to the test equipment in the radio shack.

Having now had the opportunity to use the GQ EMF-390, I very much concur with Roger's view. Nowadays we are surrounded by RF but have no 'feel' for how much of it there is around the place, which are the devices that are most culpable in creating RF fields around the house and garden, and the extent to which our own amateur radio equipment generates fields on different bands and in different locations around the antenna. And in this respect, it's worth noting that there is a significant difference between 'near field' and 'far field' effects. Most antenna modelling programs are (for obvious reasons) designed to model 'far field' – you want to know how effective the antenna is at communicating with distant stations. But the 'near field' (which actually extends only a very short distance from your antenna) behaves very differently and this is where we need to turn to other sources to measure, model and understand.

ICNIRP

One of the documents cited on the RSGB website is *ICNIRP Guidelines for Limiting Exposure to Electromagnetic Fields (100kHz to 300GHz)*. I don't recommend

Table 6. Reference levels for local exposure, averaged over 6 min, to electromagnetic fields from 100 kHz to 300 GHz (unperturbed rms values).[a]

Exposure scenario	Frequency range	Incident E-field strength; E_{inc} (V m^{-1})	Incident H-field strength; H_{inc} (A m^{-1})	Incident power density; S_{inc} (W m^{-2})
Occupational	0.1 – 30 MHz	$1504/f_M^{0.7}$	$10.8/f_M$	NA
	>30 – 400 MHz	139	0.36	50
	>400 – 2000 MHz	$10.58/f_M^{0.43}$	$0.0274/f_M^{0.43}$	$0.29/f_M^{0.86}$
	>2 – 6 GHz	NA	NA	200
	>6 – <300 GHz	NA	NA	$275/f_G^{0.177}$
	300 GHz	NA	NA	100
General public	0.1 – 30 MHz	$671/f_M^{0.7}$	$4.9/f_M$	NA
	>30 – 400 MHz	62	0.163	10
	>400 – 2000 MHz	$4.72/f_M^{0.43}$	$0.0123/f_M^{0.43}$	$0.058/f_M^{0.86}$
	>2 – 6 GHz	NA	NA	40
	>6 – 300 GHz	NA	NA	$55/f_G^{0.177}$
	300 GHz	NA	NA	20

3

Fig. 3: Reference levels taken from ICNIRP.
Fig. 4: The display when using the GQ_EMF PRO software.

it for bedtime reading but it's worth taking a look, if only to understand where Ofcom are coming from with their latest regulations. Ofcom are not, nowadays, a technical body, so they consult Public Health England who, in turn, go to ICNIRP for the necessary requirements.

I have, though, extracted Table 6 from that document (**Fig. 3** here), because it sets out the reference levels for local exposure, averaged over six minutes (which is the basis of the Ofcom regulations). These are measurements that can be made with the GQ EMF-390, if only to satisfy yourself that that your station is 'safe' (and bear in mind that 'safe' in this context means well within any possible level at which dangerous effects might occur – the ICNIRP guidelines are intended to be ultra-conservative).

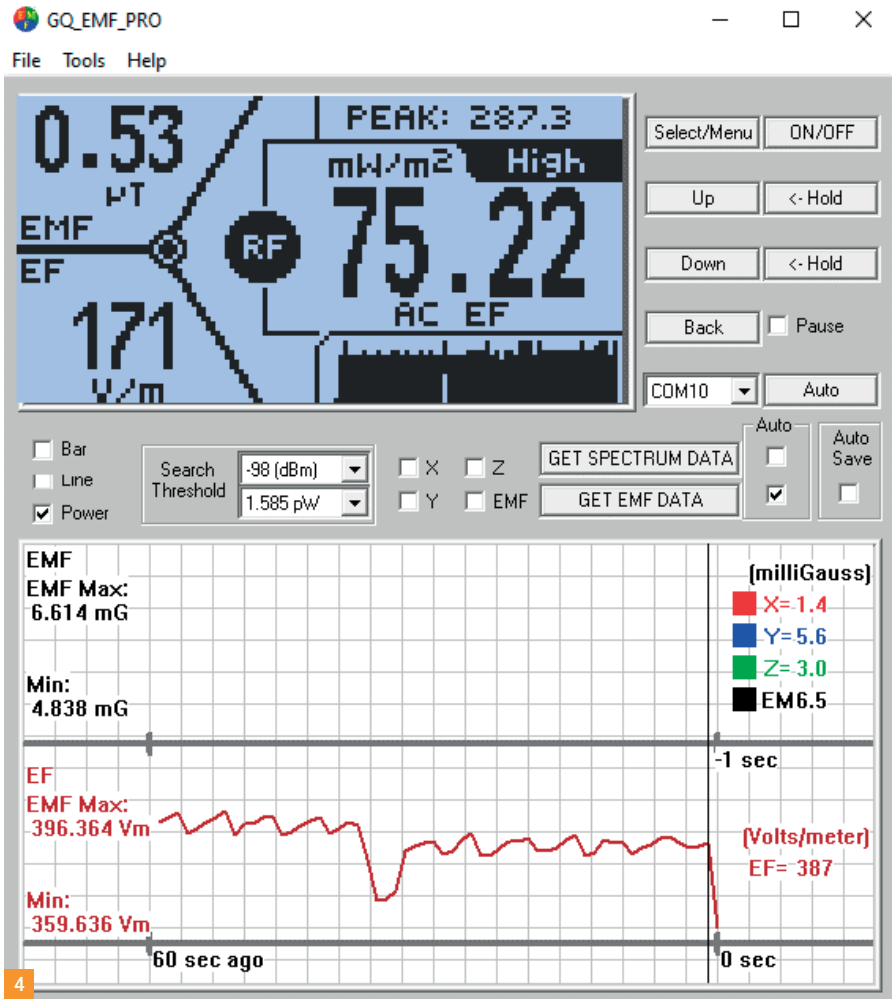
The numbers will be too hard to read – I recommend you look at the document itself if you want to follow up.

My Station

I thought, therefore, I would take a look at my own station, at two very different frequencies, to determine where I stand with respect to the requirements. First, I took the 6m (50MHz) band, 400W and FT8 (a relatively high duty cycle mode) into my 6-element Yagi antenna. This, I thought, might turn out to be a problem, but the 'compliance distance' turned out to be 7.4m. In practice, this means that unless someone climbed part-way up my mast (and stayed there for six minutes), I am comfortably within the requirement. As suggested, I saved the result as a PDF file, ready to show any Ofcom inspector who happens to come by!

And as I said earlier, using the GQ EMF-390, the fields I actually measured at ground level were very low indeed.

The only other antenna I have up at the moment is an inverted-vee for 80m and we have until November 2022 to deal with that one. I did try the RSGB spreadsheet but it actually doesn't work below 10MHz for the simple reason that the underlying Ofcom spreadsheet doesn't do so. But, again, I took the opportunity to measure around the antenna with the GQ EMF-390 and found, as I said, that I will need to be wary of anyone standing directly below the ends of the antenna for an extended period or, perhaps, simply need to reengineer the dipole to be less of an inverted-vee, by raising the ends to a 'safe' height.



PC Connection

I downloaded the software and USB driver from the net to see what it could do. As can be seen from the screenshot, **Fig. 4**, this displays what is on the EMF-390's screen at the time. But you can download the history into a .CSV file for further analysis. The high reading in this case is because the EMF-390 was close to the WiFi router on my operating desk!

Summary

There has been a lot of hot air generated as a result of Ofcom's introduction of regulations related to ICNIRP. Some have felt that amateur radio is being unfairly targeted. Some have felt that the RSGB should have knocked this one on the head. In reality, Ofcom have felt the need to apply the requirements to all radio users (something similar is happening in the USA) and, thankfully, have worked with the RSGB to facilitate self-assessment by radio amateurs, whether technically-minded or not. And having worked through the RSGB spreadsheet (I tried other bands in anticipation of putting up antennas for them again at some time in the future), the 'compliance distances' are far from onerous. For example, for my elevated 20m quarter-wave antenna that I sometimes put up, the compliance distance, even at 400W, is just 3.4m. Given that the antenna is in the middle of my garden, the only people likely to get within that distance are my family, and as I can actually see the antenna from the shack, I would know immediately if any of them got too close.

But where the EMF-390 helps is in giving reassurance, both to you as the radio amateur, but perhaps also to friends and family, that the levels around your antenna(s) are well within what is deemed safe.

The GQ EMF-390 retails for £115 and is available from Moonraker, to whom I am indebted for the loan of the unit for this review. The manual, which is worth a read if you are contemplating a purchase, is at: https://tinyurl.com/36ep4d4w

And, of course, there are a number of YouTube videos to take you through the setting up and use of the meter, albeit not specifically targeted at amateur radio. https://moonrakeronline.com

Steve Ireland VK6VZ/G3ZZD
practicalwireless@warnersgroup.co.uk

1

Buying a Boutique Radio

Did you realise these days you can buy more flavours of radio transceiver than ever before? **Steve Ireland VK6VZ/G3ZZD** investigates the rise of 'boutique' radio manufacturers selling online.

Go back 25 years or so and there were a handful of manufacturers of ready-made radios. We used to joke about most of us having ones made by 'YaeCOMWood', better known as the big three Japanese manufacturers Yaesu, ICOM and Kenwood (originally Trio).

The former 'big two' USA manufacturers of Collins Radio Company (Cedar Rapids, IA) and RL Drake (Miamisburg OH) had slipped away into history, along with their brother Heath (Benton Harbour, MI) and UK cousin, KW Electronics (Dartford, Kent). But the USA was still represented by Ten-Tec (Sevierville, TN), whose compact solid-state transceivers had a loyal following, particularly in their home country.

These companies built transceivers in relatively high volumes in traditional factories, usually which belonged to them.

The Arrival of Elecraft

In 1998, a new competitor came into the market. **Eric Swartz WA6HHQ** and **Wayne Burdick N6KR** formed Elecraft and marketed the K2 HF transceiver, named after the approaching '2K' millennium. They created a fresh amateur radio business model based on (initially) producing low volumes of high-quality products in a similar manner to the famous 1960s boutique clothing shops. This business model has had a huge influence on today's 'boutique' transceiver makers.

The boutique transceivers include the mcHF (designed by **Krassi 'Chris' Atanassov M0NKA**, Birmingham UK) to Lab599's Discovery-500 (out of Rubtsovsk, Altai Region of Russia) to XieGu Tech's G90 (designed by **BG8HT** in Huan Province, China) to Mission's RGO One (**Boris Sapundzhiev LZ2JR**, Gabrovo, Bulgaria).

Let's first look at how Elecraft developed its business – please bear in mind this is primarily my personal interpretation of the company's history.

Rather than initially spending lots of money on manufacturing facilities, the Elecraft founders opted to sell their K2 radio as a kit. Soon after launching the company at the Pacificon Hamfest in October 1998 by showing a mock-up of a K2, Elecraft sold the first 100 K2 kits as 'Field Test' units [**1**].

Having seen the mock-up, read the excellent specifications and, with N6KR's reputation as a designer of world-class QRP radios (NorCal 40A, Sierra, etc), those who attended wanted to get their hands on a K2 as soon as possible. Word spread quickly and US QRPers and kit-makers queued to be involved in the K2's final development and testing. This approach was something new and exciting and, as Wayne N6KR has written, *"has paid off time and again as we've released new products"*.

The way it worked was if you were an Elecraft field tester, you got the thrill of building and using the K2 and providing feedback to the manufacturer about its performance, knowing this was shaping the radio's production version.

When Elecraft announced the K3 in 2008, radio amateurs across the globe (including me!) clamoured to be field testers, owing to the K2's excellent performance and the superb specification announced for its successor.

When the K3 was ready for production, the way to make sure you got one as soon as possible was to make a deposit on the radio. This helped Elecraft to buy in the component inventory necessary to build the initial production run of the radio and meant your place in the lengthy queue to buy the radio was assured.

Now this approach only worked because the K2 was such a good performer, a great radio to build and (last but not least) Elecraft's support and interaction with builders and users was superb.

Some radio amateurs were initially surprised about Elecraft's decision to sell the K3 as either a modular level kit (i.e. complete and tested boards) or ready-built – a major move away from the K2, which was a component level kit. But all of a sudden you could buy a cool Elecraft radio and have the company do all the hard work for you!

This refinement of Elecraft's original approach certainly worked with me and a lot of contesting and DXing acquaintances. Right from the start K3 sales boomed and kept on booming, with over 10,000 of the K3 and its K3S successor being sold. Like the K2 you were able to add new or upgraded modules to the K3, as your ambitions and budget allowed.

When the K3S was introduced in 2015 you could upgrade your original K3 to this specification/function level by buying new modules.

Fast forward to 2021 and Elecraft has been considered a mainstream radio manufacturer for at least a decade. These days you could even say 'YaeCOMwood' has become 'YaeCOMelewood'. What has also changed is radio enthusiasts the world over have studied how Elecraft established itself as a major power and set up companies to hopefully follow in its footsteps.

The Successors

Let's look at the radios some of these companies are currently marketing. I'll make a general comparison of the radio's specifications without going into too much detail – you can have fun doing that yourself after reading this article!

mcHF makes its Mark

One of the first of the new breed of boutique radios was the mcHF [**2**] open-source Software Designed Radio (SDR) transceiver, introduced by Chris M0NKA in 2013, **Fig. 1**.

This uses classic direct conversion techniques on both receive and transmit, with Inphase/Quadrature signals (I/Q) being fed into a WM7381 audio codec followed by a 32-bit STM32F407 digital signal processing (DSP) unit, providing most of the radio's functionality.

The mcHF has apparently had about eight software/firmware versions (currently Version 0.8) and is so well thought of it has reportedly been cloned – and then the clone has been cloned [**3**]! As **Oscar Wilde** once said, *"imitation is the sincerest form of flattery that mediocrity can pay to greatness."*

Having an SDR product that is 'open source' – where its design is publicly accessible – is a noble idea but does mean copying can occur. In a similar manner I recall some female fashion college friends being horrified after discovering their designs illegally on sale at some London boutiques and market stalls only days after they were shown at a college exhibition.

The mcHF covers the 80 to 10m amateur bands, with general coverage receive from 2 to 30MHz. Measuring 190 x 69 x 45mm, the compact radio provides SSB, CW, AM and FM modes and is reportedly capable of decoding PSK, RTTY and PSK on its colour LCD display.

Its transmit RF power has been reported to be adjustable up to 10+ watts on the lower HF amateur bands, but decreasing to about 4W on 10m [**4**]. Power consumption at 12V is 360mA on receive, rising to 3A on transmit. The mcHF has two VFOs, enabling split operation, with DSP providing 300/500Hz CW and 1.8/2.3kHz SSB filters with adjustable passbands. Other nice features include a built-in spectrum scope (with waterfall display), computer control, a CW keyer, voice-operated switching and audio peak/notch filtering. And **Alexey UT0UM** is now offering a companion internal ATU:

www.mchf.at

Originally the mcHF was sold as a kit but in the last year or two, ready-built versions have been available in the USA. In October 2020, this service was reported as being expanded to include other countries, but since the second wave of Covid-19 has been affected by delays in securing some components and a backlog of orders. Contact mcHF via its website for the latest ordering status/information.

As of February 2021, an mcHF kit costs between £297.30 and £314.30, including a metal case. Alternatively, you can buy a kit (partly assembled boards) without a case for just over £244. If/when available, a fully-built radio can be purchased in Europe for around £390. There is an excellent mcHF@groups.io builder/users support group with almost 800 members – a good place to check out what its owners think about the radio's assembly and performance.

From Russia with Love: Lab599's Discovery TX-500

While I haven't been fortunate enough to get up close and personal with an mcHF, my friend **Lee VK6TY** has purchased a Lab599

2

3

Discovery TX-500 [**5**], **Fig. 2**, which shows the relative size and appearance the Discovery TX-500 and an ICOM IC-705.

Both radios – along with the mcHF and the Xiegu G90 (to be discussed later) – share what I would call a 'Swiss Army Knife' identity. They have a huge amount of functionality in a very small package and are designed to be, if required, operated outdoors. That being said, to me all have distinct identities to match the various modern breeds of radio amateur.

The mcHF has a flat-on-its-back military-type utilitarian profile, which is shared by the Discovery TX-500. However, whereas the very British mcHF softens this with its cosy, colour LCD, the Discovery TX-500 is all 'mil-spec', sharp edges, splash-proof and monochromatic display. I can see the mcHF finding a home in **Tony Robinson's** backpack as he walks Offa's Dike in a gentle drizzle, whereas the Discovery TX-599 would be buttoned down tightly inside a camouflage trouser pocket while its owner (**Daniel Craig** or **Vlad Putin**?) battles their way to the top of Scafell Pike in a rainstorm.

Fig. 1: USA ready-built version of original mcHF. (Photo: m0nka.co.uk) Fig. 2: ICOM IC-705 and TX-500 at VK6TY. Fig. 3: Xiegu G90. (Photo: Tecsun Australia) Fig. 4: Boris LZ2JR displaying the Mission RGO One. (Photo: lz2jr.com) Fig. 5: Close-up of RGO One. (Photo: lz2jr.com)

4

5

As we shall see, the technical specifications of the mcHF and the Discovery TX-500 have some general similarities but the latter offers more in terms of functionality, only comes ready-built and in terms of build, judging from photographs, could be said to be a bit like a 4WD to the mcHF's SUV.

However, you pay for this stronger build – the price of the Discovery TX-500 (from PileupDX.com) is 890 Euro (about £785), making it almost twice the price of a ready-built mcHF (providing one is available). That being said, the ICOM IC-705 (160m to 70cm) costs around £1,300 and the Elecraft KX2 (80 to 10m) is about £950.

The Discovery TX-500 also has broader coverage than the mcHF, offering you the 160m and 6m amateur bands in addition to 80 to 10m, while its general coverage receive runs from 0.5 to 56MHz. Modes offered are SSB, CW, digital, AM and FM, with the advertised receive power consumption (100mA) less than a third of the mcHF, but on transmit the consumption of the two radio is similar, in the range of 1 to 3A. The TX-500 also uses a 32-bit processor for the DSP and has a high contrast and relatively low-power consumption monochrome 258 x 128 pixels LCD, providing a 48kHz-wide 'real time' bandscope.

Like the mcHF the TX-500 also has the well-established QSD (sampling detector) SDR architecture – as incidentally do the Xiegu G90 and the KX2. On receive the Discovery TX-500 uses a switchable low noise preamplifier, giving the radio a claimed sensitivity (minimum detectable sensitivity) of –136dBm, plus an attenuator for very strong signals. Four adjustable bandwidth digital filters are available, along with I/Q output, automatic notch filtering, adjustable noise reduction and noise blanking.

On transmit, the TX-500 power output specified is variable from one to 10W PEP. The radio comes with adjustable CW sidetone/transmit offset, a speaker-microphone, three-band transmit audio equaliser; two adjustable digital filters and a DSP RF speech processor.

The low profile (90 x 207 x 21mm) case of the Discovery TX-500 is moulded aluminium, whereas the mcHF case is sheet metal. But the former weighs in at around 0.55kg, which appears to be lighter than the mcHF, and has folding stands so it can be stood at an angle on an operator's table.

The controls and sockets on the Discovery-500 are tightly fitted into the case. While the radio isn't waterproof in the complete sense, it seems very much splash-proof and weatherproof in a way none of the other boutique radios discussed here appear to attempt.

There is an active user group for the TX-500 at **Lab599@groups.io.**

An Original from China: the XieGu G90

Next up is the G90 [**6**] from XieGu, a company that has built a good reputation for cheap and well-performing low-power transceivers over the last five years or so.

As **Phil Salas AD5X** noted in his ARRL *QST* review [**7**], the G90 looks rather like a miniature version of an ICOM IC 706MKIIG, measuring 120 x 45x 210mm. But the radio – like the others discussed so far – uses a direct-conversion QSD SDR architecture with a 32-bit DSP/central processing unit.

The G90 appears aimed at those of us who prefer to use a bike or a car rather than a small backpack for their portable operation and lack the dogged Tony Robinson or adventurous James Bond gene. Weighing in at 1.7kg (including microphone), the G90 puts out from one to 20W RF and includes a built-in antenna tuner and speaker. The G90 also has a detachable front panel, which can connect to the radio's body using an included one-metre long DB9 cable, so is suitable for mobile operation.

As you can see from **Fig. 3**, the G90 has a generally similar number of front-panel controls to the mcHF and TX-500 – in this case, three knobs and 13 push buttons. The features the radio comes with are broadly similar to its two predecessors, apart from the aforesaid increased power, antenna tuner and speaker.

The G90 transceives from 160m to 10m on SSB, CW and AM as standard (you need to buy the £30 Xiegu CE-19 Expansion Interface [**8**] to connect the radio to your PC to operate the digital modes) and has general coverage receive of 0.5 to 30MHz. It is also capable of split frequency operation and has a 4.57cm colour LCD screen, panadaptor providing both band and waterfall displays, receive preamp/attenuator, noise blanker, variable bandpass filters, speech processor and SWR bridge. When it comes to CW operation, the G90 has a built-in keyer and a decoder.

In terms of power, the G90 needs an external supply of 10.5V to 16.5V. Although Xiegu states this needs to be capable of 8A for 20W RF, tests by the ARRL Lab show that at 13.8V DC input only some 4 to 4.5A is necessary for this RF output. The standby/receive current is around 750mA.

One important point to consider here if you plan to use a radio for SSB operation, having 20W rather than the (potential) 10W output of the mcHF and Tx-500 is a serious bonus. Don't forget, this means an extra 3dB of signal – which is like going from a dipole to a 2-element Yagi. To me, 20W is a more practical power level for portable operation than 10W or, even worse, the 5W used by most QRP operators. In these days of low sunspots. With small but powerful LiPo batteries readily available, why sacrifice 3 or 6dB of transmit power, which is likely to mean fewer contacts.
Note the G90 has a user group:
XieguG90G90S@groups.io
with over 100 members.

Back to the Future: the Mission RGO One

So far the boutique radios we've looked at have used SDR architecture and are solidly aimed at the amateur with contemporary tastes who likes to have a small radio capable of many communication modes, with a panadaptor/bandscope and high interconnectivity to a laptop/tablet. Mission's RGO One comes from a rather different standpoint. Here you need to think old school **Sean Connery** in an Aston Martin DB5 but powered by a high-performance Tesla electric engine.

The RGO One, **Figs. 4** and **5** – as its name phonetically suggests – takes its inspiration from the famous Argonaut series of radios produced over several decades by Ten-Tec. In terms of architecture, the front-end is unashamedly analogue and superheterodyne (9MHz Intermediate Frequency with down conversion to 134kHz for its AGC circuitry), but the back end has dual CPUs for front panel and motherboard control, both field programmable by USB, and USB CAT control.

No built-in bandscope but crystal filter-based selectivity that can slice-and-dice weak CW and SSB signals from heavy QRM (thanks to a 4-pole variable bandwidth Jones filter, which follows the 9MHz 8-pole roofing filter and first IF amplifier), plus audio that has been said to sound classic Kenwood. Yes, I have just gone misty-eyed.

One particularly nice touch – in addition to the Jones-type filtering, which I love on my old TT Argonaut V – is an H-mode mixer, originally designed by **Colin Horrabin G3SBI**, with the reputation of being the most large-signal-proof mixer designed.

The RGO One is 200 x 80 x 194mm and weighs 2.67kg. It has a colour-selectable back-lit LCD display. Buttons (15) and knobs (5), including one concentric RF/AF gain control, are heavily in evidence, so those of us who hate menus will be happy.

Although a kit is planned, Mission has opted for initially selling a factory-built and aligned radio for just over £690 (790 euros), which covers 80 to 10m. If you want to work 160m, then a receive bandpass filter costs you a further £43 and an internal ATU adds a further £123.

Like all the three previous radios, the RGO One has an excellent online user group at **RGO-ONE@groups.io** where the radio's chief designer or one of the company's chosen field testers will quickly answer any queries. This approach, pioneered so successfully by Elecraft, has now been not only adopted by the boutique radio makers, but to some extent by YaeCOMwood.

Conclusion

This article should give you a taste of the large number of boutique radio transceivers currently being made in relatively small numbers and sold over the internet by quite small companies. As you can see, some are highly innovative. If you buy one and join their online user group, there is a genuine opportunity to influence the radio's development and have a lot of fun.

Note that some boutique radios offered are more of a 'work in progress' than others. Carefully consider before making a purchase whether the radio actually has all the facilities you require now, rather than them being promised for the future. Also, what do the existing users say about it?

All radio manufacturers make promises about new additions. My view is it is easier for a company to deliver them if it is a relatively large-scale organisation because of the sheer size of their workforce and facilities. On the other hand, this delivery can be true of boutique manufacturers too. You never know – one of these manufacturers could be the new Elecraft!

These radios are relatively low-cost but keep in mind that sometimes a company's bubble may burst, particularly in these rather uncertain times. One of the keys to assessing this risk is to look at the company's record, or have actually bought something from it before.

This is one reason why I'm looking forward to the boutique QRP Labs QSX transceiver kit being sold. Its designer **Hans Summers G0UPL** announced the original concept over two years ago and having watched his company online and built one of its QCX transceivers during this period, I am pretty excited. That being said, part of me also really wants to try an mcHF, a Discovery-500, a G90 and an RGO One right now!

References

- [1] *The Elecraft History* by Wayne N6KR is a fascinating read. See: **https://tinyurl.com/5bhzmt5j**
- [2] For more details about the mcHF, see: **www.m0nka.co.uk/?page_id=2**
- [3] **https://tinyurl.com/yb99x8fy**
- [4] See N8NN review at: **https://tinyurl.com/3ctua2a9**
- [5] For the Discovery TX-500's specification, see: **https://lab599.com**
- [6] For the Xiegu G90's specification, see: **https://tinyurl.com/yp3n965w**
- [7] You can download a copy of the *QST* review by AD5X at: **https://tinyurl.com/2ews3kxj**
- [8] **https://tinyurl.com/4ys7hae7**
- [9] For specifications of the Mission RGO One, see: **https://lz2jr.com/blog**
- [10] For information about the QRP Lab's QSX, see: **www.qrp-labs.com/qsx.html**

MOONRAKER

ONE STOP HOBBY RADIO SHOP

Sales line 01908 281705

sales@moonrakeronline.com PayPal VISA

Postage (UK Mainland Only): Small items just £2.99
Medium items just £4.99 Maximum charge just £9.99

www.moonrakeronline.com

Moonraker UK Limited, Cranfield Road, Woburn Sands, Bucks MK17 8UR Open Monday-Friday 9:00-5:00pm

AnyTone

A company with more than 25 years experience of research, production and sales in the wireless communication equipment industry. Main products include Digital and Analog Portable Radio/Mobile Radio/Repeater and System, 3G/4G POC Radio and System, CB Radios, Marine Radios, GSM/CDMA/DCS/PCS/3G Repeater & other wireless communication devices & industry application solutions.

Mobile Transceiver

AT-588 Single band FM mobile 4m radio (66-88MHz), 40 Watts, 200 channels ..... ~~£169.99~~ **£149.99**
AT-5555N Single band AM/FM mobile 10m radio (28-29.700MHz) 30 Watts ..... ~~£189.95~~ **£159.95**
AT-6666 Single band AM/FM/USB/LSB 10m radio (25.615-30.105MHZ) 60 Watts ..... ~~£199.99~~ **£169.99**
AT-D578UV PRO FM/DMR mobile transceiver **£349.95**

Handheld Transceiver

AT-D868UV handheld radio is a VHF and UHF radio with both Digital DMR (Tier I and II) and Analog capabilities. Includes GPS Offering a total of 4,000 channels (Analog and Digital), 10,000 Digital Talk Groups, and up to 150,000 contacts, as well as multiple DMR ID numbers (Radio ID's) for a single radio. **£129.95**

AT-D878UV PLUS BLUETOOTH Digital DMR Dual-band Handheld Commercial Radio with Roaming and GPS VHF/UHF Dual-band Digital/Analog Part 90 DMR commercial transceiver with 1.77 inch colour TFT display and GPS. This model includes DMR Roaming, faster processor and larger memory for future enhancements. Ideal for Fire, Search & Rescue, EMS, Police, Sheriff, Forestry and Security operations. Frequency coverage 140-174 / 400-480 MHz..... **£199.99**

Accessories

CPL-02 Battery eliminator for AT-D868UV **£9.95**
CPL-01 Car charger ofr AT-D868UV **£8.95**
CPL-05 Speaker microphone for AT-D868UV **£19.99**

NEW IN

The best Anytone Handheld is here

AT-D878UVII PLUS
Enhanced features all for just
£229.99

RFINDER B1 Dual Band DMR 4G/LTE Handheld

- ROIP In BETA.
- No Hotspots.
- No Code Plugs

£999.95

BAOFENG

Started in 2001,Baofeng has always been aiming at creating user value and innovating products. From the first small factory of more than 30 people, Baofeng has deveoped into a high-tech enterprise specializing in R&D, production,sales and after-sales service of handheld wireless walkie-talkies as well as accessories.

~~Was £34.95~~
NOW JUST £29.95!

UV-9R PLUS DUALBAND HANDIE
140-174/400-470MHz, IP67 waterproof & dustproof (Not diving), Relay Forwarding Confirmed, Dual Band, Dual Display and Dual Standby, High & Low Power Switchover. Everything you need for just £29.95!

VGC

Vero Global Communications compant is a science and technology enterprise in Fujian Province, specializing in R&D, production and sales of electronic products and accessories such as radio communication equipment, alarms, radio frequency smart cards, and GPS equipment.

Mobile Transceiver

VERO VR-N7500 is a brand new 50 watt VHF 40 watt UHF Headless mobile transceiver with a solid build quality. It is very different in design compared to any other radio used mobile or base The VR-N7500 uses a smartphone as a control panel and the body is installed in the boot or similar with the mobile phone connected to the body through Bluetooth. The cars hands-free intercom can be utilised through the vehicle Bluetooth and PTT is by th esupplied Bluetooth PTT **£189.95**

VERO VR-6600PRO 50W Dual Band remote head transceiver. Dual Receiver Radio (Dual RF). Capable of Crossband Repeating. DTMF, CTCSS, and DCS Modes Supported Power output High (50W), Mid (20W), Low (5W) Power. VHF and UHF TX 144/430MHz (137-174MHz, 400-480MHz.) RX: 5-1.710MHz (AM Radio) 76-108MHz (FM Radio) 108-136MHz (AM Aviation Band) 175-250MHz, 300-399MHz, 480-520MHz 1000 Memory channels Tuning Steps 2.5/5/6.25/10/12.5/15/20/25/50/100/200KHz..... **£299.95**

VERO VR-P25DU Analogue and DMR UHF Amplifier This amplifier is a portable, lightweight, wide coverage RF power amplifier for handheld radio equipment and are equally capable of amplifying both analogue and digital signals. Use the amplifier to create a mobile device with a vehicle-mounted antenna, a powerful field radio with a field-installed antenna or a base station with an antenna on a mast. Your handheld radio connects and disconnects in seconds. The VERO VR-P25D is designed to work with any analogue and digital handheld transceivers. With an input power of 2-6 Watts, up to 30 Watts of output power can be achieved. FM analogue and digital DMR (Tier I & II), D-STAR, C4FM, P25, NXDN and dPMR. TDMA compatible (2 Time Slot) and FDMA..... **£89.95**

VERO N7500 LCD MICROPHONE This microphone works with the VERO VR-N7500 for wireless operation. It comes in two colours options, green and orange..... **£59.95**

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.

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 **£69.99**

SenHaiX 8600 5W Dual Band Sport Two-way Radio Waterproof Handheld Radio with VOX Function – includes a host of features such as dual band, dual standby, 128 channels, waterproof, VOX, Eco Mode, Scan Function, FM Radio, PPT ID and Automatic backlight plus more ..... **ALL FOR JUST £59.95**

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 ..... New Low Price **£79.95**
T192 is an IP-67 rated 3G / WiFi Android Radio as above but with the IP rating ..... New Low Price **£99.95**
T526 4G/WiFi compact network radio without display **£134.99**
T620 4G/WiFi network radio with nice small display **£139.99**
T640A 4G/Wi-Fi network radio with IP54 rating and clear display **£144.95**

T320 is the current best seller 4G / WiFi Radio. It has a host of features and a great screen including Intelligent global intercom, Front & rear camera with auto-focus function, Standby time more than 80 hours, 36mm-dia speaker with double chambers, Positioning system supports, Support WIFI, Micro 5pindata cable, Support MP3 / MP4, Sturdy and durabable with military quality..... New Low Price **£149.95**

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-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, L. 78cm complete with 4m cable and PL259 ..... **£29.95**
MRM-100 MICRO MAG 2/70cm, Gain 0.5/3.0dBd, L. 55cm, 1" magnetic base with 4m coax and BNC **£19.95**
MR700 2/70cm, Gain 0/3.0dBd, L. 50cm, 3/8 fitting..... **£9.95**
MR777 2/70cm, Gain 2.8/4.8dBd, L. 150cm, 3/8 fitting..... **£19.95**
MRQ525 2/70cm, Gain 0.5/3.2dBd, L. 43cm, PL259 fitting (high quality)..... **£19.95**
MRQ500 2/70cm, Gain 3.2/5.8dBd, L. 95cm, PL259 fitting (high quality)..... **£26.95**
MRQ750 2/70cm, Gain 5.5/8.0dBd, L. 150cm, PL259 fitting (high quality)..... **£36.95**
MRQ800 6/2/70cm Gain 3.0dBi/5.0/7.5dBdBd, L. 150cm, PL259 fitting (high quality) **£39.95**
MRQ273 2/70/23cm Gain 3.5/5.5/7.5dBdBd, L. 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) L.: 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**
FORMULA-ZERO 100m super low loss cable 10mm **£139.99**
FORMULA-ZERO 50m super low loss cable 10mm **£74.99**

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

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~~ **Special Offer £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**

End FedWire Antennas

Our HF wire antennas are made with complete waterproof potted baluns and high quality "original" flexweave antenna wire. These are great for simple plug and play HF antennas, can be used anywhere, as a permanent set up at home or out portable, just need a patch lead and your ready to go – Great value too!

LWHF-40 Freq: 7-50MHz Power: 400W Length: 10m Socket: SO239..... **£39.95**
LWHF-80 Freq: 3.5-50MHz Power: 400W Length: 20m Socket: SO239... **£44.95**
LWHF-160 Freq: 1.8-50MHz Power: 400W Length: 42m Socket: SO239 **£54.95**

BACK IN STOCK
The ULTIMATE RF Adapter Kit
£129.95

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 20-6m compact loop is ideal for QRP Transceivers when space is limited or using portable with a Yaesu FT-818ND or similar. Can be used indoors with surprising results and handy for travelling due to its "pocket" size **£69.95**

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

WHIZZ LOOP V3 same as other versions but with extended frequency range 40-6m **£99.95**

Base Antennas

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

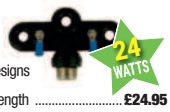
GP2500 All Band 80-6M Vertical TX 80-6M RX 2-90MHz, Power 250W Length 7.13M **£199.95**
GPA-80 budget version of GP2500 80-6M Length 6.0M **£99.95**
GPA-80F fibreglass version of GPA-80 ..... **£129.95**

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**

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

1

Receiver R1155

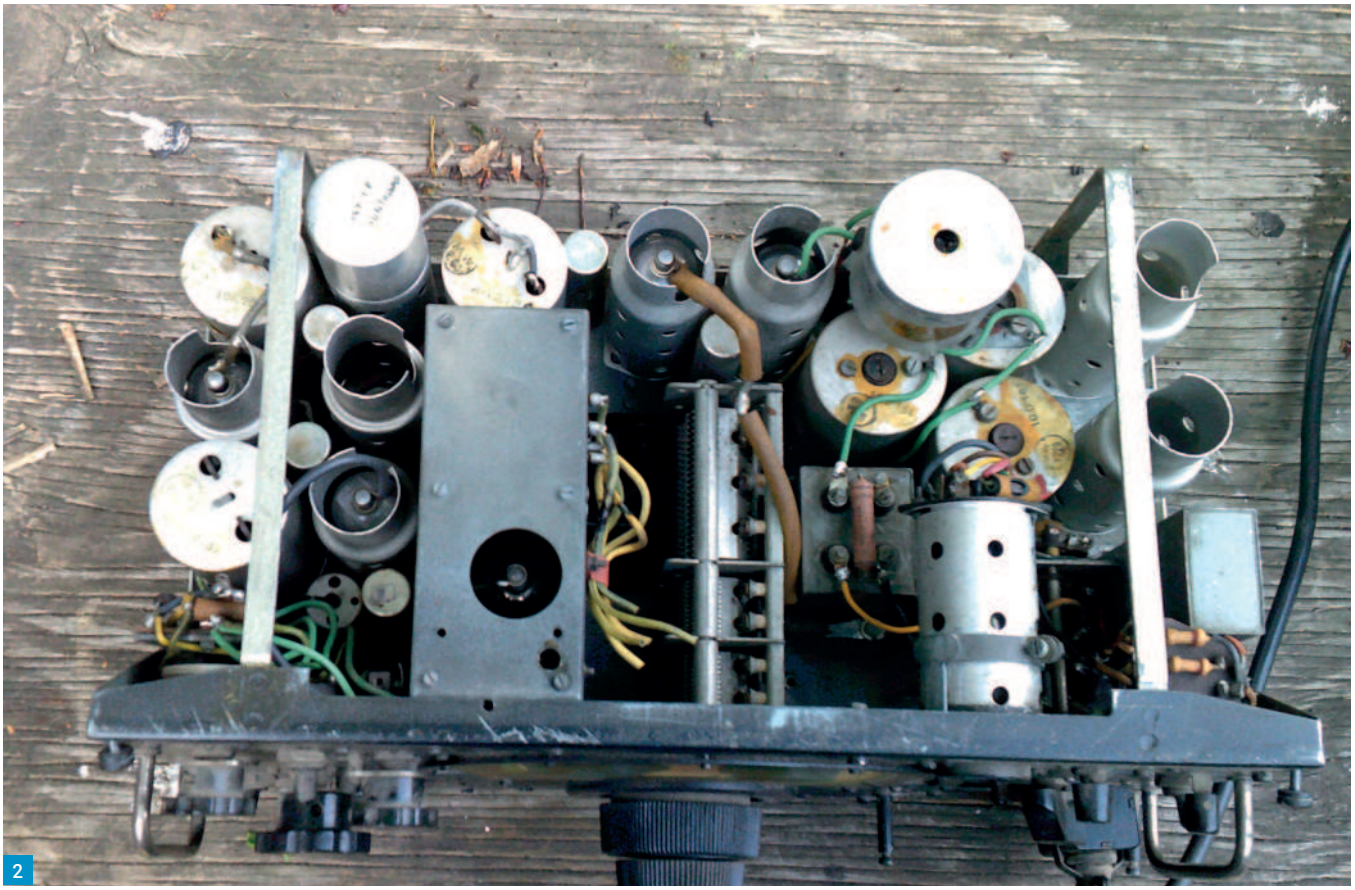
Philip Moss M0PBM describes this classic wartime receiver.

Philip Moss M0PBM
practicalwireless@warnersgroup.co.uk

This receiver is one that was donated to the British Vintage Wireless and Television Museum, Dulwich. Unlike most, it was unmodified, and little touched, and that not irretrievably so. A piece of red plastic wire to the lamps was the only immediately visible change, and later it was noted some of the coils in the RF/oscillator pack had been adjusted. As so many of these sets are butchered, it was a great relief when I found it in this condition.

There are certain sets that get the title 'iconic' and this is one of them. This set is almost always described as being the radio on the Lancaster bomber, the most well-known and successful of our four-engined bombers. While this statement is true, it is truer to say it was the radio on all our four-engined bombers. It was not restricted to that service for although that was what it was mainly used for and designed for, it was used elsewhere. Indeed, there were two essentially different types. The air-borne was in aluminium, but there was a ground-use version with cheaper but heavier steel construction.

This set was not by any means the best GB radio of the Second World War in terms of specification. However, it has a most important distinguishing feature. It was not simply a normal set, but specifically designed for direction-finding, hence the very unusual circuit. Until I had the circuit, and indeed the manual, I could not understand it nor indeed how to initially power it up, beyond getting the heaters on, which does not attract many marks! I initially connected HT negative to chassis, logical but wrong. The chassis actually floats about 20V up when correctly connected. This difference forms the bias rail for many valves. It still didn't work until I found one of the frequency changers was a KTW61 – valves transposed. With them in the right place, it worked, after I noted an all-black resistor with one end cut, which I just soldered back. Note some sets will work with a pentode rather than a triode-hexode. If they have a separate oscillator, as in my CR100, a pentode works fine. Here the triode is used as intended, but this is not the best for good stability.
A problem immediately encountered was the Jones plugs to connect it. As is usually the case, it did not come with them, and while a temporary solution was to solder wires to the back of the plugs, that was not going to do in terms of having the radio displayed. Also, how to power it? It would run off a dynamotor/rotary transformer in the aircraft, itself from the 28V DC supply. I built a mains PSU, from available parts from my collection, which also powered another of the Museum's sets, the HRO Senior/R106 (therein being another article). As a matter of interest, I decided to see how low an HT



2

it would work at – about 30V! At that point the local oscillator stopped. Not that I am suggesting you run it at this, but if you have a convenient supply well under the 250V intended, it will be fine.

Description

I am hampered in describing the circuit by the fact that as with my Murphy CR150/ Navy B40D receiver article, the circuit, even the simplified one, would take up far too many pages. As with that set, the manual is available online at the excellent VMARS website (below) for those with the interest in the detail, or who come by one of these and need service data. As is usual for military sets, there were several versions, and the frequency coverage I quote here is not the same for all. There are five bands: 75/200kc/s, 200/500kc/s, 600/1600kc/s, 3/7.5Mc/s and 7.5/18Mc/s. This is not ideal for shortwave listeners, nor does it cover the full LW and MW, and it misses out several amateur allocations, but then it wasn't designed for us. The set in use required three aerials: a rotatable loop, for the direction finding, a wire from the radio operator's position to the tail, and a longwire on a reel for the LF end of the spectrum, used for both normal and direction-finding. The loop was in a drum, had a number of turns on it, and went into the balanced input on the 4-pin Jones plug. The others went in on the multi-pin connector along with all the other connections.

www.vmars.org.uk

Valve Types

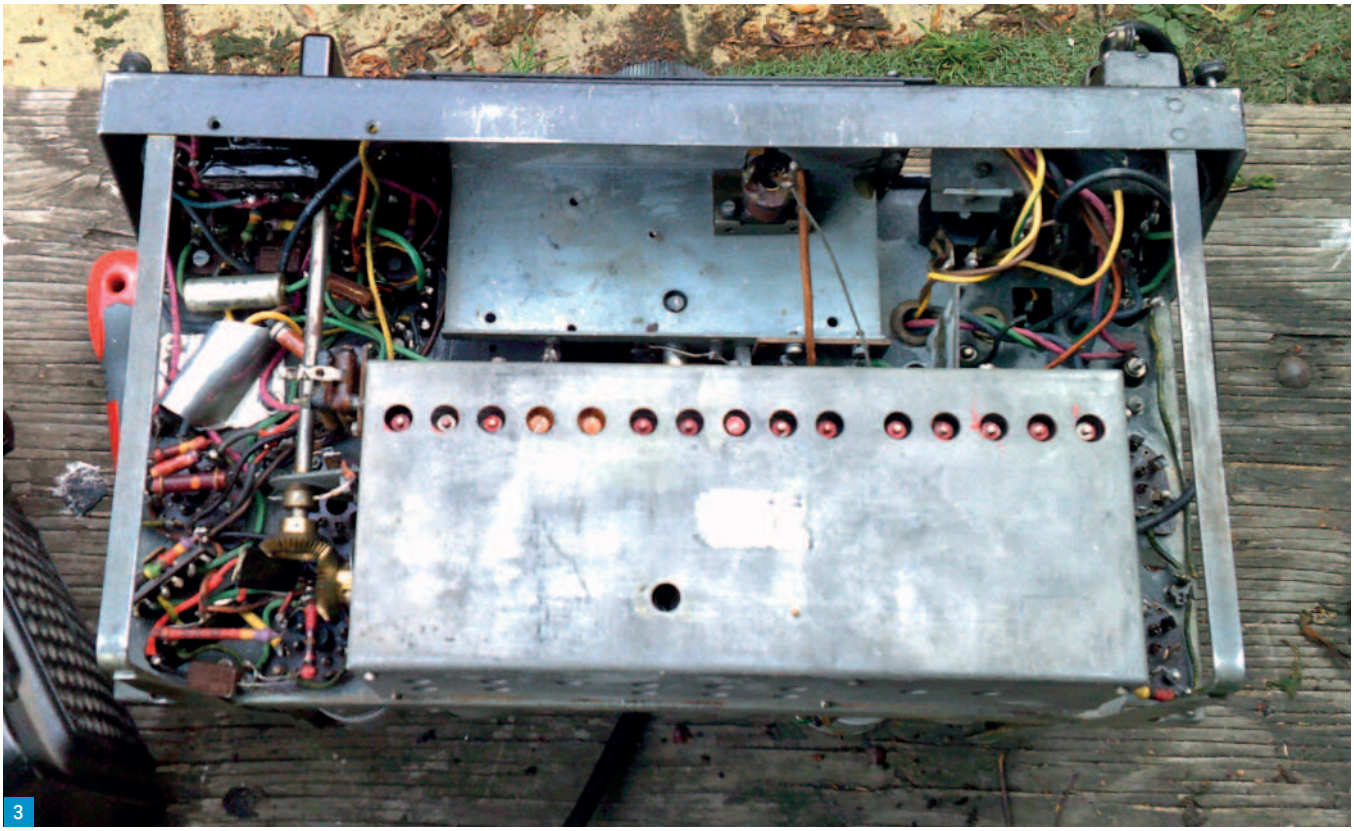
Before I go through the circuit, a note about valve types. They are all listed as Air Force types, therefore starting with V. I am not going to go over the strange world of military nomenclature. If this is new to you, you may wish to refer to my Murphy CR150/ B40D article of May 2021. I have, however, translated the valves used into their normal types, all Marconi/MOV. To do this I first had to translate them to CV types, then look up their equivalents. One, V10 the V.I.103, didn't have a VR number, but is a tuning indicator, or as more commonly known, Magic Eye, a Y63. V1 and 2 are VR99A, equals CV1581 or E1341, described as an unmetallised ECH35. Have you ever seen one of them (excluding ones where with time/damp it's fallen off)? No, neither have I. The valves fitted are very much the shape of ordinary X65s. V3, 5 and 6 are VR100 CV1100 or KTW61, much like 6K7G without the internal screening. V7 & 8 are VR101, CV1101 or MHLD6, or double-diode medium impedance triode, rather like 6Q7G. V9 is a rather fat double triode with one grid on the top cap, rather like 6C8G, but is CV1102 and a BL63. I will be referring to valves by their common nomenclature hereafter.

Photo 1: The front panel.
Photo 2: Top view.
Photo 3: Bottom view.
Photo 4: The PSU.

The Signal Paths

The set has two different signal paths, the first being the straightforward radio receiver. As military sets go, it isn't the best by any means, with limited facilities, and without the switched bandwidth options. It's a lively enough set, and brings in many stations. It is for the reception of AM/RT voice, and CW, so it has a BFO, without the facility to choose your tone, but there is a pre-set accessible through the front panel.

On this path there is a tuned RF amplifier, V3, KTW61 followed by the frequency-changer V4, X66. This is run in 'normal' mode with the triode as the local oscillator, noting so many military sets where it is used but with an external oscillator. There are then two IF amplifiers, which are common to both functions of the set, V5 and 6. Note that their screen grids are fed from potential dividers, and that there are no cathode resistors –



3

they run fixed bias plus AGC. The third IFT (intermediate frequency transformer) is not conventional. The anode winding has two taps on it. One drives the AGC via C19, using both diodes in V7, MHLD6. The second tap goes to one diode on V8, and to one grid on V9, BL63, which is in the direction-finding circuit. The 'normal' detection is taken off the IFT's secondary, and uses V8's other diode, and then is amplified for headphone level by V8's triode, with transformer coupling to the output.

Direction-Finding

OK, you have had the easy bit. The direction-finding requires the user first to find the null direction on the loop aerial, as the null is deeper than the peak is sharp, then add in the signal from the sense aerial, which with the directional aerial set for null just gives an 'ordinary' not very directional signal. The use of the loop alone enables you to find a path where the transmitter is, but like a radio with a ferrite aerial, it does not tell you which end of it is aimed at the transmitter.

The sense antenna input is alternately added in-phase and out-of-phase to the loop signal. This is done by switching the two triode-hexodes alternatively on and off and adding their signals in the balanced transformer in their anodes. The two triodes that would normally be used as local oscillators are here used to produce the switching signal, at either slow, 30c/s or fast at 80c/s. This is achieved by switching in extra capacitors for the LF signal. The reason for the two rates is that for W/T the faster rate is needed, presumably so that a character cannot be missed between cycles, but for R/T the slower rate does not interfere with intelligibility of speech. The sense aerial input is applied equally to the first grid in each of V1 and 2, the oscillator is on the third grid. The resultant signal is then fed to the RF amplifier, and then to the normal mixer for the conventional receiver.

A small aside: note that many of this type of valve used the third grid as the signal grid, and indeed the X66 used in the straightforward receiver does. I have always thought that using the first grid as signal input would give better results and reference to the famous *Radio Designer's Handbook* by **F Langford-Smith** seems to confirm that after a long discussion of different designs of mixer valves.

Simultaneously with the switching of the mixers, the switching signal is fed forward to the double-triode V9, BL63. This drives the coils in the special meter, called the Visual Indicator. This is a twin movement meter, with the halves either side of the centre where there is a vertical white line. The signal moves the needles up as would be expected dependant on the signal strength. When the system is balanced and the plane is flying directly along the path of the radio beam, the needles cross over the white line. If they cross either side, then the plane is off course. The pilot then swings (their word, not mine) the plane till they are on the centre line. The signal drive to the BL63 is the rectified output from the detector diode. The switching process gives a result of the fixed aerial signal plus the loop output, the other fixed minus loop. When the loop signal is nulled, there is just the fixed aerial signal so both meters read the same. Not surprisingly, for this to work the set itself needs to be very accurately balanced, and that can be relied upon to drift with time and also, I would assume, with temperature, which presumably swung violently between ground and flying-height. To allow for this there was a balance control. Direction finding was available on several wavebands. This meant that for a particular operation, different transmitters could be used, such that the enemy wouldn't know which to jam.

By adding and subtracting the loop signal, the difference in meter reading was doubled for the same amplitude of remaining loop signal, thus doubling the offset from the centre line where the needles crossed. Considering how precise the system needed to be, it was surprising there were few close-tolerance resistors in it.

A full explanation of the technique is to be found in publication *AP1093*, Chapter XVI.

This as with the circuit is to be found on the VMARS website.

Work

The first job after getting it to do something, was to find the Jones plugs. The Museum has some odd plugs, and I did succeed in putting a suitable plug together with a shell, so it could be wired properly. As the direction-finding wouldn't be in operation, I didn't need the 4-pin plug. Initially, I used my Solartron variable HT power supply to run it, which also has a heater supply.

At this stage I had four of five bands going, with lots of signals. Band five though was dead, that being 7.5 to 18Mc/s. Suspecting oxidation of the switch contacts, I tried turning it back and forth but that didn't work. New repair method – leave it on that band. When next tried, it worked.

Modification

As this is a Museum set, and also as few remain unmodified, I did as little as possible. However, there was a need to drive a speaker, and although the output stage was intended for headphones only, I was aware that a signal triode is quite capable of giving adequate level. The existing output transformer was the wrong ratio and had a very high resistance primary, which wasn't going to do. What I did was the minimum. Using a small output transformer of the type we had a lot of, used in many AC/DC mains sets, including the much-sought-after Bush DAC 90 (though not by me), I drilled two 6BA holes in the runner under the chassis on one side, and connected the output triode to this, leaving the original in place, but with the primary disconnected one end, and the wire instead connected to the new transformer. The output was taken via the large Jones plug to a jack socket. This modification is reversible, except for the two holes.

Under the chassis I found a new capacitor hanging, and a cut wire to a slim can housing three capacitors. These are threaded and mounted through the chassis. Another was missing, and capacitors added under the chassis. These were all 'Liquorice Allsorts' type Mullard C280, the colour-coded ones. They were not well installed with their leads not cut as short as possible so I rewired them. Another tube got hot so obviously another leaky capacitor. Cut lead and add another more appropriate axial-leaded type in its place. I had been getting multiple whistles, so clearly instability, but this went when the new capacitors were connected. I then ran the set with 300V HT and no heaters to see what if anything got hot. Nothing did. The set drew 25mA, a substantial proportion of the running total, but that was fine because the set has several divider chains across the HT. I noted missing caps to the screening cans on the valves, though they are adequately screened not to go unstable. The top-cap connections to the two X66s in the direction-finding circuit were missing (cut off). Replaced wires and top cap connectors, not that this part of the circuit is ever likely to be used. Found those valves were missing HT in most of the master switch positions, as a wire had been cut at switch (restored).

4

Something that went badly was trying to get the tuning to feel smooth. I relubricated it and it was no better. There didn't seem to be much to go wrong, so I have left it in a frankly unsatisfactory state. I consulted two people at the Museum who have had these sets, but neither could remember what they felt like. As it happens, we have since received another donated set and its tuning does not feel much better. Absolutely lamentably this set demonstrates the butchery I have referred to, with the DF circuits unwired from valve sockets. Quite stupid.

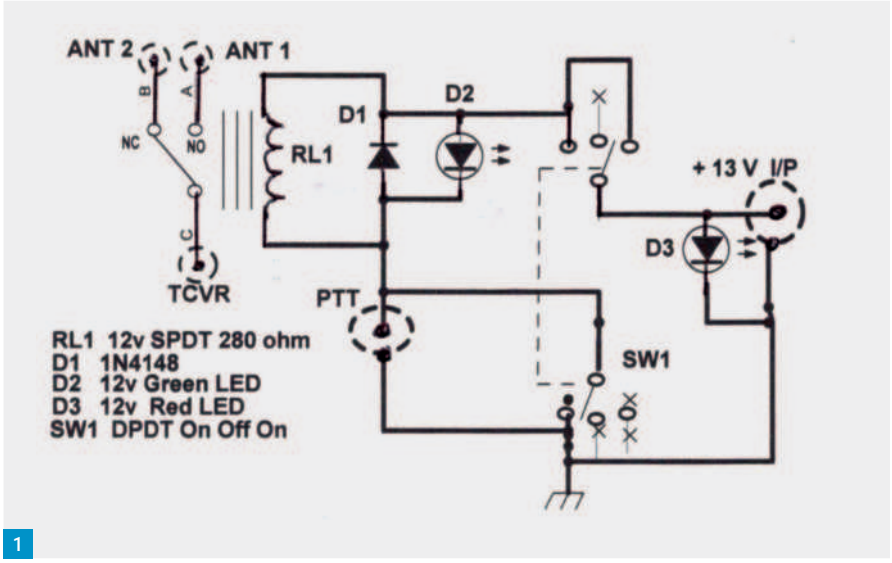
The BFO didn't seem to work well. I measured its frequency as 271kc/s. It should be close to the IF of 560kc/s. The coil had been got at. I knew this as the slug had one side broken. The slug was jammed, so carefully heated with soldering iron, which melted the wax, and allowed me to adjust it. As I did a whistle was heard, so it had been ludicrously mis-adjusted. Took slug out, cleaned, and put in upside down, so able to use undamaged slot. Strangely, when correctly set for zero-beat, the frequency was only 282kc/s so it looks as though they used the second harmonic. Strange.

I realigned the front-end. I had great difficulty with the 3/7.5Mc/s range. Again, a damaged slug, which I replaced. I needed to add 20pF across the trimmer before it would align. I had to use the soldering iron trick again to free the cores. I did the alignment with the cover off to allow access so when it was put on it pulled the tuning a bit but it was good enough. The reason I couldn't align with the cover on was because a special very slim 4BA tube spanner was needed. Unusually, I didn't do SNR (signal-to-noise) measurements. The front-end tuned circuits are all in the box that can be seen under the chassis.

Conclusions

An unusual set and therefore more interesting than a standard receiver even though it won't give the same facilities as one. For general listening it is fine, and with a little ingenuity a slim output valve could be fitted without removing any of the original components. I did contemplate doing that. That would allow full speaker volume. Alternatively, a power stage could be added in the external PSU. Not a large set, and most of us have too little space for all the sets we would like to acquire, and not needing much in the way of a PSU. It is also said to have the most attractive tuning scale of any British set of the Second World War.

David Mcalpin GM8UPI
practicalwireless@warnersgroup.co.uk



1

Homebrewing by GM8UPI

David McAlpin GM8UPI describes an easy-to-build Dual Antenna Switching Unit & has a 'how to' on Panel Marking.

Like many amateurs, I have, or shall have, more than one antenna to use on the HF bands. Perhaps a mix of dipoles, doublets, end-feds and Windoms, etc. To enable fast performance comparisons between antennas, both for transmit and receive, I was keen to use my Icom IC-7300 for this purpose. However, no provision is made with this transceiver, or many others, for the use of a second antenna, direct into the radio. An external switching means was therefore required. A mechanical/manual coax switch would fulfil part of my requirement to some extent but would not enable the use of separate antennas for transmit and receive, switching automatically. By using the radio PTT (shorting contact) signal, I designed this simple unit to fulfil my requirements.

The Circuit

The diagram, **Fig. 1**, shows the final circuit. I did consider using a switching transistor for the relay, so minimising the current required to be taken through the PTT radio connection, but decided this was not necessary in my case, for use with the IC-7300. The current taken by the unit is approximately 50mA, well within the capability of the radio and, I am sure, most other modern transceivers. On testing I found the unit worked as expected. (I did however insert 56kΩ resistors in the LEDs, to reduce the brightness to an acceptable level).

Construction

I used a small piece of Veroboard, 40 x 40mm to mount the relay to the base of the case, which made wiring reasonable easy, if not very neat! (see photographs, **Figs. 2** and **3**) The only other component mounted on this 'lower' side, was the relay 'back EMF' protection diode D1.

Wiring to the relay pins was made with RG316 coax and leads kept as short as possible.

The finished unit was tested with 100W PEP and CW, on all bands from 160m to 10m, with no problems. (I suspect the power limiting will be all due to the capability of the relay.) No 'on air' testing was done at higher frequencies, but at a pinch, it may be suitable up to and beyond 2m.

NanoVNA Testing

Using this marvellous little unit, measurement of VSWR, loss and antenna cross-coupling was made over the frequency range 1.0MHz to 500MHz for both states of the relay operation. The results are shown in **Table 1**.

N.B. The results above will have been influenced, particularly above 150MHz, by the performance of the dummy loads I used (as required) on the SO239 connectors of the unit.

All components were sourced from within the UK with the exception of the case. This nice, extruded aluminium item came from China, costing £20 inc. P&P. Total material costs were in the region of £40, excluding the decal material for panel marking.

Panel Marking

(I suggest you read fully before commencing your project!)

So many 'home built' projects we make these days, while functioning to our requirements, end up looking, well, 'home built' to put it crudely. Marking up front panels with lettering for switches, connectors etc, can be done by various methods, but getting a professional looking finish takes time and a bit of, not too difficult to learn, skill.

I use readily available Waterslide Decal A4 inkjet paper, either 'clear' or 'white' depending on the job, and with care, this method can produce very acceptable results. From experimenting and numerous failures, I have learned that to obtain the best results with decals, a number of vitally important steps require to be adhered to.

Design

Start your panel design on your laptop/PC before marking/drilling your panel. I use Microsoft PowerPoint to draw out my panel layouts. This app gives you lots of choice in regard to font type, sizes and colours. As a measurement aid to the next stage, draw the outline of your panel on to a sheet of plain A4 printing paper, in pencil.

You can mark any fixing holes on to this sheet and, if reusing a previously used panel, any holes/cut-outs that you want to use, or not to use.

If holes exist that are not required, these should be drawn on the sheet and will be covered up with your decal, and carefully filled from the rear of the panel with plastic cement or car panel body filler. This of course would be carried out after the final stage of making your decaled panel, when everything has been set, varnished and

Fig. 1: The circuit.
Fig. 2: Seen from below.
Fig. 3: View of the circuit board.
Fig. 4: Decal for front panel.
Fig. 5: Decal for rear panel.
Fig. 6: Front panel of finished unit.
Fig. 7: Rear panel of finished unit.

hardened (see later).

Now, using your PC and PowerPoint, draw the basic outline shape of your panel using the rectangle shape, with around 3-5mm inside the outer edge. Then do a quick, plain paper printout and check that the dimensions of your outline match your panel with a small inside margin all round. Adjust for any scaling errors and check again. Now you can start to get creative. I find that using font sizes 9pt or larger are fine and I always use Bold and fairly broad outline fonts such as Arial Black or Calibri Bold. I also like to add an outline 'line' on my panels, as can be seen in the various photographs.

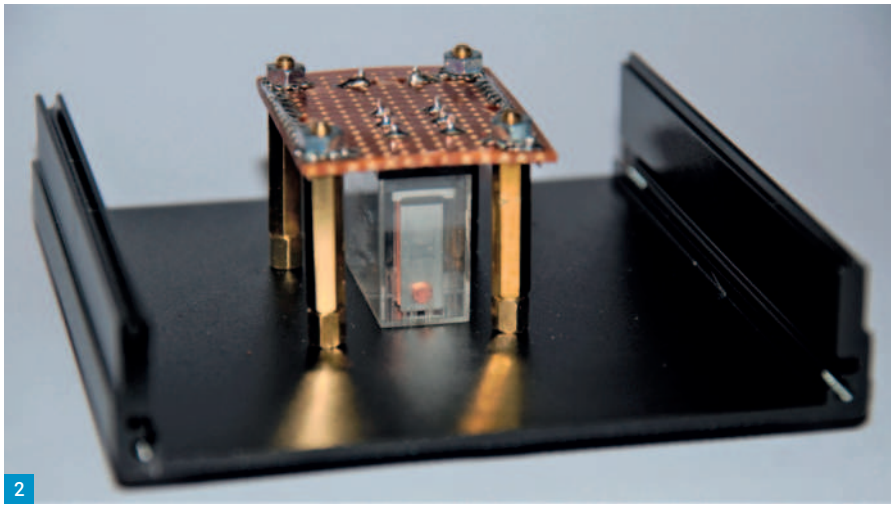
Your choice. I also like to match the background colour to the finish of the panel/case, whether that be black (as I prefer) or any other colour. By using 'white' decal paper, and 'colour fill' to your outer panel size marker, choose the shade that gives best match. I normally use 'white' decal sheets, rather than clear, which allows me to highlight the print as 'white', so giving me white lettering on the black, or whatever background colour you choose.

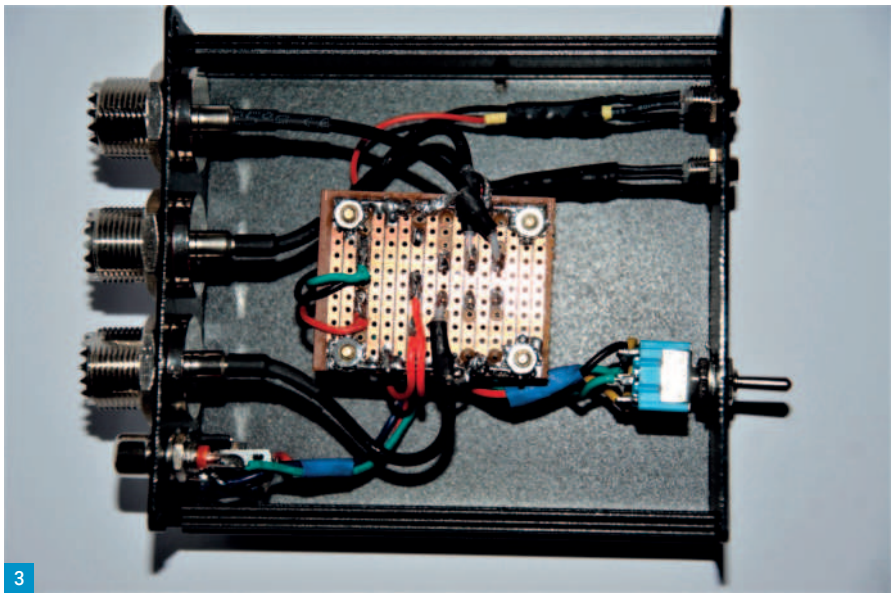
When lettering for switch or connector holes etc, take care to allow for adequate space for fixing nuts, washers or bezels, etc. Too close and you may damage the decal printing when assembling components on the finished panel. When satisfied with your design, I suggest you make a print on plain paper, and use this to mark out (centre punching, drilling, etc) your panel.

Shown in **Figs. 4** and **5** are the decal prints for the project described earlier. Note that I have extended the black background area to well beyond the actual panel dimensions, to allow for trimming the decal close to the white outline. This ensures that no white edge from the decal paper shows on the final result.

Set the printer for standard 'Photo Paper Gloss' and 'Best Quality'. Note that large panels, requiring a coloured background, will take a fair amount of your ink! Once printed and checked as OK, the sheet must be allowed to dry thoroughly in a warm, dust free area.

I have found from bitter experience that this will take a minimum of 12 hours at between +25°C and +35°C. I usually use our household drying/airing cupboard overnight!


2


3

Freq MHz	VSWR	Thru Loss	Cross Coupling
1 to 30	≤ 1.05:1	≤ 0.1dB	≥ -40dB
30 to 75	≤ 1.05:1	≤ 0.1dB	≥ -30dB
75 to 150	≤ 1.20:1	≤ 0.15dB	≥ -25dB
150 to 300	≤ 1.20:1	≤1.0dB	≥- 20dB
300 to 500	≤ 1.40:1	≤1.5 dB	≥ -20dB

Table 1: Measured characteristics of switch box.

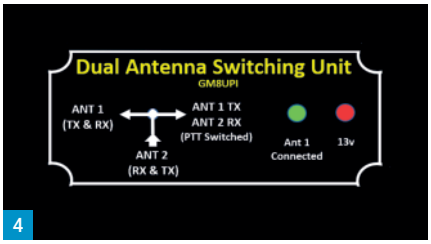
Preparing the Metal Panel and Decal

Once the panel has been drilled, cut-outs made, etc, care should be taken to deburr any holes and ensure the face to take the decal is clean with no edges that will cause the delicate decal to tear. If not already painted, then this should be done with care, in a dust free area. (My preferred paints, varnish, etc. are given at the end.) Again, left to dry thoroughly overnight. The panel should now be given two very, very light coats of varnish, 30 mins between coats. Spray from a distance of about 200mm. I prefer clear gloss but matt gloss is fine. Another overnight drying period is required.

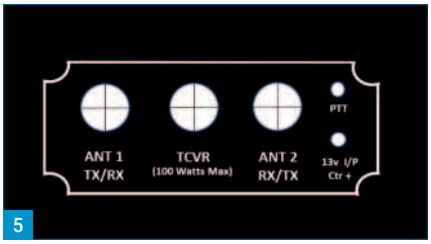
The decal sheet should now be given the same varnish treatment as the panel, and again allowed to dry for a minimum 12 hours in a warm, dust free environment. I cannot emphasis enough how important this dust free precaution is, in ensuring a perfect finished result.

Applying the Decal

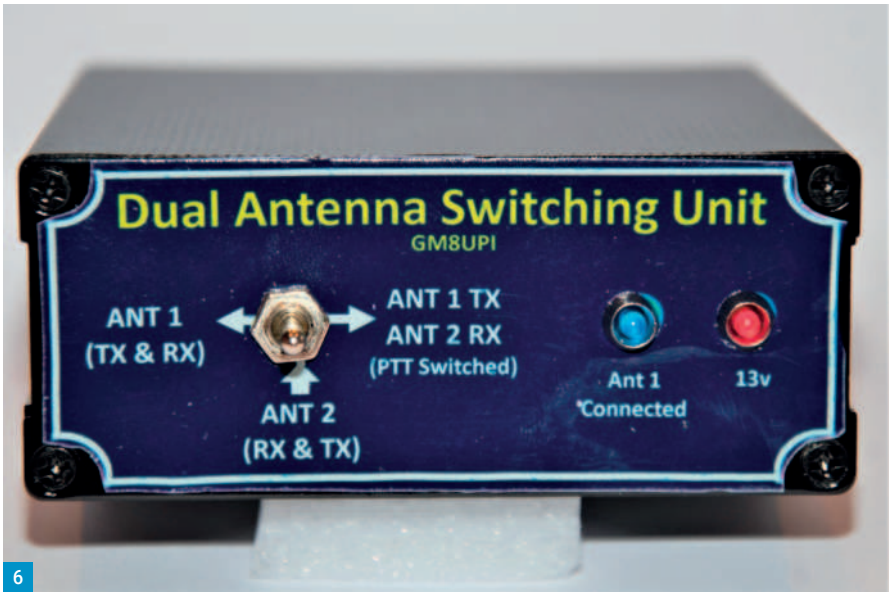
While still on the backing sheet, trim the decal carefully with a craft knife or as I prefer, good very sharp scissors. The final size of



4



5



6

7

the decal should be a few millimetres smaller than the panel edge, or just outside your edging line, if you have one. Take care not to touch the decal print itself, to avoid fingerprints. Using a suitable sized dish, with 2 – 3cm of room temperature clean water, immerse your decal completely, using a cotton bud if necessary. Do not use warm/hot water. Time of immersion will be from around ½ min to perhaps 2 mins.

With your panel on a towel, use a small soft artist-type brush (½in flat) to moisten the panel surface with water. Test the decal very carefully in the water, to see if it will slide easily from the backing. Remove backing and decal from water, allow to drain slightly, and by using the wet brush you should be able to carefully slide the decal on to the damp panel. This should require virtually no pressure from the brush. If you find the decal turning at the edges, delicate use of a wooden toothpick will usually allow you to unfurl the offending edge. The decal should virtually float on the panel, allowing final position adjustment, again very carefully using the soft brush. Once in the desired position, use the brush to gently remove water from under the decal, with very light strokes from centre to edge. Use of a small piece of fine sponge, tissue towel, or cotton bud, to remove excess water is helpful. Ensure all air bubbles and moisture are removed from under the decal and no creases have formed. Final strokes of the moistened brush should remove any blemishes.

If the results are not to your liking, then moisten the decal to remove and start again with a new decal! Perhaps some practice decal mounting is in order.

Finishing Off

The decaled panel now needs to dry thoroughly and again overnight is best. I always finish my panels off with a couple of coats of gloss varnish to totally seal the decal, again requiring overnight drying prior to assembly of any components on the panel. Prior to mounting components, you will need to carefully cut out the decal film covering the mounting holes/cut-outs, etc. I use a very sharp scalpel blade for this. Care needs to be taken when assembling, such as front nut fixing items, to the panel. Using plain washers is helpful, and if possible, tighten fixing from the panel rear, without turning the front mounting nut. A touch of super-glue at rear of panel fixing can be useful.

Warning: do not be tempted to skip/shorten any of my suggested drying times. Inkjet inks are notorious for leaching. You could end up with some very strange and unwanted colours! Also do not use an oven of any sort to hasten drying.

Figs. 6 and **7** are a couple of photographs of my project. The unit, described earlier, measures 100 x 100 x 40mm. The front panel, three-position switch, allows for automatic changeover to be enabled or any one of the two antennas to be used for non-switching, conventional transmit and receive.

Suggested/Required Materials for Decals

1. PC with PowerPoint app and inkjet printer.
2. Waterslide, clear & white Decal paper. (mrdecalpaper.com) @ £15/10 A4 Sheets.
3. 'Plastikote Clear Super' Gloss & Clear varnish. (various online suppliers) @ £5/400ml Spray can.
4. 'Plastikote' paints. Undercoats & colours. (various online suppliers) @ £8/400ml Spray can. (If required.)

73 & happy homebrewing.

The Victory Show

A Century of Service

100 years of the Royal British Legion

3rd - 5th September 2021 Gates Open 9am - 5pm

All tickets MUST be purchased in advance.

Tickets available for:
Standard admission,
VIP tickets,
Evening Dinner Dance

The Largest WWII Re-enactment Weekend in the U.K.

Standard Admission
Adults £20.00, Children 2 -16 years £10.00,
Infants Under 2 Free,
VIP Tickets Adults £60.00, Children 5 - 15 years £30.00,
Children 2 - 4 years £15.00, Infants Free

Due to Covid regulations, ALL tickets MUST be purchased in advance

www.thevictoryshow.co.uk/index.php/contact-details/application-forms

FOXLANDS FARM, COSBY, LEICESTERSHIRE LE9 1SG

For more information go to
www.thevictoryshow.co.uk

Tik Tok

DX Information

Steve Telenius-Lowe PJ4DX
teleniuslowe@gmail.com

Steve Telenius-Lowe PJ4DX explains where to find current information about DX activity on HF.

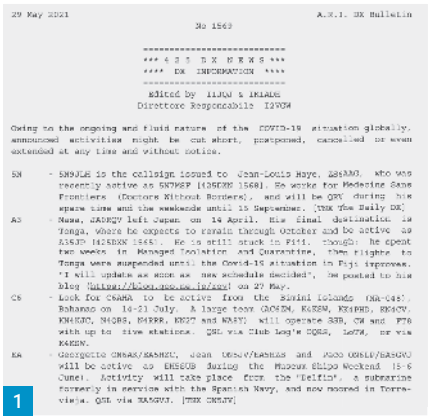
At the time of writing (mid-June) we are well into the northern hemisphere summer Sporadic E (Es) season. As a keen HF DXer I have to admit that I have actually spent more of my operating time during the last month on VHF (50MHz), in order to take advantage of the Es propagation. And I haven't been disappointed, with contacts all over Europe as far north as the Arctic Circle in Sweden, as far east as the Ukraine and Cyprus and as far south as Gibraltar (regular *PW* contributor **Kevin ZB2GI**) and Ceuta (EA9). To the west I worked several stations in Oregon and Washington states in the USA and, even farther north, VE6 in Canada. Even stations in the Middle East (Saudi Arabia, Lebanon, Israel and Qatar) were decoded on FT8 although unfortunately no QSOs resulted.

However, this *is* the HF column and not Tim's *World of VHF*, so it should be pointed out that although Es is often thought of as a VHF phenomenon it can also provide some excellent contacts on the higher HF bands, particularly 28MHz. This is reflected in this month's reports in the 'Around the Bands' section.

The majority of the Es openings to Europe experienced here have been during the late evening UK time, well after the hour when one might expect the band to have closed for the day if one is more used to 'normal' (F-layer) propagation. The Solar Flux Index (SFI) and Sunspot Number (SN) have still been too low to allow for much in the way of long-distance F2 propagation on 28MHz, so the E-layer propagation, albeit sporadic, has been most welcome. The SN was as high as 36 on 26 May and the SFI peaked at 86 on 27 May although both then decreased, **Table 1**.

DX Information

At the time this is being written it looks as though Covid restrictions might be starting to be lifted in the UK as well as other places around the world. The lifting of travel restrictions will inevitably lead to the return of the DXpedition. The lead time of any printed publication such as *PW* means that many operations that are announced close to their start date will inevitably be missed. Similarly, operations that are announced far enough ahead to appear in a magazine such as this may have been postponed or even cancelled altogether by the time the magazine is published. Where, then, can you get up-to-date information on what is expected on the bands tomorrow, or during the coming week?


29 May 2021 A.R.I. DX Bulletin
No 1569
*** 4 2 5 D X N E W S ***
**** DX INFORMATION ****
Edited by IL1JQJ & IK1ADH
Direttore Responsabile I2YDH
Owing to the ongoing and fluid nature of the COVID-19 situation globally, announced activities might be cut short, postponed, cancelled or even extended at any time and without notice.
SN - 5N9JLE is the callsign issued to Jean-Louis Haye, ZS6AMO, who was recently active as 5N7MSF [425DXN 1568]. He works for Medecins Sans Frontiers (Doctors Without Borders), and will be QRV during his spare time and the weekends until 15 September. [TNX The Daily DX]
AS - Nasa, JA1KSY left Japan on 14 April. His final destination is Tonga, where he expects to remain through October and be active as A35JP [425DXN 1565]. He is still stuck in Fiji, though: he spent two weeks in Managed Isolation and Quarantine. Then flights to Tonga were suspended until the Covid-19 situation in Fiji improves. "I will update as soon as new schedule decided", he posted to his blog https://klog.jp/~ja1ksy/ on 27 May.
CS - Look for CS4HA to be active from the Savina Islands (HA-045, Bahamas on 16-21 July. A large team (AC5EM, K4SEM, KE4PHD, KM4CW, KM4HJC, N4QBS, N4RRR, KN2C and W4AYI) will operate SSB, CW and FT8 with up to five stations. QSL via Club Log's OQRS, LoTW, or via K4SEM.
EA - Georgette CN8AS/EA8HZU, Jean CN5V/EA8HAS and Jose CN8LP/EA8ZKU will be active as EH8EOB during the Museum Ships Weekend 15-6 June). Activity will take place from the "Delfin", a submarine formerly in service with the Spanish Navy, and now moored in Torrevieja. QSL via EA8ZKU. [TNX CN5AV]

1

The Italian *425 DX News*, **Fig. 1**, is a free of charge weekly DX bulletin (written in English) and distributed by email. Edited by husband and wife team **Mauro I1JQJ** and **Valeria IK1ADH**, edition number 1571 was published on the deadline day of this column which, by my reckoning, means the service has been running for more than 30 years now. To subscribe go to:

www.425dxn.org

Another great source of up-to-date DX information is the *DX World* website, **Fig. 2**, run by **Col McGowan MM0NDX**. Updated daily or whenever there is new DX information, DX World features photos of the DX locations mentioned, often submitted by those taking part in DXpeditions. Even when the pandemic has meant there has been little DXpedition news to report, there has still been plenty of interest on the website, with some fiendishly difficult DX quizzes and rare or old QSL cards pictured in the 'QSL of the Day' feature.

dx-world.net

For real-time DX information, arguably the best option is to keep an eye on the 'spots' being reported on the DX Summit website, **Fig. 3**. This site allows you to filter the spots according to your own interests, including or excluding particular bands and/or modes as desired.

dxsummit.fi

2

3

Readers' News

May Day opened up the DX bands for **Victor Brand G3JNB** with some sparkling CW received from distant parts. **K1ZZ**, the ARRL's ex-CEO **Dave Sumner** with his big 20m antenna out there in Connecticut, heard 10 watts of CW from Victor for a 'quickie'. *"The sounds in my headphones had that distinctive 'open' quality that speaks of good DX conditions. As if to prove the point, the Royal Australian Air Force was celebrating its centenary with special event calls VI100AF and VK100AF,"* **Fig. 4**. On 13 May, **Allan VK2GR** in New South Wales was working on 17m CW, when he thought he glimpsed a UK call. He sent 'G3?' and 'Listen only G3?' until he had silence. Then, he was able to copy G3JNB who went through with 14 watts at the feedpoint of his vertical. *"I had to keep repeating my suffix but we made it – eventually! My grateful thanks to the other callers.*

"On the 2nd, K1ZZ was back with a good signal on 40m and he responded to my first call. On the 3rd, I just sat listening to ***Rob ZS1OPB*** *booming in from Cape Town on 20m SSB, the first signals from ZS heard for ages, and soon realised that I was actually receiving both sides of his QSOs with EU. Similar conditions presented, among others, CX5FK on 30m and L21RCA on 20m. Powerful call-*

4

5

Fig. 1: Extract from a recent *425 DX News* bulletin, sent by email to subscribers.
Fig. 2: The DX-World.net website is updated daily and provides up to date DX information.
Fig. 3: The DX Summit website with real-time 'spots' of DX activity. In this case the website is filtered to show only HF spots, but on all modes.
Fig. 4: The four-sided VK100AF/VI100AF QSL card commemorating the 100th anniversary of the Royal Australian Air Force (Image courtesy of QSL Manager Tim Beaumont M0URX).
Fig. 5: New WWFF award issued to Carl 2E0HPI/P.
Fig. 6: The 2E0HPI/P location at GFF-0336 north of Sunderland. Fig. 7: What a location! The 28MHz 2-element Yagi used by ZB2GI/P and ZB2JK/P from the top of the Rock.

ers, all thirsting for 'real' DX, persuaded me not to try join in but to just enjoy the longed awaited 'lift'.

"I logged QRP CW QSOs on 17m with 9K2HS Kuwait, OX3XR Greenland on 20m and OY1CT Faroe Islands on 10m. But, the most impressive operator I've heard in years was during YOTA ['Youth On The Air' – **Ed**] *when I worked DL7PIA on 40m SSB. The 'Young Lady'* ***Pia*** *was fluent in German, Italian and faultless English as she ran her pile-up with all the aplomb of the very experienced DXer. She said* "I've been licensed for two years and I think that this is a beautiful hobby".
Pia is aged 13!"

Owen Williams G0PHY reported that *"The 20m band seemed livelier this month with some good DX to be had, especially in the evenings. My best DX was VK2CR who was calling CQ Europe via the long path last Saturday at 2148UTC. I managed to get him and although he only gave me 42, he was 55 with me. I also managed to work 5Z4VJ who was a very strong signal. There have been strong signals from South America in the late evenings with stations from CX, PY, HK and CE being audible. I was also surprised to hear ZS6CCY calling CQ Europe on 40m at 1841 one evening. He was strong but a pile-up soon developed and I was unable to break it. Although not DX by some definitions I also worked 3A/IW1RBI on 20m."*

Tony Usher G4HZW is one who has been enjoying the Sporadic E propagation on

6

	June '21	May '21	Apr '21	Mar '21	Feb '21	Jan '21	Difference
SFI:	77	78	73	75	72	73	(-1)
SN:	29	36	0	11	0	0	(-7)

Table 1: Rolling six-month Solar Flux Index and Sunspot Numbers as of 11th of each month. The final column shows the difference between the June and May figures.

28MHz: *"Ten has been good for the period in question and I've not felt inclined to move to the standby of 40m. There has been Sporadic E every day and on 14 May there was much very short skip with stations in the south of Scotland 59+ and I worked two mobile stations who were both running just 5 watts (I was using the TS-830 at 100W). On 7 May stations from North America were coming through at 0800UTC, as far as I can remember I've never heard them so early before. West coast stations were heard in the evening and, on 23 May, KL4NE in Alaska was heard, though not worked. 4 June provided the most interesting conditions with the band open to North America at midnight our time followed by a short path opening to Japan as it approached 1.00am!"*

Etienne Vrebos OS8D is another who took advantage of the Es, saying: *"I have been very active on 6m and 10m, wide open last weeks and made in total 350 QSOs this May... Again, I was delighted to work a huge amount of newer [operators], with low power, many UK stations, beginners and had good chats with most of them, in order that they feel great with their first SSB QSOs. A lot of stations were /P or /M, even one /AM: a German plane above Saudi Arabia at 40,000ft working with his Collins and 400W output. A long chat and the pilot mentioned a lot of squares they crossed: that's interesting to fill up a map for square chasers, much more quickly than with /MM transmissions."*

Tim Kirby GW4VXE says that *"with the distractions of 6m, I am afraid HF operation has been rather minimal apart from the Wednesday CWOps sessions. I did spend a few minutes, literally that, on 10m during the CQ WPX CW contest and was pleased to work D4Z. 20m has been open later and there have been a few nice chats on CW. **Bob W6PU** on a 6000ft mountain in New Mexico was a nice one at the end of May. During RSGB CW NFD I was pleased to give some points away on 80m as GW4MM/P – it was nice to hear some familiar calls from 'years ago'. Looking forward to next year – with Covid hopefully behind us, perhaps there will be more portables out again. Having discovered (while reviewing an antenna analyser) that my 80m dipole matches very respectably on 17m, I've been listening on the band from time to time. ZD7FT was one of the first stations I heard on SSB – and there was some other DX heard shortly afterwards – quite impressive! I have been using a 1980s vintage FT-757GX as a receiver – I don't have a microphone for the rig. I will have to bodge up an adapter cable."*

We welcome back **Carl Gorse 2E0HPI** who unfortunately has not been too well of late *"so the radio has been put to one side... but hopefully [I'm] on the mend now"*. Carl is very involved with the amateur radio Flora and Fauna organisation (see **Fig. 5**) and went out portable on 31 May to activate Souter Lighthouse ENG-127 and WWFF GFF 0336, **Fig. 6**. Using 20W from a Xiegu G90 transceiver to a home-made dipole, Carl made 92 QSOs on 7MHz SSB. He reports that there is a new award, the GxFF Home Nations Award and there are plans for a September 'Autumn Event' for GxFF activities. See: www.wwff.co


7

Kevin Hewitt ZB2GI reports that he *"painted the GARS club house this month, the walls and ceilings have been given a fresh coat of white paint and the concrete floor has been repainted green. My May log included 550+ FT8 contacts operating from my home station and 150+ SSB QSOs operating from the club station and portable. I operated portable from the upper galleries twice with **John King ZB2JK** earlier in the month, but we found band conditions poor on both occasions. John did make a few 10m QSOs into Italy and France operating Pedestrian Mobile. The crazy 10m conditions enjoyed across the UK and Europe did not reach this far south until last weekend. Operating portable up the Rock, **Fig. 7**, on the 23rd with John, we found 10m and 6m SSB open."*

Around the Bands

Owen G0PHY: 14MHz SSB: 3A/IW1RBI, 5Z4VJ, CN8LAH, KP3DZC, TC568FA, VK2CR.

Tony G4HZW: 28MHz FT8: 4J3DJ, 7X3WPL, 7Z1AL, 9J2BS, 9K2OF, AB1II, AG9S, AI3Q, CE1PTT, CN8DN, D4Z, FS4WBS, HC6IM, HD1ECU, J69BB, JH0RNN, JH1FSF, JY4CI, K0TT, K2AL, K4MY, K7OP, KA5SYP, KP2B, LU1ASP, LU8ENU, N8LRG, P43RR, PJ2MAN, PJ4EVA, PP2FRS, PU5AOA, PV8ABC, PY4WL, R9CA, RZ8U, TF1OL, UN7FGZ, VA3DAZ, VE1WAN, VE2JI, VO1CH, YB2HAF, YW200BC/1, ZD7JC.

Etienne OS8D: 7MHz SSB: 3A/IW1RBI. **14MHz SSB:** BD7MHZ, JA2DXD, JE1RXJ, JE1RZR, JR7TKG, JS1KSU, JW4GUA, UN7MBH, UP2L, UP55L, VU2DSI, VU3ESV, VU3TPW, VU3WEW, YB1DNF. **18MHz SSB:** AP2SD. **28MHz SSB:** ZD7FT.

Carl 2E0HPI/P: 7MHz SSB: DF7GK (DLFF 0124), F5NLX/P (FFF 2689), G1OCN/P (GFF 0376), GI0AZA/M (GIFF 0028), ON/PD0WRL/P (ONFF 0252).

Kevin ZB2GI: 7MHz FT8: W1EL. **14MHz FT8:** 7Z1WW, AC9QR, K1ADV, K4RHS, K8SIX, KB3LAN, N0FW, NX2O, VA7DXX, W7AV, WB6EWM. **18MHz FT8:** CE1LEW, CO6DS, HI8MDQ, K4MQM, W7VA, YV1SW, ZS4JAN. **21MHz FT8:** 4Z1TL, 5B4AJG, 9K2RT, HP1RY, K7PT, N4CC, NR5T, OD5TX, PJ2CF, PU2PPP, PY2SGL, TA4SO, W4HWD, YV1HGS. **24MHz FT8:** HK3CFM, K4IJQ, PU4MMZ, PY2WC, VE3PJ, W8HW. **28MHz SSB:** EA8CWA, GB0SOS, PY2TDY, PY2KY, PZ1EL. **28MHz FT8:** 9K2HN, 9Y4DG, AB1NS, CA3OPJ, FG4ST, HC6IM, HI8JSG, HK3X, KI4FSI, PY6TH, W3FOX, W5BN.

GARS club station ZB2GI: 14MHz SSB: 5B4AAB, RP76BA, RP76KPA, TC568FA, VE2CSI.

Signing Off

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

LAZY SUMMER DAYS

With a radio from Nevada

FAST FRIENDLY SERVICE YOU CAN TRUST!

SUMMER HOT SELLERS!

Yaesu FTDX10 HF/6m/4m SDR 100W Transceiver

A WINNER!
The receiver is already rated number 3 in the Sherwood Performance

£1549.95

SAVE £156!!

Buy:
- Icom IC-705
- LC-129 case,
- AH-705 tuner

Normal price: £1754.95
Bundle price: **£1598.95**

Bundle Deal AVAILABLE

Icom IC-705
VHF, UHF, HF,
D-Star all mode
10W QRP portable
transceiver
£1299.00

WEB DEAL!

Icom 9700
2/70/23cms
Transceiver
The Boss's choice!
£1795.95

WEB DEAL!

Icom 7300
Top selling
HF/50/70MHz
100W SDR
Transceiver
£1195.95

WEB DEAL!

Icom 7610
SDR HF+6m 100W
transceiver
7" full colour
touch display
£2999.95

Yaesu
FTdx-101D
SDR HF/50/70MHz
100W Transceiver
£3149.95

Yaesu
FTdx-101MP
New 200W version
£4199.95

Yaesu
FT-991A
Full coverage
HF/VHF/UHF
£1239.95

HOT SELLER!

Yaesu
FT-DX10
HF/6m/4m SDR
100W Transceiver
£1549.95

Yaesu
FT-818ND
Portable
Multi-Band
with 6W output
£599.95

Yaesu
FT-891
HF/6m Mobile
Great portable radio
£679.95

SAVE £300!

Yaesu
FT-dx5000MP
Premium Class HF
50MHz 200W
Transceiver
While stocks last! ~~£3299.95~~ **£2999.95**

Acom 1010
- 1.8-54MHz
- 60W drive
- 700W output

See web for **FULL ACOM RANGE** **£1795.95**

Yaesu
FTM-300DE
50W Dual Band
Digital Transceiver
£399.95

Yaesu
FTM-400
Dual Band UHF/VHF
Transceiver
£389.95

Icom
IC-7100
HF/VHF/UHF 4m
Transceiver
Remote control head
£1099.95

Icom
IC-R8600
Wideband
Communications
Receiver
£2499.99

Yaesu FT-70DE
Dual Band Digital C4FM +
analogue transceiver
- 1,105 channel memories
- 5W of reliable RF Power

£169.00

Yaesu FT-4XE
Twinband VHF/UHF handheld
- 200 memories
- 0.5/2.5/5 W HF transmit power
- 1W Audio power

£62.95

Yaesu FT-3DE
C4FM/FM Dual Band
Loud audio, Voice record,
GPS, Bluetooth, lots more!
£399.95

Yaesu FT-65E
VHF/UHF 2m/70cm dual
band FM handheld
- PC programming
- Versatile scanning modes

£79.95

Icom ID-52E
D-STAR Digital
Handheld Transceiver
Expanded airband RX
Louder audio
£499.95

Icom R-30
Digital & Analogue
Multi Mode Scanner
- With dual watch and dual band recording

£569.95

Icom IC-R6E
Pocket sized Wideband Scanner
- Freq: 100kHz-1309.995MHz
- Modes: AM, FM, WFM
- 1300 memories

£199.95

Icom IC-2730
VHF/UHF dual band
mobile transceiver
- 1000 channel memory

£289.95

Alinco DR-735E
50W VHF/UHF with
'rainbow' display
Remote head option
£349.95

Alinco DX-10
Multi-Mode 28MHz Transceiver
- Power:
  25W SSB, 12W AM/FM/CW
- Multi-colour display

£169.95

Alinco DJ-MD5
Professional quality DMR
Digital/Analogue Handheld
- Power: 0.2/1/2.5/5W
- Digital Voice recorder

£149.95

Alinco DJ-MD5X-EG
Dual Band DMR/Analogue
- Built in GPS with APRS support
- Automatic repeater roaming
- Power: 0.2/1/2.5/5W

£179.95

AOR AR5700D
Digital
Communications
Receiver for the
professional user!
£4595.00

AOR AR DV-1
The Professionals'
Choice
Advanced
Scanning Receiver
£1199.95

AR-DV10
Digital Handheld Scanning
Receiver
- 100kHz-1300MHz analogue and digital modes

£939.95

AOR LA-400
Low Noise - hear weak signals in
the LW, MW and SW Bands
- Receives 10kHz-500MHz
- 30.5cm diameter Loop

£399.95

NEW

YAESU M-70
Base Mic
- Wide frequency range with selectable filters

£129.95

NEW

ADONIS UD-1
Unidirectional Mic
- Electret - high clarity
- Normal/Low cut

£119.95
Requires optional adaptor cable...£16.95

INRAD W-1
Competition Headset
Headband tilt back for superb
comfort over long periods
£119.95
Requires optional adaptor.....£22.95

INRAD DMS-629
Base microphone
Clear well-articulated audio
Endorsed by Flex Radio!
£169.95
Requires DM series cable for rig of your choice..£16.95

---

nevada®

Serving our customers for 50 years

• Unit 1 • Fitzherbert Spur • Farlington • Portsmouth • Hampshire • PO6 1TT

follow us on twitter: @NevadaRadio follow us on facebook: www.facebook.com/nevadaradio

50 YEARS nevada

Personal callers welcome - for CLICK & COLLECT only!

ACOM AMPLIFIERS

Acom 1200s
1.2kW SOLID STATE Amplifier
- Covers: 1.8-54MHz
- Power: 50W input for 1.2kW out
- Full protection for SWR and overheating
- Weighs just 12kg
- Now with new MFR1K80 High Power LDMOS

~~£3474~~ **SPECIAL £2999.95**

NEW 

Acom 700S

700S..... 700W solid state (1.8-54)MHz.... **£2599.95**

Acom Valve Amplifiers
1500..... 1.5kW PEP (1.8-54)MHz..... **£3199.95**
1000..... 1kW (1.8-54)MHz..... **£2395.95**
1010..... 700W 160 10m..... **£1795.95**

Remote Auto Antenna Tuner
04AT..... 1.5kW + 4 way antenna switch.... **£999.95**

ACOM

Acom AT-04
1.2kW Remote Auto ATU
with 4 way Ant switch
- For use with A700s or A1200S only
- Powered down coax.
- Up to 300 feet remote
- Fully protected

£999.95

Alinco DM-330MW MkII
Communications Grade 30A Supply
'Best in Class!' **£149.95**

DM-330FXE.. 30A standard filtered supply. **£129.95**
DM-30E.....30A (peak) digital display..... **£99.95**
DM-430E..... 30A Digital & P/Pole conn.. **£109.95**

ALINCO

Alinco DX-10
28MHz Multi Mode Transceiver
- AM/FM/SSB/CW
- 25 W RF output
- Channel operation
- Freq. Programmable
- Multi colour display

£189.95

Comet CAA-500 MkII
Commercial Grade
Antenna Analyser
- 1.8 - 500MHz
- TFT display
- Auto Sweep
- Overlay 5 sweeps (in different colours)
- Large X needle meter

£499.95

PALSTAR

Palstar AT-2K
2kW Antenna Tuner – 'built like a tank'
- Covers: 1.8-54MHz
- 6 way Antenna switch
- Silver plated Roller inductor

~~£779.95~~ **£669.95**

AT-500.. 600W tuner 1.8 -54MHz. **£569.95**

HEIL Headsets for Icom
The perfect combination!

PMD-IC PMS-IC

PMD-IC..... Double headset/mic..... **£116.95**
PMS-IC..... Single headset/mic..... **£98.95**

DUAL ANTENNAS

High Performance Beams

6M Yagis
PA-50-4-3B.....4 el. 9.2 dBi 2.92m.. **£159.95**
PA-50-6-6BG.....6 el. 11.5dBi 5.84m.. **£299.95**
PA-50-7-9BGP.....7 el.12.7 dBi.8.68m.. **£359.95**

Dual Band 6/4
PA5070-7-3.....6m 3el/ 4m 4 el..... **£229.95**
PA5070-11-6 BG.....6m 5el /4m 6 el..... **£299.95**
PA5070-13-7BG.....6m 6el/ 4m 7 el..... **£369.95**

4M Yagis
PA70-2-08.....4m 2 el 6.2dBi 0.8m... **£65.00**
PA70-3-1A.....4m 3 el 6.9 dBi 1m..... **£75.00**
PA70-5-3.....4m 5 el 3m boom..... **£169.95**
PA70-6-4.....4m 6 el 6m boom..... **£179.95**

Dual Band 2/70cms
PA144-432-8-09RA..3 el/ 6 el rear m..... **£99.95**
PA144-432-37-7-2CBGB.12 el/25 el 2 con.. **£349.95**
PA144-432-13-1.5-2CB..5 el / 9 e 2 con... **£289.95**
PA144-432-17-2.....6 el/ 12 el..... **£159.95**
PA144-432-19-3-2C.7 el / 12 el..... **£219.95**
PA144-432-21-3B...7 el / 14 el..... **£199.95**
PA144-432-13-1.5A.5 el/9 el 1.5m boom. **£139.95**
PA144-432-34-6-2CBG..11 /23 el 2 conn.. **£249.95**
PA144-432-38-6BG..11 / 28 element..... **£234.95**

2M Yagis
PA144-5-1.5.....5 el 1.5m boom..... **£99.95**
PA144-6-2.....6 el 2m boom..... **£119.95**
PA144-8-3.....8 el 3m boom..... **£169.95**
PA144-9-5A.....9 el 4.67m.boom..... **£199.95**
PA144-11-6BG.....11 el 5.72m boom.... **£249.95**
PA144-12-7BGP.....12 element..... **£289.95**

70cms Yagis
PA432-8-1.2R..... 8 el 1.2m boom..... **£109.95**
PA432-14-3.....14 el 3m boom..... **£169.95**
PA432-23-6.....23 el 6m boom..... **£259.95**
PA432-30-8BG.....30 el 8m boom..... **£269.95**

23cms Yagis
PA1296-13-1R..... 13 el 1m rear mnt..... **£109.95**
PA1296-18-1.5AR...18 el 1.5m rear mnt.. **£139.95**
PA1296-36-3BRG... 36 el RG Balun..... **£169.95**
PA1296-36-3BUT....36 el Teflon Balun..... **£189.95**
PA1296-70-6RG.....70 el RG Balun..... **£239.95**

Accessories
PD1024..... 2m 2-way splitter 1.5kW..... **£89.95**
BPF2..... 2m passband filter 1kW..... **£225.00**

SIRIO ANTENNAS

Quality Antennas from Italy!

WY400-10N SPECIAL!
- 70cms 10 element
- Wideband 400-470MHz
- Boom: 2m, Gain: 14 dBi

~~£119.00~~ **£99.95**

VHF/UHF Verticals
CX4-68..... (68-73)MHz 4m 4.15dBi..... **£69.95**
CX440..... (440-455)MHz pmr 4.15dBi... **£39.95**
CX455..... (455-470)MHz pmr 4.15dBi... **£39.95**
TORNADO 50-60.(50-60)MHz 6m 3.5dBi.. **£59.95**

HF/VHF/UHF Beams
SY3..... 3 el (26-28)MHz 10.65dBi..... **£99.95**
SY4..... 3 el (26-28)MHz 13.15 dBi... **£119.95**
SY50-3..... 3 el 50MHz 8.5dBi..... **£99.95**
SY50-5..... 5 el 50MHz 10.5dBi..... **£129.95**
SY68-3..... 3 el 70MHz 7.0dBi..... **£79.95**
WY108-3N... 3 el 108-137MHz Air Band.... **£89.95**
WY140-6N... 6 el 2m (wideband) 10.5dBi.. **£99.95**
WY400-6N... 6 el 70cms (wideband) 11.0dBi. **£79.95**
WY400-10N. 10 el 70cms (w/band) 14.0dBi. **£119.00**

26-28MHz Verticals
Gain-Master.. 1/2 wave 5.5m 500W..... **£119.95**
Gain-Master..Full size 7.3m 500W..... **£139.95**
Vector 4000..3/4 wave 8.4m 1kW..... **£99.95**
Sirio 2008.... 5/8 wave 6.1m 1kW..... **£109.95**

SPIDERBEAM

Telescopic Masts and Poles

Fibreglass Telescopic Poles
10m – **NEW!** Mini pole..... **£69.95**
12mtr Heavy Duty..... **£99.95**
18mtr Standard..... **£199.95**
22m 'Long John' **NEW**..... **£399.95**
26mtr Standard..... **£499.95**

Aluminium Telescopic masts *German engineered!*
10 metre Standard (1.35m retracted)..... **£339.95**
10 metre Heavy Duty (1.7m retracted)..... **£359.95**
12.5 metre (1.65m retracted)..... **£399.95**
14.5 metre Heavy Duty (2m retracted)..... **£499.95**
15 metre Standard (2m retracted)..... **£459.95**

ROTATORS

YAESU

G-2800DXC... Extra heavy duty..... **£929.95**
G-5500.....Azimuth/Elevation... **£654.95**
G-1000DCX... Heavy duty..... **£499.95**
G-450C.....Standard duty..... **£339.95**

Hy Gain YRC-1X & YRC-3X Computer controllers for Yaesu rotators **See our web!**

SPID

Double Worm drive with almost zero backlash. PC control and near silent operation

SPID RAU.....medium duty..... **£545.95**
SPID RAK.....medium to heavy duty. **£595.00**
SPID RAS..... Azimuth/Elevation... **£999.95**
SPID RAS-HR.Az/elevation, hi-res..... **£1795**

More on our web site!

CREATE
High Quality Japanese manufacture
Using a worm gear for higher Torque

RC5-B Heavy Duty
- Rotating torque 22 kg/m
- Brake torque 250 kg/m
- Mast dia. 48-63mm
- Vertical load 700 kg
- Horizontal load 1,000 kg
- Controller w/preset

£1289.95

RC5-A3 Heavy Duty with pre-set
- Rotating torque 16 kg/m
- Brake torque 200 kg/m
- Mast dia. 48-63 mm,
- Vertical load 700 kg
- Horizontal load 1000 kg
- Variable speed 75-110

£899.95

Medium Duty models
RC5-3.....Medium/HD w/pre-set..... **£679.95**
RC5-1.....Medium duty..... **£569.95**

ULTRA LOW LOSS COAX

Ecoflex 15
per metre.....£7.99 price per 102m drum..... **£759**
Ecoflex 15 plus
per metre.....£7.99 price per 102m drum..... **£759**
PL259 connector (Part: 7350)..... **£8.95**
N type connector (Part: 7395)..... **£9.95**
Ecoflex 10
per metre.....£3.79 price per 102m drum..... **£359**
Ecoflex 10 Plus
per metre.....£3.79 price per 102m drum..... **£359**
PL259 connector (part: 7378)..... **£5.95**
N type connector (part: 7367)..... **£6.50**
Aircell 7
per metre.....£2.99 price per 102m drum..... **£269**
PL259 connector (part: 7390)..... **£2.65**
N type connector (part: 7392)..... **£5.25**
Aircell 5
per metre.....£2.75 price per 102m drum..... **£259**
Other 100M Coax Drums
Westflex 103.. Semi Air-spaced low loss..... **£179.95**
RG-213 (Cabnex)....Low loss good quality..... **£99.95**
RG-Mini 8.....Super XX..... **£69.95**
RG58/CU..... Mil spec..... **£39.95**
Twin Feeders
450 Ohm..... Twin feeder..... **£89.00**
300 Ohm..... Twin feeder..... **£76.50**
Nevada Antenna Wire
Coated flex weave Antenna wire..... **£59.95**
Nevada KEVLAR – green ultra-strong wire!
Nevada 28.....2.8mm 2kW per metre..... **£0.99**
Nevada 32.....3.2mm 5kW per metre..... **£1.20**

HUSTLER HF VERTICALS

4 BTV.....40 - 10m 6.25m high..... **£199.95**
5 BTV.....80 - 10m (5 bands) 7.46m..... **£249.95**
6 BTV.....80 - 10m (6 bands) 7.3m..... **£289.95**

Mobiles for HF and CB radio in stock too!

NEVADA

PS-40M
Linear
- 40A (max) with meter
- 1.5-15V DC
- Cigar adaptor output

£129.95

Quality Power Supplies 2 YEAR WARRANTY!
PS-08..... Linear 8A (max) 13.8V DC..... **£34.95**
PS-30M.....Linear 30A (max) 3-15V DC..... **£99.95**
PSW-50.....Switch mode 50A (max) 9-15V DC..**£129.95**
PSW-30.....Switch mode 30A (max) 9-15V DC.... **£79.95**
PSW-30H.....Switch mode 30A (max) 9-15V DC.... **£69.95**
PS23-SW1... Switch mode 23A (max) 13.8V DC.... **£59.95**
PSW-07.....Switch mode 7A (max) 13.8V DC..... **£29.95**
PSW-04.....Switch mode 5A (max) 13.8V DC..... **£24.95**

VIBROPLEX

VIBROPLEX END FED WIRES
1kW power rated
- no external tuner required!

NEW 

New Space Saver Model!
EF-80-10-JR-KW

- Covers: 80/40/30/20/17/15/12/10m
- Only 75ft long

£169.95

EF-80-10-JR-KW..... 80-10m, 75ft long..... **£169.95**
HF-ALLBAND-KW..... 80-10m, 130ft long..... **£169.95**
EF-40-10-KW..... 80-10m, 66ft long..... **£159.95**

SDRplay

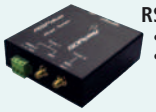
NEW 

RSPdx SDR in metal case
Covers: 1 kHz - 2GHz
Now with Improved:
- Performance below 2MHz
- Plus more!

£194.95

RSP 1A Wideband Budget SDR
- Covers: 1 kHz - 2GHz
- Software upgradable
- Good dynamic range

£99.95



RSP DUO Dual Tuner SDR
- Covers: 1 kHz - 2GHz
- Software upgradable

£239.95

SSB

SSB Masthead Preamplifiers

SUPER AMP - SERIES
Super-low-noise, large-signal handling, protective circuit. High quality Helix filters, Vox control, remote & T bias DC feed.

MHP-200R..... 1.5kW 2m (T-Bias)..... **£599.95**
SP200..... 750W 2m (T-Bias)..... **£349.95**
SP70..... 500W 70cm (T-Bias)..... **£349.95**
SP400..... 750W 4m (T-Bias)..... **£389.95**
SP13B..... 50W 2.4 GHz (T-Bias)..... **£499.95**
DCW-2004B...Sequencer 6/2/70cm..... **£279.95**

MUCH MORE ON OUR WEBSITE 24/7 - BACKED BY FRIENDLY, KNOWLEDGEABLE STAFF

OPEN: Mon to Fri 9.00am - 5.00pm
Unit 1 Fitzherbert Spur Farlington
Portsmouth Hampshire PO6 1TT

023 9231 3090

Nevada Price Pledge

We always aim to be competitive
If you have seen it cheaper - LET US KNOW!

MORSE KEYS

BENCHER
BY-1..... Iambic Black.....£189.95
BY·1B..... Iambic Black Chrome **NEW!**.....£229.95
BY·2..... Iambic Chrome.....£239.95
RJ-1..... Hand Key Deluxe Black.....£169.95
RJ-2..... Hand Key Deluxe Chrome.....£199.95
EZ-1..... Universal Key hook up wire.....£16.95

VIBROPLEX KEYS
Original Deluxe.....Bug Key Chrome..... £299.95
Iambic Deluxe.....Single lever Chrome. £249.95
Iambic Standard.....Paddle Black.....£199.95
Iambic Code Warrior Junior.....Satin.....£189.95
Vibrokeyer Deluxe ...Single lever Chrome. £249.95
Hand Key Standard...Black.....£199.95
Hand Key Deluxe.....Chrome.....£249.95
Hand Key 'Camelback' miniature travel...£109.95

HI MOUND
HK-705.. Hand Key Affordable..... £44.95
HK-708.. Hand Key improved action..... £69.95
HK-709.. Deluxe Hand key with heavy base... £79.95
TC-701...Budget hand key..... £49.95
MK-701.. Paddle key..... £64.95

HEIL HEADPHONES


Heil BM-17 Single Headphone


Heil BM-17 Dual Headphone

Both DYNAMIC MIC or ICOM MIC Options
BM-17-DUAL-IC.....For Icom inc lead.....£134.95
BM-17-DUAL.....Dynamic.....£129.95
BM-17-SINGLE-IC.....For Icom Radios..... £114.95
BM-17-SINGLE DYNAMIC..... £119.95

HEADSETS for ICOM RADIOS
Pro-Set 7 IC.for Icom (Black or Red) colour £259.95
Pro-Set 6 IC.....Icom element..... £169.95
Pro-Set Elite IC...for Icom radios..... £189.95
PMS-IC...Single Lightweight Headset..... £98.95
PMD-IC..Double Lightweight Headset..... £116.95

HEADSETS (HC6 or HC7 elements)
Pro-Set 7..... HC7 (Black, red or Pink)..... £239.95
Pro-Set 6..... HC6 element..... £159.95
Pro-Set Elite 6.....HC6 element..... £174.95
PMS-6 Pro Micro..Single headset HC6..... £84.95
PMS-6 Pro Micro..Double headset HC6..... £99.95
HTH-Dual..... Lightweight Dual for H/helds... £49.95
HTH-Single... Lightweight Single for H/helds. £29.95

HEADPHONES & SPEAKER SYSTEMS
Pro-Set 3..... Comfortable Studio/Amateur. £109.95
HPS-5..... Amplified Speaker..... £199.95
PRASEQ..... Audio Processing unit..... £269.95

MICROPHONES
ICM.....Quality Hand mic for Icom radios.... £123.95
GM-ELITE.....Dual element..... £162.95
HM-PRO.....Open enclosure Hand mic..... £99.95
PR-781G..... Gold Studio Microphone..... £209.95

ACCESSORIES
HS-2..... Hand PTT control..... £36.95
FS-2..... Footswitch dual channel..... £54.95
FS-3..... Footswitch single channel..... £29.95
PL2-T.....Balanced Boom for Studio mics.... £139.95
CB-1PTT..... Heavy duty Mic base..... £76.95

Full range of leads and mounts in stock!

MASTRANT

Quality Guy Ropes & Accessories
Full range in stock!

P type Ideal for general guying
P2.....2mm 100kg B/s..... £16.95
P3.....3mm 200kg B/s..... £24.95
P4.....4mm 400kg B/s..... £39.95
P5.....5mm 500kg B/s £49.95
P6.....6mm 850kg B/s..... £79.95
P8.....8mm 1,300kg B/s..... £109.95

M type Thinner higher performance
M2.....2mm 240kg B/s..... £31.95
M3.....3mm 100m 390kg..... £49.95
M4.....4mm 900kg B/s..... £119.95
M5.....5mm 1150kg B/s..... £179.95
M6.....6mm 1850kg B/s..... £237.95
M8.....8mm 2600kg B/s..... £336.95

Full range of fittings in stock

InnovAntennas

XR7C
7 band compact 'Full size performance'
- Includes 6m/4m bands!
- Freq: 20m/17m/15m/12m/10m/6m/4m
- Boom: 3.5m, Turning radius 4.84m
- Gain: averages 11.24 dBi
- Wind survival: 105 mph

£1296

XR SERIES BEAMS
XR-3.....6 el **Standard** 20/15/10m..... £795.00
XR-3C.... 6 el **Compact** 20/15/10m..... £795.00
XR-4C.... 8 el **Compact** 20/15/10/6m..... £859.00
XR-6..... 11 el **Stand.** 20/17/15/12/10/6m... £1195.00
XR-6C.... 11 el **Compact** version of XR6... £1296.00
XR-7..... 14 el 20/17/15/12/10/6/4m..... £1195.00
XR-7C.... 14 el **Compact XR7**..... £1296.00

LOG PERIODIC BEAM
BOLPA....10 el **Compact XR7**..... £1295.00

MOXON 2 ELEMENT RECTANGULAR BEAMS
M-20..... 20m..6.13 dB. 2.8m Boom..... £339.95
M-17..... 17m..6.13 dB 2.2m Boom..... £299.95
M-15..... 15m..6.13 dB 1.87m Boom..... £269.95

50MHz ANTENNAS
LFA-8..... 8 el LFA2 13.57 dBi..... £599.95
LFA-7..... 7 el LFA2-HD..12.8 dBi..... £385.95
LFA-7..... 7 el G3WOS 12.9 dBi..... £399.95
LFA-6..... 6 el LFA3 11.9 dBi F/B 30.21dB.... £309.95
LFA-6..... 6 el LFA2 11.22dbi F.B 32.21dB.. £269.95
LFA-6..... 6 el LFA2 11.22dbi F/B 38.21dB.. £290.95
LFA-5..... 5 el. LFA3 10.7dBi F/B 31.79db... £219.95
LFA-4..... 4 el LFA 9.4dBi F/B 31.87 dB.... £189.95

50MHz/70MHz DUAL BAND
DB664....6-3 el 6.83dBi 4-3 el 7.05dBi..... £149.95

70MHz ANTENNAS
LFA-70-6. 6 element LFA 11.83dBi..... £189.95
LFA-70-4. 4 element LFA 9.8dBi..... £149.95
LFA-Q..... 2 element Quad 6.8dBi..... £114.95

144MHz ANTENNAS
44-LFA-3 RM.....3 el rear mount 8.67dBi..... £95.95
144-OWL-3.....3 el 6.94dBi wideband..... £39.95
144-OWL-4.....4 el 8.58dBi wideband..... £49.95
144-LFA-8-Xpol..8 el Crossed 9.49dBi..... £139.95

We carry the full range of INNOV HF & VHF Antennas. Full details on our web site.

ANTENNAS

SPIDERBEAM YAGI KITS
- No compromise design
- Handle 2kW power!
- Lightweight, Portable
- For home or Dxpeditions

SPIDERBEAM YAGI KITS
Spider 3..... 10/15/20m Standard..... £389.95
Spider 3HD..... 10/15/20m Heavy Duty..... £489.95
Spider 5..... 10/12/15/17/20m Standard..... £429.95
Spider 5HD..... 10/12/15/17/20m HD..... £499.95

HY-GAIN
LJ-203BA.....20m 3 element Yagi..... £449.95
LFA-2M9EL...2m 9 el 14.04dBi 4.46m..... £239.95
LFA-2M12EL.2m 12el 15.82dBi 7.07m..... £239.95
LFA-2M.....16 el 2m 16 el 17.3dBi 10.9m. £349.95

CUSHCRAFT
A3-S..... 20/15/10MHz 3 element Yagi..... £789.95
MA5-VA..... 20/17/15/12/10 MHz Yagi..... £369.95
MA6-VA..... 20/17/15/12/10/6m Yagi..... £499.95
A50-6S..... 6m 6 element 11.6dBi..... £299.95
A719B..... 70cms 19 element 5dBi 4.1m..... £249.95
AR-450..... 70cms Ringo Vertical 3dBi..... £79.95
AR-270B.....70cms/ 2m Vertical..... £199.95
A-148-20T.....2m 10 element Crossed..... £199.95
A-148-3S.....2m 3 element 7.8dBi..... £74.40
AR-X2B.....144MHz Vertical 7dBi..... £139.95
R-8..... 40-6m Vertical 1.5kW 8.7m..... £669.95
R-9..... 80-6m Vertical B grade..... £599.00

HARI TRAPS

80m..... 1kW price per pair..... £89.95
17m..... 1kW price per pair..... £74.95
15m..... 1 kW price per pair..... £74.95
12m..... 1kW price per pair..... £74.95
30m..... 200W price per pair..... £59.95

See web for full range of HARI Baluns/Traps

MFJ

MFJ-969
Antenna Tuner
- Freq: 160 - 6m
- 8 way Ant Switch
- X needle meter

£299.95

ANALYSERS
226.....(1-230)MHz Graphic analyser £439.95
269C..... HF/VHF Digital Analyser..... £499.95
202B..... Noise Bridge 1 - 100MHz..... £89.95

MORSE
461.....Morse Reader-pocket sized..... £135.95
492-X..... CW Memory Keyer..... £139.95
550.....Popular Morse code practice key.. £24.95
557.....Morse code key with oscillator..... £59.95
561.....Iambic CW Travel Paddle..... £44.95

BALUNS
911H..... 1:1 or 4:1 Switchable Balun..... £59.95
912.....4:1 Remote Balun box..... £84.95

TUNERS
921.....2m Antenna Tuner..... £129.95
923.....2m/70cms Tuner & SWR/Power.. £299.95
931.....Artificial ground unit..... £159.95
934.....300W Tuner + artificial ground.. £289.95
941E.....300 Watts Versa Tuner II..... £195.95
945E.....1.8-60MHz 300W manual tuner.. £179.95
948.....300W PEP reading ant tuner..... £214.95
949E.....300W tuner + Dummy load..... £259.95
959C.....Receive ant tuner + pre-amp..... £174.95
969.....300W tuner 160-6m..... £299.95
971.....200W 1.8-30MHz Portable ATU . £179.95
974HB.....300W Balanced Tuner..... £299.95
986.....1.5kW HF differential ATU..... £539.95
989D.....1.5kW HF Roller Inductor ATU.... £549.95
991B..... 150W HF Auto Tuner..... £309.95
993B ..... 150W/300W Auto Tuner..... £359.95
993BRT... 150/300W Auto Remote Tuner... £429.95
994B..... 600W Auto Tuner..... £399.95
994BRT... 600W remote Auto Tuner..... £549.95
998.....5kW 1.8-30MHz Auto Tuner..... £849.95
904H..... 150W Travel ATU with 4:1 Balun.. £219.95

POWER OUTLETS
1104..... 3 way 30A DC Power Pole outlet... £62.95
1112..... 6 way 15A DC multi power outlet... £59.95
1117..... 4 way 35A DC multi power outlet... £89.95
1118..... 8 way 30A DC multi powr outlet.. £129.95
1129..... 10 way 40A DC power outlet..... £159.95

ANTENNAS
1020C..... Tuneable indoor active antenna... £129.95
1026..... QRM eliminator+active antenna. £279.95
1763..... 3 element 2m beam..... £79.95
1799X..... 9 Band vertical..... £379.95
1982LP... End fed half wave 80-10m 30W... £64.95
1982MP... End fed half wave 80-10m 300W. £95.25
1982HP... End fed half wave 80-10m 800W. £129.95

TELESCOPIC MASTS
1902H..... 10ft Strong Fibreglass mast £149.95
1904H..... 25ft Strong Telescopic mast..... £199.95
1904HD.. 25ft Super Strong Fibreglass..... £219.95
1906..... 33ft Strong Fibreglass mast..... £209.95
1908H..... 43ft Strong Fibreglass mast..... £299.95

SWITCHES
1700C..... 6 Way coax switch.2kW..... £169.95
1701..... 6 Way coax switch 2kW (SO239).. £119.95
1702CN.. 2 Way coax switch 2kW (N Type)..£59.95
1704 (P)..4 way coax switch 2.5kW (SO239)£139.95
1704 (N). 4 way coax switch 2.5kW (N type) £139.95
1705H..... RF By-pass switch 60MHz 1.5kW... £39.95
1708B..... RF Sensing T/R Ant Switch 200W. £119.95
1708B SD.....RF sensing SDR switch..... £149.95

SWR/WATTMETERS
813.....QRP SWR/Wattmeter..... £59.95
826B..... Digital SWR/Wattmeter..... £249.95

DUMMY LOADS
260C..... 300W DC-650MHz SO-239..... £59.95
260N..... 300W DC-650MHz N type..... £62.95
261N..... 100W DC-500MHz N type..... £44.95

ACCESSORIES
1025..... Noise canceller/signal enhancer... £269.95
1234B..... Rig Pi Station server..... £399.95

We carry a HUGE range of MFJ Products – check our web site for full listing

DAIWA METERS

CN-901G
UHF SWR/Power Meter
900 MHz-1.3GHz

£249.95

CN-103LN.. 140-525MHz 20/200W N type. £99.95
CN-501H.... 1.8-150MHz 15/150/1.5kW..... £99.95
CN-501H2.. 1.8-150MHz 20/200/2kW..... £99.95
CN-501VN. 140-525MHz 20/200W N type. £99.95
CN-901HP.. 1.8-200MHz 20/200/2kW..... £139.95
CN-901HP3.. 140-525MHz 20/200/3kW N type £179.95
CN-901VN. 140-525MHz, 20/200W N type. £129.95

COMET

CA-52HB4
50MHz 4 element
HB9CV Wideband
Beam

- Lightweight - ideal Portable Antenna
- Gain 10.4 dBi, boom 3.2m

£129.95

VHF/UHF FIBREGLASS BASE ANTENNAS
GP-15N..... 50/144/430MHz, 2.4m..... £109.95
GP-1M..... 144/430MHz 1.2m..... £59.95
GP-3M..... 144/430MHz, 1.78m..... £69.95
GP-6M..... 144/430MHz, 3.07m..... £99.95
GP-93N..... 144/430/1200MHz, 1.78m.... £129.99
GP-9M..... 144/430MHz 5.15m..... £149.95
GP285..... VHF 5/8 (135-175)MHz..... £89.955

VHF/UHF BEAMS
CA-52HB..... 2 element HB9CV for 50MHz... £79.95
CA-52HB4....4 element HB9CV for 50MHz. £129.95
CYA-1216E. 6 element. 1200MHz..... £99.95
CYA-2414... 2.4GHz 14 El.15.5dBi..... £99.95

ANTENNA TUNER
CAT-10..... 10W (3.5-50)MHz..... £129.95

HF PORTABLE ANTENNA SYSTEM

BOX SET HF-350M
Multi Band Vertical
- Covers: 160m to 6m
- Complete Portable system
- With Carrying pouch

HFJ-350M... 1.8-50MHz Box Set w/case.... £149.95
HFJ-350M... 3.5-50MHz 9 Bands..... £129.95
CCB-HFJ..... Pouch for HFJ-350M..... £28.95
CGW-560.... Radial set..... £16.95

HF BASE ANTENNA
CHV-5A..5 band rotary loaded Dipole 4m long..£369.95

BALUNS
CBL-1000....1.7-30MHz 1kW/CW..... £34.95
CBL-2500....1.8-56MHz 2.5kW/CW..... £39.95

LOW PASS FILTERS
CF-30MR.....1.8-32MHz 1kW/CW..... £59.95
CF-50MR.....1.8-57MHz 1kW/CW..... £59.95

DUPLEXER
CF-360A....1.3-30/49-470MHz 2xPL259 SO239..... £49.95
CF-360B..1.3-30/49-470MHz 2xSO239 PL259..... £59.95
CF-4160B..1.3-170/350-540MHz SO239 N PL259 £39.95
CF-416A....1.3-170/350-540MHz SO239 2xPL259. £39.95
CF-416B....1.3-170/350-540MHz SO239 PL259 N £39.95
CF-503C....1.3-90/125-470MHz PL259 2xSO239.. £89.95
CF-530..... 1.3-90/125-470MHz SO239 2xPL259. £49.95
CF-530C.... 1.3-90/125-470MHz 2xSO239 PL259. £49.95
CF-706PL.. 1.3-57/75-550MHz SO239 2xPL259. £49.95
CF-706N....1.3-57/75-550MHz SO239 N PL259. £49.95

TRIPLEXERS
CFX431A... 145/433/1296MHz PL259 2 x N sock £89.95
CFX-514N..50/144/430 MHz 2 x PL259, N sock.. £69.95

CROSS NEEDLE SWR/POWER METERS
CMX-200.... 1.8-200MHz 30/300/3k..... £79.95
CMX-400.... 140-525MHz 30/60/300W..... £89.95

CIVIL/MILITARY AIRBAND
AB1230H.... H/Held Airband receive..... £29.95
AB1230M... Mobile Airband receive..... £39.95
AB380..... Base Airband receive..... £89.95

DUAL BAND MOBILE ANTENNAS
CSB7500..2m/3.6dBi, 70cms/6.1dBi..... £59.95
CSB7700..2m/4.4dBi, 70cms/6.9dBi..... £69.95
CSB7900..2m/5.1dBi, 70cms/7.7dBi..... £79.95
SBB-2..... 2m/2.15dBi 70cms/3.8dBi 0.46m. £29.95
SBB-4..... 2m/3.0dBi, 70cms/5.5dBi 0.92m. £39.95
CA-285.... 2m/3.5dBi, 50MHz/0dBi 1.32m... £25.95

TRI-BAND MOBILE
SB15..... 6/2/70cms 1.53m 120W..... £59.95

HF MOBILE
UHV-4..... Quad Band 28/50/145/433MHz.. £89.95

ACCESSORIES
MCB3.Drive on Base for mobile mast support. £79.95
MG-4M.... Magnetic Mount c/w 4m cable.... £34.95
CTC-50M... Thru window cable/SO-239 assembly £45.95
3D4-M..... SO239 socket/Cable assembly 4m. £19.95
3K-054M...SO239 w/ 4m miniature cable/PL259 £29.95
CSP-400...Lightning arrestor DX -500MHz... £29.95

AMPRO HF MOBILE ANTENNAS

250W Power - 3/8th thread mount
AMPRO-160m... 160m 2m long..... £59.95
AMPRO-80m..... 80m 2m long..... £25.95
AMPRO-40m..... 40m 2m long..... £22.95
FULL RANGE ON OUR WEB

PART EXCHANGE - WE OFFER THE BEST RATES FOR YOUR OLD GEAR, CALL US NOW FOR A QUOTE!

www.nevadaradio.co.uk

Colin Redwood G6MXL
practicalwireless@warnersgroup.co.uk

1

EMC

Colin Redwood G6MXL looks at some EMC issues he has encountered over the years.

Over the years that I have been licensed I've encountered a few Electro-Magnetic Compatibility (EMC) issues at the two main locations that I have operated from. These were all associated with my transmissions. So far, I've been lucky enough not to suffer significant interference to amateur band reception from nearby electronic equipment, etc.

Managing Neighbours

There is no doubt in my mind that in the case of an EMC issue the way relationships with neighbours is managed is of vital importance, not just in the case of the EMC issue itself, but ongoing. If neighbours are upset, word will spread, giving the hobby a bad name locally. In the future you may want your neighbours' support for a planning application for a new antenna mast. While EMC issues are not grounds for refusing planning consent, neighbours left upset following EMC issues will no doubt seek every reason to object to your proposed antenna mast.

Is It You?

Without doubt, the first step is to establish whether the EMC issues reported by neighbours are really associated with the operation of your station. Keeping a detailed log of your transmissions will greatly assist. If you haven't kept a log up to this point, I would certainly start to keep one at least until the EMC issue is resolved to the satisfaction of both yourself and your neighbour. Ask the neighbour to keep a log of when the 'interference' is present. I once had a complaint from a neighbour regarding their TV picture breaking up. I hadn't been on the air for several weeks, so I was able to emphatically deny that my station could have been the cause. When comparing logs, don't forget to take into account local time differences (BST and UTC in UK summertime).

70cm TVI

My first case of television interference (TVI) occurred when I was running 30W SSB on 70cm. A near neighbour a few houses along the road complained of TVI. We compared the time she experienced problems with my log and quickly confirmed a link to my operating when pointing the beam from my directional antenna in the direction of her house. The complainant was using a TV antenna in her loft together with a preamplifier (preamp). I figured that most likely my 70cm signals were overloading her preamp resulting in the TVI. I thought that a tuned notch filter might help. It would allow broadcast television signals to pass but reduce the level of my 70cm signals getting to her preamp. Once my neighbour confirmed the installation of the 70cm tuned notch filter at the input to her preamp, I resumed operation with no further reports of TVI.

Landline Telephone

My second EMC complaint was a rather different case. My immediate neighbour reported hearing my signals on her landline telephone. Her concern was not so much that she could hear my signals, but that I might be able to listen-in to her phone calls. I suggested she contact her telephone supplier, who visited and fitted a suitable filter and assured her that I would not be able to listen into her phone calls.

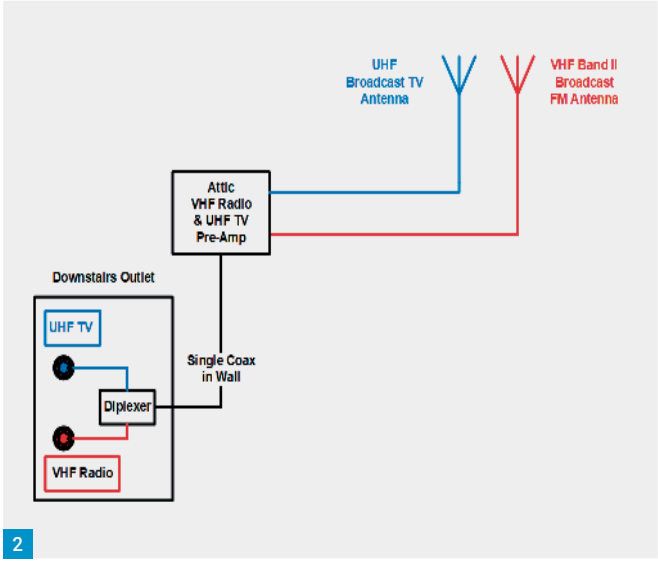
TVI

The third problem occurred several years later and was a variation on the first TVI problem. In this case it was a neighbour further away with an outside TV antenna. The TVI appeared to be occurring when I operated on a variety of VHF amateur bands using up to 100W into Yagi antennas with gains of up to around 10dBd. The neighbour's house was in the direction in which I tended to point my beams. As the problem occurred on more than one band, a notch filter for a single band was not the answer. Instead, I gave them a hi-pass filter to install, **Fig. 1**. I heard nothing more from them, so assume it resolved the problem.

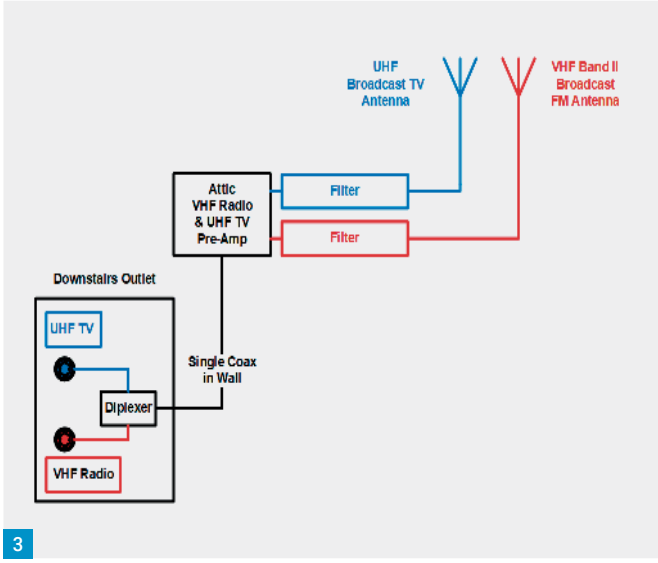
New QTH

Some years passed and I moved house. The main focus of my on-air activity from home switched from VHF/UHF to HF. I operated for over 15 years at the new house with no EMC issues, so I thought all was well. The arrival of a new neighbour coincided with a period where I had lowered my HF antenna for maintenance. I had spoken to them a few weeks previously and mentioned that I am an active radio amateur and that I would shortly be putting my antenna back up and operating. There was certainly no adverse reaction, on the contrary they seemed totally supportive.

While talking to the neighbours I said that there shouldn't be any problems, but in the unlikely event of any issues, to please let me know. I knew that the previous occupant had used a cable TV supplier and had never reported any EMC problems. The new neighbour said that they would be using an existing terrestrial antenna with an existing preamp they had acquired with the property, which they had already called an engineer out to reactivate.



2



3

TVI (again)

Well within 15 minutes of my return to the air, I had the dreaded knock at the door. Not only was their television being affected, some touch-sensitive lights were coming on and off. I said that I would stop transmitting immediately and would get back to them. I felt that it would be relatively easy to resolve the TVI (Freeview – digital) problem. We're fortunate to live line-of-sight to a local TV relay station about 5km away that runs 50W ERP. Alternatively, there is a high-power TV transmitter further away running 200kW ERP. Both transmitters are on almost the same bearing and are both vertically polarised. The main Rowridge TV transmitter is almost unique in using both vertical and horizontal polarisation.

To get things underway, I ordered a high-pass filter with a view to fitting it on the input to my neighbour's preamp. I hoped that this would prevent the preamp from being overloaded by my HF signals. The high-pass filter attenuates signals below 200MHz by 60dB, while having minimal effect on UHF television signals, so it would reduce any of my HF, 6m, 4m and 2m band signals. I gave my neighbours the filter to install on the input of their preamplifier, which is located in the loft space. I left my neighbours with this for a few days without transmitting as I wanted to give them a chance to be happy that the filter wasn't adversely impacting their TV reception. When I returned to the air, it was agreed that even when transmitting 100W on any HF band, there was no TVI.


4

Fig. 1: A high-pass filter – allows UHF TV signals to pass, while attenuating HF and VHF signals. Fig. 2: The original broadcast UHF television and VHF FM installation. Fig. 3: Fitting filters on both inputs to the loft-mounted preamplifier stopped it being overloaded with signals from the amateur bands. Fig. 4: The base of the touch-sensitive lamp. The black logic box is at the top. The 10mH inductor can be seen just to the right of the centre. Fig. 5: The principle of a lowpass filter used to attenuate HF amateur band signals while allowing an LF oscillator to still operate.

Home-Front

In parallel, I decided that I needed to make sure my own house was in order. I was aware that my signals sometimes caused problems with the old analogue (pre-digital) television reception. The switch to Freeview digital and a new television improved matters but didn't completely resolve them. **Fig. 2** shows the arrangement for Freeview television and Band II broadcast

radio reception at my QTH that I acquired when we moved in. I fitted a high-pass filter to the TV antenna input of the amplifier, which stopped LF to VHF signals getting into the amplifier via the UHF input. While this improved matters, it didn't resolve the TVI problem completely. I therefore fitted a bandpass filter on the Band II broadcast radio antenna input to the amplifier. This totally resolved the problem by attenuating strong amateur band signals from getting into the amplifier through either input and thus stopped overload, **Fig. 3**. I now had clean Freeview TV and Band II FM reception, which I could demonstrate to any complainant and Ofcom.

Touch-Sensitive Lights

I was more worried about my neighbour's touch-sensitive lights. I know that some amateurs take the view that an EMC issue like this is for the complainant to resolve. I take a completely different approach. I'll do anything I can to keep on the air while keeping good relations with my neighbours, and that means doing what I can to resolve EMC problems that my neighbours experience from my activities.

Research showed that inside each touch-sensitive light was a low radio frequency oscillator that runs all the time it is plugged into the mains.

The oscillator is clearly audible on a medium wave portable radio if placed within a metre of the lamp. When the metal base of the lamp is touched, this slightly alters the frequency of the tuned circuit of the oscillator, which in turn triggers the electronics to either switch on (if the lamp is off) or switch off (if the lamp is on). My neighbour also had some similar lights, which had three levels of brightness. All were being affected.

I firstly checked all aspects of my station. Besides checking the entire antenna system, I carefully checked that my transmitter was producing a clean signal. I wasn't using any processing and I turned the drive down so there was no ALC. I was using the built-in auto ATU in my transceiver, which I felt should help supress any harmonics. In short, I reckon that I had done everything I reasonably could to radiate a clean signal.

I ran controlled tests with my wife sat with the neighbour recording the results 'blind' using mobile phones for talk-back. My tests covered powers from 5W to 100W on the 30m, 17m and 12m bands running FT8. Some of the tests included no transmission as a control.

The initial tests were absolutely clear. The lights operated exactly as expected no matter what power I ran on the three bands. I returned to the air. It was only a couple of days later, that I had another knock on the door. Even running 70W rather than the 100W maximum in the tests, the lights were again flashing on and off. It transpired that my neighbours had moved their lights.

I gladly accepted an offer from my neighbour to borrow one of the lights and ran further controlled tests. It was clear that the light was more susceptible to lower frequency transmissions than higher frequencies.

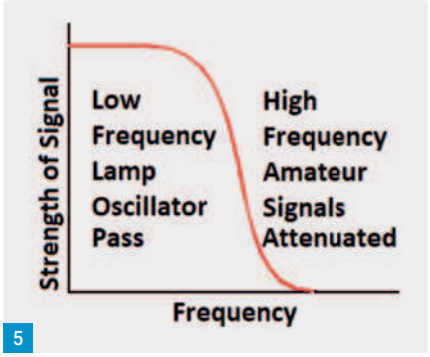
I could run 60W on 12m with no problems, but even 5W of 30m would affect it.

I did some research and found a couple of references on the ARRL website and in an old *RadCom*. These provided a possible solution, which involved fitting a small inductor and resistor in between the sensor (the metal base of these lights) and the control logic box.

I had several concerns with this approach. First, would it work? Second, if it worked, it would no doubt invalidate the supplier's guarantee, so my neighbour might not agree to this approach? And third, would my neighbour be concerned about the electrical safety of a modified light?

I bought another identical lamp, removed the cover from the base and tried fitting radio frequency chokes of various values between the metal base of the lamp and the plastic box with the oscillator and control logic in it, **Fig. 4**. I needed to make a lowpass filter, allowing low frequency oscillator frequencies to pass, but attenuating HF amateur signals, **Fig. 5**.

I obtained a selection of axial-leaded



5

RF inductors (they look almost identical to resistors) from CPC/Farnell. As I experimented with various values, I found that as I increased the inductance, the immunity of the lamp improved, enabling me to run higher power at lower frequencies with the lamp operating correctly. I tried including a resistor in series with the inductor, and although it seemed to improve the immunity, it also affected the operation of the lamp. In the end I found that a value of 10mH (which looks like a 10kΩ resistor) by itself – no resistor – provided sufficient immunity to my 100W 10MHz and higher frequency transmissions, while still providing absolutely normal operation of the touch-sensitive lamp. Before re-gluing the base, I put sleaving over the inductor and exposed solder joint. I re-glued the base with a hot-glue gun.

The next challenge was to persuade my neighbours to allow modifications to the lamps. I was happy to have a professional portable appliance test (PAT) to certify the safety of the modification, and then subject to my neighbour's agreement to fit RF chokes in his lamps and have each of them PAT conducted to certify the safety of the modified lamps. In the end I didn't need to do this as my neighbour decided to replace their lights.

Conclusions

In each of these EMC cases, by adopting a friendly and proactive approach to EMC issues reported by neighbours, I have been able to return to the air and operate on a variety of bands at reasonable power in a domestic environment.

ML&S Trusted by the World's Most Famous Brands

Hilberling · AnyTone · Heil Sound · Wouxun · Hairui · MyDEL · Tigertronics · bhi RADIOSPORT

MARTIN LYNCH & SONS LTD

THE WORLD FAMOUS HAM RADIO STORE

ML&S

www.HamRadio.co.uk

0345 2300 599

International Tel: +44 1932 567 333

Wessex House, Drake Avenue, Staines, Middlesex TW18 2AP. E-mail: sales@hamradio.co.uk. Opening Hours: Mon - Fri: 8.30am to 5pm. Sat: 9am to 4.30pm.

SAFE ONLINE SHOPPING. E&OE

Hilberling appoints ML&S Martin Lynch and Sons as their only factory appointed dealer

Hilberling

For more information on these two remarkable top end pieces of equipment see **www.HamRadio.co.uk/Hilberling**

After almost 16 years of talking and negotiating with the factory in Germany I am very proud to announce that **ML&S is the very first dealer in the world** directly appointed by Heir Hilberling for the sale of the **PT-8000A transceiver** and **HPA-8000B 1kW HF-70Mhz linear amplifier**.

To experience the performance and quality for yourself, I do have a demonstrator (that is actually my own station so silk gloves please!!) set up in the store and will be available for you to try towards the end of June.

Wouxun KG-UV9K or KG-UV8G

KG-UV9K 2m + 70cm Handie Pro Pack

Now with 8.33 step for Airband Channel Spacing Changes. (Radio only: £79.95)

KG-UV8G 2m + 4m Handie Pro Pack

ALL THIS FOR £149.95

With a huge 7.5W on 70MHz & 9.5W on 144MHz, colour screen, voice announcement, 999 memories & PC programable. (Radio only: £99.95)

Choose from 144+70Mhz or 144+432MHz

Pro Pack Bundles include:

- KG-UV9K or KG-UV8G Transceiver
- Two batteries
- Two belt-clips
- Software and transfer data cable
- Fast charger dock and Power Supply
- Hand speaker mic
- Battery eliminator
- Manual
- Wrist strap
- Leather case
- In-car charger
- SMA-PL259 adaptor
- Hands-Free kit

Wouxun KG-UV980PL

Includes FREE programming software.

Up to 50W (band dependent). Unique Quadband mobile/base from Wouxun. Bands covered are 4m / 6m / 2m / 70cm.

ML&S Price: Just £279.95

& Free Shipping!

The New KG-UV9D Mate

2m + 70cm Bright Orange Rugged High Power (8W+7W) Dual-band Handie ideally designed for emergency operations. Supplied complete & ready to go.

ML&S Price: Just £139.95

Radiosport Headsets

Whether for DXing, contesting, field day, or casual everyday use we think you'll agree Radiosport headsets have the features you want. ML&S are proud to have been appointed their distributor and have stock today. All headsets are supplied with GEL Cushions giving extra comfort and FREE cloth covers.

RS10SL	Listen only stereo lightweight headset for CW ops	**£109.95**
RS60CF	Deluxe Dream 10th Anniversary Edition Stereo Headset with boom	**£239.95**
RS20S	Deluxe Dream Edition Stereo Headset only no boom	£169.95
Mini-XLR	Lead set for any radio (Yaesu/Kenwood/Icom/ Flex/Elecraft)	**from £69.95**
PTT-FS-RCA	Foot switch with 7ft cable with phono plug	**£50.95**
PPT-HS-RCA	Hand PTT Switch, 7 foot cable with phono plug	**£64.95**

How about an additional 3.5mm socket on the opposite ear cup to allow "tethering" of another headset for a logger or maybe just an additional pair of ears?

Hear those weak signals with bhi DSP noise cancelling products

New! BHi NCH
Active Noise Cancelling Headphones. £39.95

New! BHi Wired Stereo Communications Headphones. £19.95

bhi

Designed and built in Great Britain

PARAPRO EQ20

PARAPRO EQ20-DSP. £259.95

Four product options are available.

The basic EQ20 and EQ20B can be used with the bhi Dual In-Line and Compact In-line noise cancelling units.

NES10-2MK4 New NES10-2MK4 amplified DSP noise cancelling speaker. **£119.95**

Dual In-Line Dual channel amplified DSP noise eliminating module. **£179.95**

New DESKTOP MKII Amplified DSP base station speaker – 10 Watts audio. **£199.95**

New NEDSP1901-KBD Pre-wired low level retrofit audio DSP noise cancelling module. This module replaces the popular NEDS01061-KBD that many Yaesu FT817/FT-818 users have installed over the last 18 years. **£119.95**

Compact In-Line Compact DSP noise cancelling module with improved DSP algorithm giving even better noise elimination. **£179.95**

see www.HamRadio.co.uk/bhi for full specifications

Anytone AT-778UV £99.95

25W 250 mems, full feature. Including programming cable.

RADIO TONE RT4 4G Internet Transceiver

Large Screen & fully compatible with Zello PTT, International Radio Network & Echolink.

RRP: £299.95
ML&S PRICE: £179.95

HAIRUI Soldering Workstations

HAIRUI 850D+ £82.95
ESD Lead-free Digital Intelligent Hot Air Station Wholesale

HAIRUI 863D £104.95
Three-in-one re-workstation. Blower gun for SMD rework, separate soldering iron, auto-shut-off to protect heating element.

Tigertronics SL-USB £99.95

ALL sound card Digital and voice modes are supported by the SignaLinkTM USB. This includes traditional modes such as RTTY, SSTV and CW (to name a few), as well as today's hottest new modes like PSK31, FT-8 and WSPR.

Buy with your required lead and get a discount off the bundle price.

MyDEL Headphone Stand £11.95

Ideal to hang up your Heil, RadioSport or other headsets on your operating desk.

Made of aluminium alloy, with a cushioned rubber part to prevent the headphones from slipping.

EVEN LYNCHY HAS ONE ON HIS DESK.

ML&S Appointed Sole UK Distributor for CW Morse Keys!

There are over 35 different keys to choose from including Camel Back, Straight Keys, Micro Keys, Lightweight Keys, Heavy Duty Keys, Paddle Keys, Navy Keys & even Bullseye Keys. With such a huge & colourful range to choose from there's bound to be a model (or two!) to suit CW enthusiasts worldwide.

FROM ONLY £19.95

ML&S are the sole UK distributors for the DV Mega Range of products

DVMEGA is a collective name for digital voice and data related kits and modules. C4FM, DMR and D-STAR is supported with more digital voice and data modes added all the time.

DVMEGA Globetrotter is a powerful digital voice communication tool that allows you to communicate from anywhere to anyone with just a simple internet connection. **£139.95**

DV Dualband (VHF/UHF) radio shield
This shield is compatible with Arduino UNO or MEGA. This module has a 10mW UHF and VHF transceiver on board. In combination with an Arduino you make your own stand-alone dual band hot spot. This module, together with the AMBE3000 forms the basis for a self-assembly D-Star kit transceiver. **Just £119.95**

DVMega DVstick 30
USB-stick facilitates the use of a PC to communicate on Dstar, DMR and C4FM! Just install BlueDV and use the PC-microphone & speakers to communicate to reflectors/ talkgroups. Ideal solution to use on a laptop whilst traveling. **Just £89.95**

DVMEGA Cast is a AMBE3000 based Multimode IP radio for DMR, D-Star and Fusion. The DVMEGA Cast is compatible with Ham radio networks like BrandMeister, DMR+, YSF, FSC, REF, XRF, XLX, DSC etc. **£319.95**

Heil Sound

ML&S are the official UK importer for Heil SOUND

Pro-Set 7 Headphones	**£239.95**
Pro-Set 6 Headphones	**£129.95**
Pro-Set IC Headphones	**£162.95**
Pro-Set Elite 6 Headphones	**£174.95**
Pro-Set Elite IC Headphones	**£189.95**
Pro-Set 3 Headphones	**£109.95**
PR-781 Microphone	**£189.95**
PR-40 Microphone	**From £299.95**
PR-40 Microphone **New All Black Version**	**£299.95**

FOLLOW US ON TWITTER AND FACEBOOK HamRadioUK

You can now order from ML&S for delivery on a Saturday or Sunday!
Order before 2pm as late as Friday of each week and see it delivered at the weekend.

DPD

Watch our YouTube Channel on www.MLandS.TV

Web purchases: Just select Saturday or Sunday at the check-out.
Or call to place your order for Saturday or Sunday delivery on 0345 2300 599

MARTIN LYNCH & SONS LTD

THE WORLD FMOUS HAM RDIO STORE

ML&S

www.HamRadio.co.uk

0345 2300 599

International Tel: +44 1932 567 333

Wessex House, Drake Avenue, Staines, Middlesex TW18 2AP. E-mail: sales@hamradio.co.uk. Opening Hours: Mon - Fri: 8.30am to 5pm. Sat: 9am to 4.30pm.

SAFE ONLINE SHOPPING. E&OE

YAESU

ML&S Officially The Largest UK Dealer & Distributor of Yaesu Musen Products

Yaesu FTdx101D & FTdx101MP CALL
Give Tony, my Sales Manager, a call on 0345 2300 599 for a super trade-in deal.

Yaesu FTdx10 HF+6+4m Hybrid £1549.95
SDR Base Station
Narrow Band SDR with 3 types of Roofing Filters and Phenomenal Multi-signal receiving Characteristics.

Yaesu FTdx3000 £1399.95
HF/6m Base Station
Looking for a HF/6m Base Station sized radio at a VERY LOW PRICE?

Last remaining stock

New Yaesu FT-991a £1229.95
HF/50/144/430 MHz All-Mode "Field Gear" Transceiver
Sales of this fantastic all-band all mode transceiver have gone through the roof. Its compact dimensions and typical super-sturdy Yaesu construction adds to its spectacular performance.

Stock is hard to get even though we're supplied from the factory direct from Japan.

Yaesu FT-891 £679.95
HF/6m Base/Mobile
A modern day FT-857 without 2&70. Bang up to date in looks and smaller than a 2m only FM rig of 25 years ago!

FT-891+FC-50 Bundle
Buy a new FT-891 & FC-50 Auto-Tuner and save! Just £869.95 for both.

Yaesu FTM-400XDE £399.95
Dual Band transceiver for 144/ 430MHz with the new C4FM/FDMA Digital Mode.

NEW Yaesu FTM-300DE £389.95
50W C4FM/FM 144/430MHz Dual Band Digital Mobile Transceiver.
In stock and available now. This model will become a best-selling Dual bander.

Yaesu FT-818ND
6W QRP 160m-70cm All Mode Transceiver
New version of the best selling FT-817ND. 160m-70cm, 6W o/p from 13.8V, Built in Battery pack, TCXO, even 2W on AM!

ORDER NOW to Ship or Collect. See HamRadio.co.uk/FT818

New! Leg-Peg Retractable Legs.
Introducing the LEG-PEG RETRACTABLE LEGS for FT-817/818.
Unlike the wire designs seen before, this design allows the user to fold away the stand when not in use. Better still they are so beautifully made that it looks like Yaesu put them there in the first place.
Only £19.95

Desktop Microphones for the family of YAESU HF Transceivers

Yaesu M-70 Desktop Microphone £129.95

Yaesu M-90D Desktop Microphone £179.95

Yaesu M-90MS Microphone Stand Kit £169.95

For full specifications, photographs, reviews, shipping details and special offers see

www.HamRadio.co.uk

or call the team on 0345 2300 599 for advice

Yaesu FT-3DE - Latest 5W C4FM/FM Handie £369.95
Provides reliable 5W RF power output in a compact, light weight design. See web for latest offer!
A mobile device with the Digital Mode C4FM! In addition, thanks to the Yaesu Dual Mode system, this radio can, of course, transmit in Analog FM. The FTM-400XDE has a 3.5-inch colour touch screen. The number of control buttons is reduced to 4 buttons and keys. All important settings are selected directly by pressing on the display. The FT-400DE supports 3 Digital and 1 Analog Mode.

Yaesu FT-65E £84.95
VHF/UHF 2m/70cm Dual Band FM Handheld
This dual-band 2 metre/440MHz has three output power levels: 5, 2.5 or 0.5 watts. Receive coverage is 65-108 (FM broadcast band), 136-174 and 400-500MHz. The FT-65e is compact and light, yet ruggedly constructed. The speaker provides a full 1 Watt of powerful, clear audio.

Yaesu FT-4XE £64.95
5W VHF/UHF FM Portable Transceiver
The ultimate in compact design (W 52mm x H 90mm x D 30mm), providing up to 5W of stable and reliable output power thanks to Yaesu's integration of the highly efficient Bridged Transless (BTL) amplifier technology.

Yaesu FT-70DE £169.95
5W Rugged Designed (meets IP54) Handie
Covering 108-137MHz Airband AM and 2/70 transceive on FM/C4FM Digital. A massive 700mW of audio ensures extra-loud volume with Clear Voice technology.

KENWOOD

ML&S Officially Appointed UK Sole Distributor & Repair Workshop for JVC-Kenwood's Ham Radio Products

Kenwood TS-890S £3499.95 With FREE MC-43 Mic.
HF/50MHz/70MHz Base Station. Full Down Conversion and Roofing Filters Promise the Best Performance of your DX Life.

For a full in depth G3ZPF user review see www.HamRadio.co.uk/TS890

Kenwood TS-990S £5799.95
The Ultimate Flagship Base Station. 200W HF/50MHz Transceiver with Dual TFT Display. Twin Receive, Built-in PSU & Auto ATU.

Kenwood TS-590SG £1399.95
160-6m Base with ATU. Upgraded version HF & 6M FULL DSP Base Transceiver.

Kenwood TS-480SAT £829.95
The ever popular TS-480SAT (Internal ATU) 100W HF/6m with remote head operation.
Low Stock Remaining!

Kenwood TH-K20E £99.96

VHF FM Portable Transceiver with Keypad
Boasting 5.5 watts of RF output, Kenwood's new TH-K20E radio is powerful. Despite being small enough to fit comfortably in the palm, it offers full-size performance and numerous features to ensure superb operating ease.

ICOM

ML&S Stock the Full Range of New Icom Products

Icom IC-705 £1299.95 IN STOCK!
IC-705 + XPA125B - Perfect Combo!

IC-705 5W QRP | XPA125B 100W+ ATU Amp

We all know the IC-705 by now but how about a small 100W amplifier with internal ATU to sit alongside?
The New XPA125B is the perfect match & at a price that is really remarkable, £469.95.
Check out our special *Bundle Offers* on this incredible portable battery powered 160m-70cm all mode transceiver today.
Full Unboxing & Demo Video on www.MLandS.TV

IC-705 optional accessories include:
See HamRadio.co.uk/IC705

- Icom LC-192

Multi-function Backpack £156.00

- MyDEL MP-705

8 Amp PSU £39.95

- mAT-705Plus

Micro Auto-Antenna Tuner £219.95

- VS-3 Bluetooth headset

- Nifty MB-705NF Mount your Icom IC-705 at the correct angle for table top use

- Prism IC-705 Cover

- MyDEL QRAB Quick release antenna bracket

- MyDEL IC-705 Carry Cage

- MyDEL Z-Mount Tilt Stand

- BP-272 & BP-307 Spare battery packs

NEW! Icom AH-705 £299.95
Random wire Auto Tuner for IC-705. In Stock NOW.

Icom IC-7300 See web for latest special offer
100 Watt - HF/50/70MHz TRANSCEIVER with SSB / CW / RTTY / AM / FM

The IC7300 sports HF+6m+4m coverage, it's 100W, houses an eye-catching touchscreen TFT display and includes an internal antenna tuner.

PTRX-7300 Now available from stock. £199.95
Optional PTRX7300 high quality RF interface module allowing the Icom IC-7300 to have a pure RF signal output for connection to an external SDR receiver.

ML&S Trusted by the World's Most Famous Brands

Icom IC-7610 £2999.95 With FREE SP-41 base speaker
Brilliant Dual Band Transceiver

The Icom IC-7610 is a complete redesign of the former IC-7600 following on from the huge success of the IC-7300. 100W, Dual band receive and a huge widescreen display.

Icom IC-9700 £1795.95
Base Station 2/70/23 all mode including D-Star

These VHF/UHF All-Mode Direct Sampling transceivers sport the absolute latest technology.

Icom IC-7100 £1099.95
HF/6m/4m/2m/70cm Base & Mobile Transceiver including D-Star with remote control head unit.

How many of you spotted the Icom IC-7100 when it was introduced? If you didn't take any notice of the spec, now's the time to have a proper gander at this great radio covering 160-10, 6/4/2/70. It was Icom's first venture into featuring 4m as standard on some of their products and I'm pleased to see they've continued the trend ever since.

At a discounted price of £1099.95 you're getting a very special Touch-Screen display radio, all-mode including D-Star, remote control via the optional Icom RS-BA1 & more.

New Icom IC-R8600 £2499.95
New 100kHz-3GHz Receiver with SDR technology from IC-7300.

The IC-R8600 replaces the IC-R8500 wideband receiver and features technology incorporated into Icom's best selling IC-7300. The IC-R8600 receives a wide frequency range from 0.01-3000MHz frequency in analogue and various digital modes (D-STAR, P25, NXDN and dPMR). The IC-R8600 also features a larger 4.3 inch touch screen display which displaying a fast moving spectrum scope and waterfall display.

Icom ID-52E D-Star 2/70 Handie
The new ID-52E has these exciting features:

- Simultaneous reception in V/V, U/U, V/U as well as DV/DV
- Airband reception is expanded from VHF to UHF (225 to 374.995 MHz)
- Can be charged via a micro USB connector. - Audio output has been increased from 400 mW to 750 mW
- The latest D-STAR functions allow you to send, receive and view saved photos on an installed microSD card using only the ID-52
- Accessories for the ID-51E, including battery packs and microphones, can be used.

Price and availability TBA

Icom ID-5100 £574.95
Latest 2/70 D-Star Touch Screen Transceiver from Icom. Bluetooth connectivity and second station control through an Android device.

Deluxe Version also available

SOMETHING FOR THE WEEKEND...
Sign up to our mailing list at HamRadio.co.uk for weekly updates, bargains, news and much more!

Have you watched ML&S TV yet?
Every week there's something new. One simple URL
www.MLandS.TV YouTube

Have you listened to our ML&S Podcasts yet?
Listen right now on Spotify, Apple Podcasts & Pocket Casts
Apple Podcasts · Pocket Casts

ML&S No.1 FOR SDR RADIO
Click www.HamRadio.co.uk
for our full range of SDR products

QRP SDR with a twist. Introducing the ELAD FDM-Duo Range

New! Elad FDM-S3 Range From £949.90
Wideband Sampling SDR Receiver 9kHz-108MHz

The FDM-S3 receiver is an exceptional SDR with very strong performance features. Here the Italian manufacturer has taken the possibilities of modern SDR design to the extreme. For example, the FDM-S3 offers an incredible bandwidth of 24MHz, which can be scanned simultaneously and in which up to 4 receivers can be operated simultaneously. So far, this has only been reserved in this form for much more expensive receivers.

Elad FDM-DUO

Direct from the ELAD factory in Italy the FDM-Duo is a compact 5W SDR 160m-6m QRP Transceiver with unique modes of operation.

If you don't wish to be tethered to a PC like so many SDR products the Elad FDM Duo will work as a stand-alone rig offering performance far in advance of anything available today. Connect to a PC & you open up a new world of advanced SDR communications.

FDM-Duo in Black, Red or Silver from £959.95

Receive only version also available: £759.95

Elad Amplifier DUO ART
HF and 50MHz, 60 or 120W amplifier. Includes power supply, preselectors and remote controller for FDM-DUO.
60W Version £949.95
120W Version £1049.95

Elad Companion Speaker SP1 for FDM-Duo £134.95

New! Expert Electronics MB1 PRIME £6799.95
SDR Transceiver including ATU. A transceiver and a PC in a single package.

Expert Electronics SunSDr2dx £1749.95
HF/6m/2m Transceiver.
The most innovative small-form factor SDR transceiver from Expert Electronics. HF-6-2m, 100W/50W/4-slice receiver, 80MHz Bandscope.

New! AAT-100 Auto Tuner for SunSDr2dx £399.95

EXPERT ELECTRONICS

For weekly in-depth reviews, feature presentations and demo videos, check out our YouTube TV channel

YouTube **www.MLandS.TV** YouTube

Free to subscribe - start watching today!

FlexRadio
The next generation of transceivers from FlexRadio

ML&S are proud to be the only Authorised UK Distributor for Flex Radio SDR Products & Accessories.

Advanced SDR available with or without front panels.

FLEX 6400: **£1999.95** FLEX 6400M: **£3099.00**
FLEX 6600: **£3999.95** FLEX 6600M: **£4999.00**

SDRplay RSPduo £239.95
Dual Tuner 14-bit SDR.

Dual-Tuner wideband full feature 14-bit SDR, 1kHz to 2GHz, 10MHz of spectrum visibility. Simultaneously monitor 2 separate 2MHz bands of spectrum between 1kHz and 2GHz. 3 software selectable antenna inputs, & clocking features ideally suited to industrial, scientific, Ham & educational applications. Windows 10.

SDRplay RSP-1a £99.95
1kHz-2GHz & 10MHz BW.
Brand new design, the RSP1A is a major upgrade to the popular RSP1 offering a powerful wideband full featured SDR covering 1kHz to 2GHz & up to 10MHz visible bandwidth. Better still, it's "Built & Designed in Britain"!!

SDRplay RSPdx £194.95
Mid-range SDRplay Radio
Complete redesign of the popular mid-range RSP2pro 1kHz–2GHz receiver. Multiple antenna selection, Improved pre-selection filters, Even more software, Selectable attenuation steps, Special HDR (High Dynamic Range) mode for reception at frequencies below 2MHz.

WSUB1G+ Spectrum Analyser £179.95

A powerful, high performance digital spectrum analyser covering the 1GHz frequency range starting at 50KHz. The new SLIM model offers an outstanding robust design, a more convenient USB connector on the side and larger internal battery capacity. **Explorer Field Strength EMF Licence Add-On (Digital Download) Now Available.**

KiwiSDR
10kHz to 30MHz Web Interface SDR
ML&S: From £249.95

KiwiSDR is a software-defined radio (SDR) covering shortwave, the longwave & AM broadcast bands, various utility stations, and amateur radio transmissions world-wide.

ML&S are the sole UK distributors for the new ZUMspot RPi, an advanced radio module board.
All ZUMspot Packages supplied by ML&S Include: ZUMspot Pi UHF Board, UHF Antenna, Raspberry Pi Zero WH, MMDVM software and Plastic Case.

ZUMspot RPi New Updated Version
Featuring DMR, D-Star, C4FM, P25 & NXDN Hotspot.
Advanced Radio Module Board. Paired with a Raspberry Pi and the MMDVM software becomes a small and efficient multi-mode digital hotspot.

Assembled and tested: £169.95

Zum AMBE Server £169.96 (Board Only)
Allows for audio transcoding for DSTAR, DMR, Fusion, P25 and NXDN. It also supports some variants of dPMR.

Zum Spot USB! £109.95

The ZUM-Spot USB new from KI6ZUM, uses the very popular BlueDv software to create a very versitile and simple to setup PC based hotspot. The ZUM USB comes ready to go with a small antenna and a very classy high quality case, it is a huge upgrade on the very popular DV4Mini and the BlueDV software is the cherry on the cake.

DMR DUAL BANDERS FROM TyT & ANYTONE

TyT TH-9800 £199.95
50W Quad-band Mobile Radio.
Two way
26-950MHz RX.
Full Duplex. 809 Channels.

Anytone AT-D578UV Reduced to £309.95
AT-D578UVIII-PLUS coming soon!

2/70 DMR & FM 50W/45W APRS, digital roaming & Bluetooth.

Anytone AT-779UV £89.95

TyT MD-UV380 £84.95
DUAL BAND VHF/UHF DMR HANDHELD
137-174/400-480MHz DMR Handie 5W.
Enter the new digital age in style with the TYT MD-UV380 DMR Digital Portable Two Way Radio!

TyT IP-98 £124.95
Android network IP Radio
A radio with a SIM card, working in "own network". Optional speaker microphone can be connected.

Anytone AT-D878UVII Plus £229.95
Latest version AT-D878UVII PLUS BLUETOOTH Digital DMR Dual-band Handheld.
2m, 70cm mobile with programming cable and programmed with UK voice repeaters.

FUNcube Dongle Pro+ £149.95

The Original & Best Wideband SDR Receiver.
150kHz-1.9GHz incl SAW Filters

Call the team to discuss our excellent part exchange deals or if you have unwanted gear you want to sell.

You can now order from ML&S for delivery on a Saturday or Sunday!
Order before 2pm as late as Friday of each week and see it delivered at the weekend.

Web purchases: Just select Saturday or Sunday at the check-out.
Or call to place your order for Saturday or Sunday delivery on 0345 2300 599

How to Win a Contest!

Joe Chester M1MWD
m1mwd@gmx.com

Joe Chester M1MWD tries to draw some conclusions about activity from contest statistics.

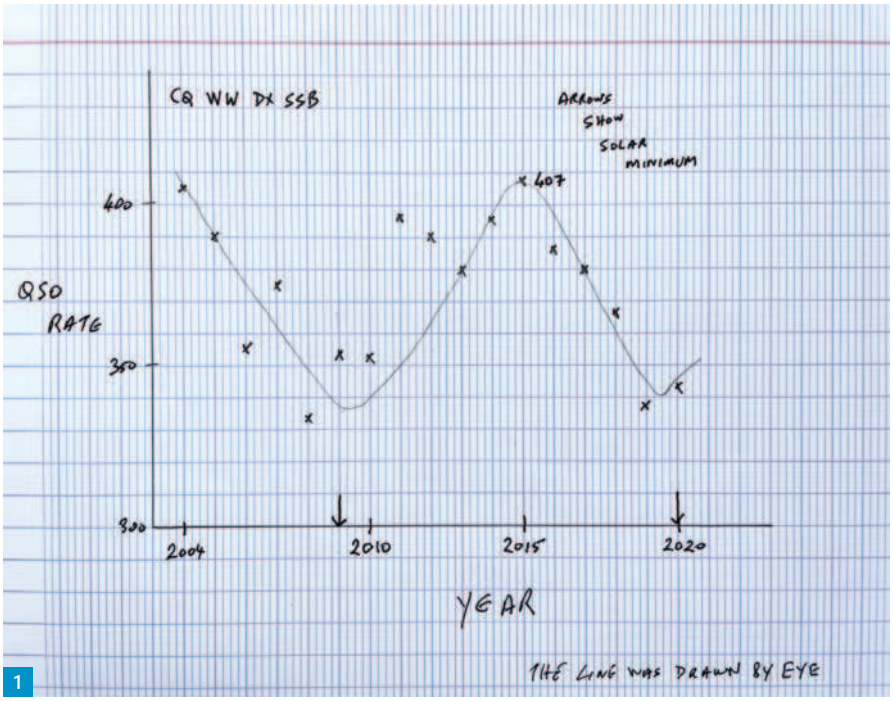
As I've said often enough, I'm not into contests. Never entered one, no intention either. But one day last week, my Elecraft system started to misbehave during a morning 80m net. Every time I pushed the PTT the frequency shifted 0.5kHz. And the SWR went through the roof. So, I switched off, intending to check out the system later. Suddenly it was 1900UTC, so I switched on, found a quiet spot and tuned up the rig. Everything looked fine, so I decided to give away a few points in the RSGB 80m Club Contest that evening.

I was surprised to be able to work ten stations, more or less in quick succession, in less than 15 minutes of operation. So clearly, there is nothing obvious wrong with my setup. A couple of days later I tried the net again, but conditions were very poor, and though I was heard on various web SDRs, I switched off to await better conditions. What was wrong on that Monday morning net? Where did the high SWR come from? Why was the KX3 jumping frequency? To be honest, I have no idea, but it's all working now.

QSO Rate

Stray thought? Have you done any contesting? If so, how well did you do? No, I'm not asking if you won the thing, or won anything. But I am curious about something that appeared briefly in these notes several months ago. I am interested in what I will describe as the QSO rate of contesters, i.e. how many QSOs are you making in an hour, say?

Now there is a website, with numbers, but bear with me for now. My 'score' was 10 in 15 minutes, or 40 an hour (if I had stayed on for that long). I think QSO rate is a really interesting measure of system performance – that is antenna, feeder, matching unit, transceiver, plus of course the operator, and conditions. Clearly if propagation is poor, then the QSO rate should suffer accordingly. This statement may not be quite what it appears, as you will see later. Let me further state that I'm interested in SSB contacts only. For CW operators the QSO rate is a variable feast, depending on how fast they can send. And I have heard of operators doing 80WPM, while reading a newspaper, and having a cup of tea and a chat with a colleague at the same time, although that does sound a bit of an exaggeration to me. But clearly a 10WPM operator is going to have a lower QSO per hour than a 40WPM operator.



1

Fig. 1: The author's attempt to fit a trend line to the reported contest data.

But this factor, CW speed, drops out of consideration if we focus solely on SSB. There is not much difference between fast and slow talkers saying just 59 73! Which brings me to the interesting point here. What is the absolute maximum number of SSB QSOs an operator could make in an hour of operation? Let's make this easier. Assume the contacts are there waiting for the QSO, and that conditions are very good, so no significant QSB, or QRN or QRM either. If I, a rank amateur in the world of contesting (and in much else besides!), can do a QSO every minute and a half, what can the avid contesters do? And what is the absolute maximum that could be achieved? If CW people can imagine 80WPM, then could an SSB operator do one every second? 3600 QSOs in an hour? Wow! Maybe this is too much to contemplate. So, what about one every five seconds – go on, time it yourself. How long does it take to say *"QRZ"*, listen to a callsign, then repeat that callsign and add *"59 73 136"*. That last number is the serial, required in most contests. I think five to six seconds might be enough. Giving us a maximum achievable QSO rate of something like 600 contacts an hour. Now remember I specified perfect conditions for this experiment.

In actual fact, I think this idea would make for a very nice 'contest' for a club evening. Bit of a laugh anyway. And you don't need to keep it up for an hour, a ten-minute window per participant should be enough. I will leave you to design the experimental setup, which shouldn't be too difficult. Other club members could throw their callsigns at the volunteer and see how many 'QSOs' he can make in ten minutes. You mightn't even need to go on air! But back to reality.

I mentioned a website, it's:
www.cqww.com/rates

Here are listed the best hourly QSO rates of the participants in the CQ WW Contest, from 2004 to 2020. These are listed separately for the various contest categories, e.g. single operator, QRP, and various classes of multi-operator stations. Some numbers to consider. In the single

operator category, the highest achieved rate in all of these years was 8P5A, operated by **Tom W2SC**, with 407 contacts an hour in 2015. Now you can look at this in various ways. That rate means a completed contact every 8.5 seconds. I don't think this is averaged over the 48 hours of the contest, but his best hour during the contest. Now don't ask me how the guy could keep this level of operating for up for 48 hours. But the result for the hour in question is there in that table. For your information, the hour in question was actually the first hour of the contest that year, 24 October 2015, and it's also interesting that he sat on one frequency, 14.328MHz for the whole hour, no search and pounce work. For those interested in how contesters get high scores in contests these two points may be of interest.

Another interesting piece of data comes from the QRP participants. **John P40A**, in Aruba, or KK9A, his US callsign, achieved 289 contacts per hour in 2004, over 70% of that of the full power station. How absolutely fabulous was that score, then? Who says life's too short for QRP? And at the other extreme, if I look up the multi-multi people, I see that CN2AA did 1012 an hour, also in 2015, just short of two and a half times the single operator rate. But there were twelve operators with several transceivers at this station.

Further Analysis

I did some further analysis on this data as I'm curious about how the QSO rate varies year on year. Surely there must be some effect from the variable propagation conditions, and also from improvements in the technology in the various transceivers in use?

The data here is less than convincing. Over the 17 years for which there is data in this table, the winners averaged around the 372 mark, the lowest winner being CU2X in 2008 with 333 QSOs per hour. I thought there would be a wider variation. You might think that transceiver performance would have improved over this length of time, or that propagation effects would be noticeable. But it's not that clear, to me anyway. In fact, if anything it is saying that these two factors have had relatively little impact on these performances.

The last solar maximum was about 2004, where this table starts. And the data runs right through to the solar minima, the minima of 2009 and 2020. A trend is just discernible, matching the solar cycle (see my attempt at graphing these in the hand-drawn graph). But these operators are still managing an average of 370 or so contacts an hour every year. And how then to explain 2011 and 2012? So, I suspect that, overall, it must come down to the skill of these operators.

From which I immediately generalise. To have fun on air, you don't need the very best transceiver. Furthermore, and I am guilty of saying this both in this magazine and elsewhere, you don't need the very best of propagation conditions either.

Even when propagation is poor, there are still lots of stations out there waiting for your CQ call. Let's see if I can give you a few key sentences to chew on. The first is that once again, QRP operators do very well in comparison to their high-powered cousins. I know nothing about the exact conditions when these results were achieved but managing to make close to 300 contacts an hour is quite a statement. Secondly, 8P5A's extraordinary rate is only two thirds of my estimate above of the theoretical maximum achievable for a single operator.

Of course, the team of twelve easily exceeded this, almost twice over. However, I think I would be tempted to revise my theoretical performance figure downwards. Which probably means that these operators are reaching the maximum rate achievable practically. But still a long way from my exceedingly modest 40!

And finally, overall propagation conditions have only very little impact on the QSO rates being achieved. So why exactly are people saying day after day that there is no one on the air because conditions are poor?

MOONRAKER

ONE STOP HOBBY RADIO SHOP

Sales line 01908 281705

sales@moonrakeronline.com PayPal VISA

Postage (UK Mainland Only): Small items just £2.99
Medium items just £4.99 Maximum charge just £9.99

www.moonrakeronline.com

Moonraker UK Limited, Cranfield Road, Woburn Sands, Bucks MK17 8UR Open Monday-Friday 9:00-5:30pm

RM

Base 240v Mains

BLA1000 1.8-55MHz All mode solid state base amplifier, can deliver up to 1000 watts on all main amateur bands between 1.8 -50MHz, has instant start-up, no setup necessary, and has some very useful features too, including SWR protection and twin antenna outputs **£2799.95**

BLA600 is a compact wideband 500W linear amplifier for the HF and 6m bands, from 1.8 to 54 MHz **£1999.99**

BLA350 PLUS is ideal base amplifier for the HF bands, the BLA 350 Plus mains powered Solid State amplifier gives a hefty 300 watts output and is simple to drive **£899.99**

Mobile 12v & 24V

HLA305V is a 12v wideband professional compact amplifier for the HF band covering 1.8-30 MHz Output is nominal 250W at full power, 6 band filter and LCD for Amplifier Status. Input drive from 1W to 10W maximum. Ideal for handhelds, FT-818ND and similar **£699.95**

HLA300V PLUS covers from 1.8-30 MHz, and with up to 300 watts on tap, gives you the edge working those weaker DX stations **£599.95**

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)..... **£429.95**

LA250V is a 12v professional 200W 140-150MHz amplifier, at 1 to 20W input (13.6V 30A). It uses 4 Mitsubishi RD70 Mosfets mounted on a copper heat spreader **£549.95**

MUA100 is an UHF wideband compact amplifier for the UHF band covering from 405 to 480 MHz Output is nominal 100W at full power . **£479.99**

MAT-TUNER®

SALE • SALE • SALE • SALE • SALE • SALE

MAT-40 is an outdoor weatherproof long wire and vertical wire tuner, 0.1-120 Watts, 1.8-54MHz..... ~~£259.95~~ **£229.95**

MAT-10 is a tuner designed for automatic "one touch" tuning use with Yaesu FT-817/818 transceivers via dedicated control cable (included with tuner purchase) 30W SSB, 1.8-54MHz..... ~~£229.95~~ **£179.95**

MAT-705 PLUS Specifically built for the new ICOM IC-705, the mAT-705 is the latest compact and fully portable Micro-ATU powered by an internal 9V dry battery! ..... ~~£229.95~~ **£199.95**

MAT-125E is a general use external automatic antenna tuner for use with any HF transceiver. Automatic RF-sensed or manual tuning modes. 0.1-120 Watts, 1.8-54MHz ..... ~~£179.95~~ **£169.95**

MAT-180H is an automatic antenna tuner designed for modern ICOM and Kenwood HF transceivers, 0.1-120 Watts, 1.8-54MHz..... ~~£159.95~~ **£139.99**

MAT-K100 is an automatic antenna tuner designed for modern Kenwood and ICOM HF transceivers, 0.1-120 Watts, 1.8-54MHz..... ~~£159.95~~ **£139.99**

ALL CONNECTING CABLES AVAILABLE £19.99

SALE • SALE • SALE • SALE • SALE • SALE

SHARMAN multiCOM

Sharman have been totally focused on sourcing and distributing radio communications and hobby products for dealers, distributors, and retailers throughout the UK, Ireland and Europe for many years. They produce a lovely range of power supplies to compliment their range.

SM-23 a lovely lightweight, slimline no frills switch mode power supply with cigar socket on the front and connecting terminals on the back providing 23 amps supply – amazing value too..... ~~£69.95~~ **£59.95**

SM-30II our most popular switch mode power supply. It has 30 amps with adjustable voltage, 10 amp cigar socket at the front plus terminals for low amp connections with the large ones at the back. Double meter at the front showing volts and amps complete with a noise offset control – Fab power supply lightweight too and great price ..... ~~£79.95~~ **£69.95**

SM-50II same as above but with a massive 50 amps to play with ..... ~~£129.95~~ **£119.99**

NEW IN!
GQ Electronics Multi-Function EMF Meter
£115.00

AVAIR

SWR Meters

Quality meters at affordable prices – from HF to UHF

AV-20 1.8-200 MHz 30/150W **£49.99**
AV-40 144-470 MHz 30/0150W **£49.99**
AV-201 1.8-160 MHz 5/20/200/400/1000W **£59.99**
AV-400 140-525 MHz 5/20/200/400/1000W **£59.99**
AV-601 1.8-160/140-525 MHz 5/20/200/400/100W **£79.99**
AV-1000 1.8-160/430-450/800-930/1240-1300MHz up to 400W **£89.99**

bhi

Bhi design and manufacture a range of DSP noise cancelling products that remove unwanted background noise and interference from noisy voice and radio communication channels to leave clear speech.

NES10-2 MK4 Noise Eliminating Speaker **£119.99**
The next evolution in BHI DSP speakers. This is one of the best DSP speakers on the market superb for elimination of unwanted noise on Ham Radio, Comms radio and scanner

DESKTOP Mk2 ..... **£199.99**
10 watt DSP noise cancelling base station speaker will work with most radios, transceivers, receivers, and SDR radios, giving a new listening experience. The new rotary controls make it very easy to use and set up to your own operating conditions.

DUAL IN-LINE **£179.99**
The Dual In-Line DSP noise eliminating module provides two channel/stereo noise cancellation, and is suitable for use on all radios and receivers including SDR, especially those with stereo or two channel output options.

COMPACT IN-LINE **£179.99**
This small compact battery operated handheld unit is ideal for portable use, and includes the latest bhi dual channel/stereo DSP noise cancelling technology. It is designed to be used with a pair of stereo headphones, but will also drive a mono loudspeaker or a pair of powered stereo speakers.

PARA PRO EQ20-DSP..... **£259.95**
The bhi ParaPro EQ20-DSP features a 20W modular audio power amplifier with a parametric equaliser plus the option of having bhi's latest dual Channel DSP Noise Cancelling technology and Bluetooth technology. The parametric equaliser allows any specific part of the frequency range to be selected and adjusted in strength enabling the user to shape the audio to suit their ears!

HP-1 Wired Stereo Headphones ..... **JUST £19.95**
The HP-1 stereo headphones are suitable for general purpose use and can be used for radio communications as well as listening to music.

WATSON

Watson have been offering high quality shack accessories for many years and have gained a reputation for good quality products for the hobby enthusiast

Power Supplies

POWER-MAX-65-NF 60amp switch mode variable volts power supply with V & A meters & noise offset **£259.99**
POWER-MAX-45-NF 38amp continuous switch mode power supply with a 45amp peak..... **£119.95**
POWER-MITE-NF 22amp amazingly small switch mode power supply but has all the features you would expect of a larger power supply **£84.95**

Switches

CX-SW2PL 2 Way SO239 up to 2kW DC-1000MHz **£34.99**
CX-SW2N 2 Way N-Type up to 2kW DC-1000MHz **£41.95**
CX-SW3PL 3 Way SO239 up to 1.5kW DC-800MHz **£54.95**
CX-SW3N 3 Way N-Type up to 1.5kW DC-800MHz **£59.95**
CX-SW4PL 4 Way SO239 up to 1.5kW DC-900MHz **£69.95**
CX-SW4N 4 Way N-Type up to 1.5kW DC-900MHz **£79.99**

Dummy Loads

DM-150PL 30-150W DC-600MHz PL259 fitting **£44.99**
DM-200N 35-200W DC-1000MHz N-Type fitting **£64.99**

Arrow Antenna

The Arrow II line of Antennas has been engineered to provide maximum gain and efficiency in the smallest practical size & weight

ARROW II 146/437-14WBP Portable satellite antenna (inc duplexer) 54" long **£199.99**
ARROW II 146/437-10WBP Portable satellite antenna (inc duplexer) 38" long..... **£149.99**
ARROW II 146/437-10WB Portable satellite antenna (without duplexer) 38" long.. **£89.99**
ARROW II Roll up bag to suit all above antennas **£59.99**
ARROW GP121.5 - 1/4 Wave Ground Plane - (Aircraft Band)..... **£49.99**
ARROW GP70.250 1/4 Wave Ground plane (4 Metre) **£59.95**
ARROW GP52 1/4 Wave Ground Plane (6 Metres) **£64.99**
ARROW GP146 1/4 Wave Ground Plane (2 Metre) **£49.95**
ARROW GP146/440 1/4 Wave Ground Plane (Dual Band) **£59.95**
ARROW FHL UHF Fox Hunt Loop 1MHz-1000MHz **£79.99**
ARROW FHL VHF Fox Hunt Loop 1MHz-600MHz **£79.99**
ARROW 4 MHz Offset Fox Hunt antennuator **£79.99**

DIAMOND ANTENNA

Yagis

1st class Japanese quality antennas with simple plug and play assembly

A1430S7 Dual band 2/70cm, 7 ele, 7.5/9.3dB, 100W **£119.99**
A144S10R 2m, 10 ele, 11.6dB, 100W **£79.99**
A144S5R 2m, 5 ele, 9.1dB, 50W **£44.95**
A430S15R 70cm, 15 ele, 14.8dB, 50W **£64.99**
A430S10R 70cm, 10 ele, 13.1dB, 50W **£49.99**
A502HB 6m, 2 ele, 6.3dB, 130W **£79.99**

VHF/UHF Verticals

X-30 Dual Band 2/70cm 3.0/5.5dB Gain 1.3m SO239 fitting **£49.99**
X-30N Dual Band 2/70cm 3.0/5.5dB Gain 1.3m N-Type fitting **£49.99**
VX-30 Dual Band 2/70cm 2.15/5.5dB Gain 1.3m N-Type fitting (radial free) **£69.99**
X-50 Dual Band 2/70cm 4.5/7.2dB Gain 1.7m SO239 fitting **£64.99**
X-50N Dual Band 2/70cm 4.5/7.2dB Gain 1.7m N-Type fitting **£69.99**
X-200 Dual Band 2/70cm 6.0/8.0dB Gain 2.5m SO239 fitting **£99.95**
X-200N Dual Band 2/70cm 6.0/8.0dB Gain 2.5m N-Type fitting **£104.95**
X-300 Dual Band 2/70cm 6.5/9.0dB Gain 3.1m SO239 fitting **£99.99**
X-300N Dual Band 2/70cm 6.5/9.0dB Gain 3.1m N-Type fitting **£99.99**
X-510N Dual Band 2/70cm 8.3/11.7dB Gain 5.2m N-Type fitting **£129.99**
X-5000 Tri Band 2/70/23cm 4.5/8.3/11.7dB Gain 1.8m N-Type fitting **£149.99**
X-6000 Tri Band 2/70/23cm 6.5/9.0/10.0dB Gain 3.05m N-Type fitting **£179.99**
X-7000 Tri Band 2/70/23cm 8.3/11.9/13.7dB Gain 5.0m N-Type fitting **£199.99**
V-2000 Tri Band 6/2/70cm 2.15/6.2/8.4dB Gain 2.5m N-Type fitting **£119.95**

Professional factory fitted premium patch leads

High quality patch leads with all combinations factory fitted and available from stock All simply priced (search CS Premium on our website as many more not listed)

One Metre RG58 Options

CS Premium RG58 1M (PL259 to BNC Male) **£14.99**
CS Premium RG58 1M (PL259 to N-TYPE Male) **£14.99**
CS Premium RG58 1M (PL259 to SMA Male)..... **£14.99**
CS Premium RG58 1M (BNC Female to SMA Male) **£14.99**
CS Premium RG58 1M (BNC Male to N-TYPE Male) **£14.99**
CS Premium RG58 1M (N-TYPE Female to PL259)..... **£14.99**
CS Premium RG58 1M (N-TYPE Female to BNC Male) **£14.99**

Ten Metre RG58 Options

CS Premium RG58 10M (PL259 to PL259) **£19.99**
CS Premium RG58 10M (PL259 to BNC) **£19.99**
CS Premium RG58 10M (PL259 to N-TYPE Male) **£19.99**
CS Premium RG58 10M (PL259 to SMA Male) **£19.99**
CS Premium RG58 10M (N-TYPE Male to BNC Male) **£19.99**
CS Premium RG58 10M (PL259 to SMA Male) **£19.99**
CS Premium RG58 10M (N-TYPE Male to N-TYPE male) **£19.99**
CS Premium RG58 10M (N-TYPE Male to SMA Male) **£19.99**

One Metre RG213 Options

CS Premium RG213 1M (BNC Male to BNC Male) **£19.99**
CS Premium RG213 1M (N-TYPE Male to N-TYPE Male)..... **£19.99**
CS Premium RG213 1M (BNC Male to N-TYPE Male) **£19.99**
CS Premium RG213 1M (PL259 to BNC Male) **£19.99**
CS Premium RG213 1M (PL259 to N-TYPE Male) **£19.99**

Ten Metre RG213 Options

CS Premium RG213 10M (N-TYPE Male to n-TYPE Male) **£29.99**
CS Premium RG213 10M (N-TYPE Male to BNC Male) **£29.99**
CS Premium RG213 10M (PL259 to BNC Male) **£29.99**
CS Premium RG213 10M (PL259 to N-TYPE Male) **£29.9**

Summer Sizzlers

We have the best deals from your favourite radio brands in stock and ready to ship the same day!

Super Summer Bundle!

Buy the **ICOM IC-705** for just **£1299.95** and plug that 4m gap with a **FREE Anytone handheld!**

ICOM

IC-9700 Bundle Deal
Buy the IC-9700 for just
£1795.00
and get a FREE SM-30II PSU & SQBM3500 Antenna!

IC-7300 Bundle Deal
Buy the IC-7300 for just
£1199.99
and get a FREE SM-30II PSU!

IC-7610 Bundle Deal
Buy the IC-7610 for just
£2999.99
and get a FREE SM-30II PSU & GPA-80F Antenna!

IC-R8600 Bundle Deal
Buy the IC-R8600 for just
£2499.95
and get a FREE Whizz Loop V3 Antenna!

YAESU

FTDX10 Bundle Deal
Buy theFTDX101D for just
£3149.95
and get a FREE SM-30II PSU & GPA-80F Antenna!

FTDX101D Bundle Deal
Buy the FTDX10 for just
£1549.95
and get a FREE SM-30II PSU!

FT-991A Bundle Deal
Buy the FT-991A for just
£1249.95
and get a FREE SM-30II PSU!

FT-818ND Bundle Deal
Buy the FT-818ND for just
£599.95
and get a FREE Whizz Loop V3 antenna!

SEARCH 'BUNDLE' ON OUR WEBSITE FOR MORE SIZZLING SUMMER OFFERS

SEEN A BETTER DEAL? THEN CONTACT US NOW – WE WILL MATCH OR BEAT ANY OTHER UK IN STOCK DEAL!

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

Tim Kirby GW4VXE
longworthtim@gmail.com

WFVIEW

With the Sporadic E season in full swing, **Tim Kirby GW4VXE** has another packed column, starting with a mention of WFVIEW.

Jef Van Raepenbusch ON8NT mentions WFVIEW, **Fig. 1**, software for controlling modern Icom receivers and transceivers either using USB or network connections. Jef says, *"wfview provides the user with data from the radio's spectrum display. The main tab contains all the basic features most users will need for a QSO or casual listening. Other tabs contain convenient buttons for jumping to various bands or adjusting more detailed parameters of the radio, including the calibration control adjustment on the IC-9700, which can be used in tandem with the waterfall display.*

"wfview goes beyond simply allowing the user to adjust the radio. wfview enhances the user's experience, with easy-to-use keystrokes for most tasks and accessibility labels for screen readers. The software even includes a built-in rig server, primarily designed for the IC-7300, which allows other instances of wfview on remote computers to connect in and enjoy fast real-time control and low-latency audio.

"wfview supports Linux, Windows, and macOS, and is fully open-source". You can read about it more at:
http://wfview.org

The 6m Band

Andy Adams GW0KZG (Letterston) reports over the period from May and June. Andy put up a 6-element Powabeam for the 6m band. He has struggled somewhat with noise issues in some directions but nevertheless has made some nice contacts, the highlights being TF3VG (HP94), KP4EIT (FK68), VO1HP (GN37) and CU2JX (HM77).

Roger Greengrass EI8KN (Co Waterford) has been using both FT8 and FT4 modes and worked HZ1BW (LL34) on 7 May, VO1HP (GN37) on 14 May and W4AS (EL95) on 15 May. Roger caught an opening on 3 June working N5DG (EM20), HI3T (FK49), PV8DX (FJ92), VE9XX (FN77), HI8GSP (FK58), HI8RD (FK58), HC1HC (FI09), KP2/K0BZ (FK77) and K1TOL (FN44). Next day, Roger worked VA1WV (FN75), K5XI (FN64), VE1JBC (FN73) and N1NK (FN41).

It was good to catch up with **John Sluymer VE3EJ** (Ontario) on the band on 4 June and in an email after the opening, John said he'd worked 110 European stations. Next day, John worked Z37CXY for a new country. John says that he never ceases to be amazed in how selective the band can be – sometimes he will hear **Glenn VA3DX** just a few miles away, working stations that John just can't hear and then, the reverse occurs.

During May, **Kevin Hewitt ZB2GI** (Gibraltar) made over 550 QSOs on FT8 using his IC-7300 and an Outback Multiband whip with counterpoise wire attached to a broom handle stuck out of the window. Highlights of Kev's log include 5B4AAB (KM64), 9A9Z (JN75), 9H1TX (JM75), CN8DN (IM53), CT1EEB (IN50), CU6NS (HM58), DC8GT (JN38), EA1P (IN70), EA6T (JM19), EA8C (IL18), EI8JK (IO51), F2JD (JN25), G0CER (IO82), GW4VXE (IO71), GX1RAF (IO91), HB9HIT (JN36), IK2QPR (JN55), IT9BCC (JM67), K1DJ (FN42), K2QL (FN22), K9MU (EN44), LA3DV (JO49), LX1JX (JO30), M1AMY (JO01), M7GZZ (IO93), MM0GOR (IO85), N8JX (EN64), NP3DM (FK68), NP4G (FK78), OE3WHC (JN88), OH5KW (KP30), ON7EQ (JO21), OZ1ZD (JO46), PA4VHF (JO32), S51AT (JN75), S56Y (JN65), S57ZM (JN76), SM2SUM (KP03), SP4K (KO03), UT8IO (KN87), VO1CH (GN37) and W5BN (FN33). Kev also operated from the top of the Rock using an FT690 II and a 3-element Yagi, **Fig. 2**, and includes an impressive log, all on SSB, considering the low power: 9A9R (JN85), EA3AYO (JN11), EA7JM (IM76), F1RAF (JN18), F4GBD (JN05), F4GET (IN87), F4HEC (JN07), F4IIQ (JN06), F5JRX (JN26), G4ELJ (IO91), HB9AID (JN36), HB9FAP (JN46), HB9ZCF (JN47), I0OOZ (JN61), I5IIL (JN54), I5XFW (JN53), IK1PMR (JN45), IK2EAE (JN45), IK2OHG (JN45), IK2XRL (JN45), IK5EKL (JN53), IT9BNX (JM68), IU0DUM (JN61), IU0JIW (JN61), IU5ICR (JN53), IV3QBT (JN65), IW3GJF (JN55), IW6NXR (JN72), IW7DHC (JN61), IZ0HPX (JN61), IZ0TTE (JN62), IZ1MLQ (JN35), IZ4AQT (JN54), IZ5CML (JN53), IZ5HQB (JN53), IZ5ZRC (JN53), IZ8FXZ (JN61), S57L (JN75), SP1FJZ (JO84), SP3OOC (JO92), SV3DCX (KM08) and TK1CX (JN42).

Tony Collett G4NBS (Cambridge) sends an excellent and comprehensive report. On 12 May, Tony caught his first aurora in a long time, working MD0CCE (IO74), GM4UYE (IO86) and GM3POI (IO88) on CW and MM5DWW (IO89) on SSB. On 13 May

Fig. 1: A screenshot of the wfview software for remotely controlling Icom transceivers.
Fig. 2: Kevin ZB2GI's 3 element 6m beam used for his portable operation at the top of the Rock.
Fig. 3: Portable satellite operation COVID style: Patrick WD9EWK operating from the Navajo Nation reservation in DM46, which was subject to COVID restrictions.


2

before the UK Activity Contest Tony worked SV6KRW (KM09) and 5B4AIF (KM64) on FT8 as well as several CW QSOs with ES, HA, OH, SM, SP and YL. During the contest on SSB, Tony worked IT9BDM (JM77) and TF8KY (HP83). The evening of 18 May saw a nice opening to the Caribbean with VP2EIH (FK88), KP4DGW (FK68), KP4JRS (FK68), PJ2BR, PJ4EVA (FK52), KW4SP (EM64) and C37AC (JN02) all worked on FT8. There was a big opening to the US on 19 May when Tony made 46 QSOs in 31 squares, the best DX being W7CD (CN87) at 2058z. Europeans were strong nearly all day on 20 May but at around 2215UTC on what seemed a dead band, Tony worked VE1PZ (FN85), W4FZ (FM18), N1UK (FM05) and WA2MJP (FN32).

During the afternoon of 23 May, Tony found the band good into Scotland with eight worked as well as OY1DZ (IP62), all on FT8. The evening of the same day saw plenty of Europeans followed at 2040UTC by 9Y4D (FK90), FG5GH (FK96) and 8P2K (GK03). On 25 May, Tony made 90 QSOs in 74 squares between 1230 and 2200UTC with the highlights being A92AA (LL56), 9K2YM (LL48) and Z61DX (KN02). On 28 May, Tony caught RA4DX (LO21) with EI7IX (IO53) and EI4KF (IO54) coming through on what he thinks was backscatter. Out of nowhere on 1 June, Tony worked S01WS (IL46) calling CQ on SSB at 1650 and N4QS (EM56) on FT8 just afterwards.

3 June was a big day with the highlights being A71AM (LL55), TR8CA (JJ40), A92GE (LL56), A65BR (LL75), 4X1YS (KM71), HI3T (FK49), HI8DL (FK58), HI8RD (FK58), PV8AZ (FJ92), 7Z1SJ (LL25), WP4JCF (FK68), 5T5PA (IL10), HI3T (FK49), D4VHF (HK76) and NP2J (FK77) on CW, WP4ROQ (FK68) and PJ4DX (FK52) on SSB, KP2/K0BZ (FK77) and HI8RD on FT4 and finally HC2FG (FI07), HC1HC (FI09), HC1BI (FI09) and finally PV8DX (FJ92) back on FT8. 4 June saw a few QSOs through the day, including TT8SN (JK72) on CW at 1638UTC. At 2000UTC the band opened across the Atlantic, allowing Tony to make 44 QSOs in 19 squares. During the UK 6m Group Contest on 5/6 June things were pretty quiet although Tony managed to work 5B4AAB (KM64) on SSB, Z36W (KN11) on CW and IZ8FFA/P (JM87) and finally IS0BSR (JN40) back on SSB. Tony worked IG9CGH (JM65) for a new square and 9H1GP (JM75) for the best DX of the afternoon on 6 June. Finally on 7 June, Tony worked ZB2IF (IM76), 4Z1UF (KM71), HZ1SK (KL91) and SV2DGH. Thank you, Tony for a great report which captures, very nicely, what's been happening on the band.

Jef ON8NT uses 10W from his IC-7300 to a V-2000 vertical and lists his highlights; SV9CVY (KM25), ZB2GI (IM76), EA8DBM (IL18), EA8W (IL38), EA8JK (IL18), CN8LI (IM63), 7X2RF (JM16) and EA9QD (IM75).

Steve and Eva Telenius-Lowe, PJ4DX and PJ4EVA (Bonaire) have both been very active on 6m FT8 this month. Steve writes: *"Despite normally being mainly an HF operator the Sporadic E (Es) propagation on 6m has been so good I actually spent far more time on 6m this month than on HF!*

"Eva and I both started to use FT8 only in November last year, so this was our first experience of using FT8 on 6m during the Es 'season'. What a difference it has made!

During the last month we have both worked literally hundreds of European and North American stations, plus many more in the Caribbean and South America.

"Best DX during the month was 5B4ALJ at about 10,250km on 6 June, and other notable DX worked included (in no particular order): CT1IUA, EA8JF, EA7KI, SV2DSD, F4BKV, CT3MD, CS8ABF, ON4IQ, PA2J, EI5EV, IS0ZOD, LX1JX, DK8NE, ZB2GI, OZ1SKY, SP6TRX, IW5DHW, EA6Y, S57RR, 9H1TX, 9A3K, HB9Q, OK1FAV, OE3KLU, HG2DX, OG3G, OM3EY, UR5WA, Z37CXY, SM4KYN, ES5PC, GU8FBO, GM3SEK, MD0CCE, GI4SNA, LA9DAA, YL3HA, OH0Z, D4VHF, YU1EL, EA9ACD, 4O4A, E72U and LZ2BU.

*"Both Eva and I were also particularly pleased to make QSOs with **Tim GW4VXE** and* PW *Editor **Don G3XTT**!*

"I have now worked 79 DXCC entities on 6m, with 67 of them so far confirmed on Logbook of The World (LoTW). Around 30 of those were 'new ones' in the last month. Eva,

having only started on 6m in May, already has 49 DXCC worked and 43 confirmed on LoTW".

Phil Oakley G0BVD (Great Torrington) has had some PC problems, which have curtailed FT8 operating somewhat this month, but nevertheless has worked some nice ones, including D4VHF (HK76), TA9J (LN10), 3A2MW (JN33), W4SO (EL98), K3VN (EL98), W4AS (EL95), W4TAA (EL87) and VO1LM (GN37).

Dave Thorpe G4FKI (Ampthill) was amazed to be heard in Taiwan by BX6ABV on FT8. Dave was using a simple wire dipole at around 10ft above the ground. On 19 May, Dave says that he copied literally dozens of US stations, using the same setup.

The 4m Band

Both **Simon Evans G6AHX** (Twyning) and **Ken Eastty G3LVP** (Cheltenham) worked LX1FX/MM (JN23) on 19 May – the first time both of them have worked a maritime mobile on 4m. Simon also lists HA5LV, SQ8PEH, SP6A, OH0Z and EA5Z all worked on SSB.

Gordon Smith GW6TEO (Castlemartin) sent an interesting report covering May and says that his first Es opening was on 14 May with the band open, on and off for about three hours, allowing Gordon to work into EA, HA, E7, OK, DL, S5, 9A, SP, OM, OZ, LX and ON. On 16 May there was a very brief opening into 9A, DL and EA. On 24 May he worked nine EA stations and one ZB2, with EA7AAF (IM77) being a new square.

The best opening of the month for Gordon was on 25 May with 25 stations worked with several new squares; EA4FT (IN70), SQ8AQX (KO00), YO9HP (KN35), HA3PV (JN96), LZ2JA (KN22) SV1QT (KM17), SP8WW (KN19) and perhaps best of all, 9K2YM (LL48) for a new square and a new DXCC. Gordon wonders whether the contact with 9K2YM is a first from Wales to Kuwait on the band.

Using his IC-7300, mobile whip, counterpoise wire and the magic broom handle stuck out the window, Kevin ZB2GI sends an impressive log of stations worked on the band using FT8: DB5KN (JO31), DG0CAW (JN49), DJ2QV (JN58), DK2EA (JO50), DK5EW (JN48), DL1AE (JO31), DL3MBG (JN67), DL3YEE (JO42), DL5EBS (JO31), DL6BF (JO32), DL8GP (JN39), EA7HCL (IM76), EI2FG (IO61), EI4DQ (IO51), F5DQK (JN18), G0CHE (IO90), G0KSC (JO01), G0LFF (IO90), G1CWP (IO90), G1OUA (IO91), G3SED (IO90), G3WCS (IO83), G3WKW (IO91), G3XDV (IO92), G3YHM (IO90), G3ZQH (IO92), G4CCZ

3

(IO91), G4DKB (JO01), G4EZP (JO01), G4FUF (JO01), G4HGI (IO83), G4PLZ (JO02), G4YTL (IO92), G6OUA (IO91), G8BXC (JO01), G8HGN (JO01), GI4SNA (IO64), GW4ZHI (IO82), GW6TEO (IO71), GW8ASA (IO81), GW8ASD (IO83), HA1WA ((JN87), LX1ER (JN29), M0CKM (IO90), M1DNJ (JO01), ON4AOI (JO21), ON4GG (JO20), ON5SA (JN29), OS4PS (JO20), PA2CHR (JO32), PA2J (JO21), PA2M (JO21), PA3GHQ (JO21), PA3GHQ (JO21), PA4VHF (JO32), PE1ITR (JO21), PE1IWT (JO32), S52OR ((JN76), S57D (JN76), S57TW (JN75), S59F (JN65), SP2CHY (JO94), and YL3HA (KO26). With the same setup, Kev was also able to make a few SSB QSOs: G3MXH (JO02), G0ORG (JO02), M0GHZ (IN81) and G4FKK (IO91).

The 2m Band

Roger EI8KN caught a 2m Es opening on 14 May, working EB5GC (IM97) and EA5IEA (IM97). On 19 May, he caught another opening to Italy, Germany, Malta and Switzerland working about 20 stations with the best DX being 9H1CG (JM75). Roger also caught the opening on 25 May working 12 stations from Italy in the I6, 7, 8 and 0 call areas.

Simon G6AHX caught an Es opening on 25 May, working IH9YMC (JM56) on SSB and was delighted to learn that IH9 counts as Africa.

Gordon GW6TEO was just out of the main focus of the opening on 25 May, but managed catch four minutes of it just as the opening was coming to an end, working IK0FTA (JN61), IC8TEM (JN70), IU8MHG (JM78) and IT9GSF (JM67).

Tony G4NBS found time to be active on 2m as well as 6m and made a few contacts towards the end of the contest on 16 May, working GM3S and GM3HAM/P (IO74) as well as GI4SNA, all on SSB. On 31 May around sunset, some Scandinavian stations appeared on FT8 as things cooled down. Tony worked OZ1KWJ (JO45), OZ1JMN (JO46), OZ9GA (JO46), LA3BO (JO59) and LA9DM (JO59), LA9NKA (JP20), SK6QA (JO58), SF6F (JO67), SM6YNO (JO67) and SM4GGC (JO69).

During the UK Activity Contest on 1 June Tony made 105 QSOs in 24 squares and was particularly pleased to work M0AFJ/P (IO70) and GW0RHC (IO71) as well as the more 'usual' stations. On FM, Tony worked three stations, including M7ALE/P (IO93) and GW8ASD. During the FT8 Activity session on 2 June, Tony found lots of activity with the highlights being OZ1BEF (JO46), DL1DBR (JO41), GM1MYF (IO87) and EI8KN (IO62).

Roger Daniel G4RUW (Newbury) caught the Es opening on 25 May and worked YO6OBK (KN26) for a new square, followed by IZ8DSK (JN71) and IZ8DVD (JM88). Roger says that he's heard 14 countries so far this year by Es.

The 70cm Band

Tony G4NBS caught some DX on the 70cm band during the evening of 31 May, working OZ1SKY (JO56), LA9AKA (JP20), OZ1DLD (JO45) and OV3T (JO46). At 2303 local time,

Tony saw very strong signals from OZ2ND (JO46) on FT8, so suggested a move to SSB, which resulted in a nice 30-minute QSO only to be tail-ended by OZ4VW (JO45) who Tony had last worked in 1987. During the FM Activity Contest Tony made four QSOs. Two of them were in IO80: G0UHY and M0BAO/P. During the UK Activity Contest, Tony made 116 QSOs in 25 squares. M0AFJ/P (IO70) was an enormous signal but there was little activity from the south-west. Tony worked a number of GM, GI and GD stations without the need for aircraft scatter this month. During the FT8 Activity period on 9 June, Tony thought there was good activity and made 60 QSOs with 21 squares. Tony saw a few decodes from GM0HBK (IO77) but unfortunately, he faded before he could call. OV3T (JO46) was also seen but not worked. The best DX was OZ2AE, OZ1KWJ, DJ6TA and DL6KAI (JO30) as well as EI8KN, GI6ATZ and MM0CEZ.

Jef ON8NT reports SSB QSOs with F8KGU (JN19) and M1CRO/P (JO01) and G3XDY (JO02) on CW.

Satellites

Jef ON8NT enjoyed listening to an ARISS contact from the ISS on 25 May at 1833UTC.

Patrick Stoddard WD9EWK (Phoenix) writes, *"A busy few weeks here... after trips to Hawaii by **Dima N6DNM** and **Ian K5ZM,** several North American satellite operators have claimed the satellite version of the Worked All States award. N6DNM also travelled to the Channel Islands – not those off the coast of France, but the islands near Santa Barbara and Los Angeles in southern California – to help some operators get their AMSAT Gridmaster award for working all 488 continental USA grids. **John KG4AKV** made a detour on his trip along the US east coast to help long-time satellite operator **Christy KB6LTY** work grid FM25 in North Carolina, the last of the 488 she needed for the Gridmaster award. The Gridmaster award is the satellite operator's equivalent to the ARRL Fred Fish Memorial Award offered to operators on the 6m band.*

"In the past month, I have made two significant road trips. In mid-May, I made a long drive starting from south of the Phoenix area ending up on the Navajo Nation reservation in northern Arizona. In the process of making that drive, I operated from six different grids – DM32, DM33, DM34, DM44, DM45 and DM46. When I was on the Navajo Nation reservation for grid DM46, I had to wear a mask while standing next to my car and working satellites – the COVID requirements were still in effect up there at that time [**Fig. 3**].

*On my way home, I parked east of Grand Canyon National Park and worked a western AO-27 pass, making a D-STAR contact with **Endaf N6UTC** from grid DM45 as the last bit of daylight disappeared.*

"On 5 June, I set out for eastern Arizona, looking for the DM54/DM55 grid boundary along the I-40 freeway. I spent most of the day out there, putting two rarely-heard grids on the satellites for operators around North America, and driving a few hundred more miles for some radio fun. At the end of my day at DM54/DM55, I worked N6UTC through AO-27using D-STAR. This followed contacts I made with N6UTC earlier in the day in FM, SSB and packet through the NO-84 digipeater. D-STAR seemed like a great way to wrap up the day".

Here at GW4VXE I've caught the occasional westerly AO-91 pass and have been able to make a few QSOs through the crossband repeater on the ISS.

Thanks to everyone who's written in this month – please keep your news and photos coming! See you next time.

Eric Edwards GW8LJJ
ericgw8ljj@outlook.com

Inductors & Inductance (Part III)

Eric Edwards GW8LJJ completes his overview of inductors.

Last time we looked at a notch filter, which is used to remove unwanted frequencies or bands of frequencies. In this, the final part of *Inductance and Inductors*, we will look at the other types of filters used for RF (Radio Frequencies). These are BPF (Band Pass Filter), LPF (Low Pass filter) and HPF (High Pass Filter). In the diagram, **Fig. 1**, showing the four different types of filters the vertical axis represents the amplitude of the signal and the top is usually labelled as 0dB, which means no attenuation. The amplitude level drops as the line drops to the bottom and this is marked in negative dB (–dB) to show the amount of attenuation (signal level drop). The horizontal axis shows the frequency increase from left to right. The filter 'cut-off' (reduced output at unwanted frequencies) amplitudes are measured at the –3dB points, in other words, it is when the signal drops to half, so it is better to have the –3dB point before the first harmonic.

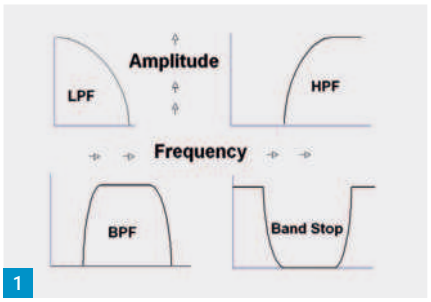
The LPF shows it passing signals at the top (start) of the vertical axis, which will be 0dB and as the frequency increases (travels along the horizontal axis) the signal starts to drop in amplitude. Where this is at the –3dB point, it is considered end of the wanted frequency. The HPF does the opposite so it has no output until it reaches the wanted frequency, so removing any unwanted frequencies below it. The BPF is a combination of HPF (at the start) and LPF at the end so only allowing a band of frequencies to pass. The Band Stop (notch filter) is the exact opposite in operation to the BPF. It stops any signals within a given bandwidth to pass. It notches them out.

In all radio circuit designs there are filters. It could be said that radio receivers and transmitters are collections of filters and amplifiers. The simplest of receivers, the 'crystal' set, uses a filter to tune in the wanted stations and normally uses a 'rejector' tuned circuit that removes, or attenuates other signals.

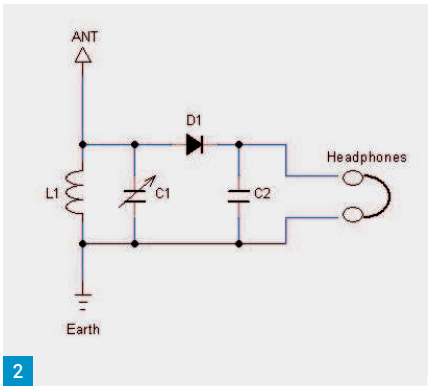
This type of receiver has no amplifiers, of course, and relies on a good rejector filter for its selectivity. It is all to do with 'resonance'.

Resonance

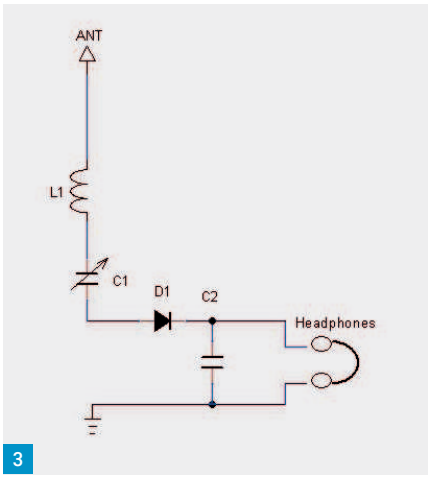
A tuned circuit is said to be resonant when it is sensitive to a particular frequency, and insensitive to all others. To explain further, in earlier parts of this series we learned that a coil (inductance) has opposition to changes of current, which is called inductive reactance. As the frequency increases so does the inductive reactance whereas a capacitor has a resistance to voltage, called capacitive reactance, which gets smaller with an increase



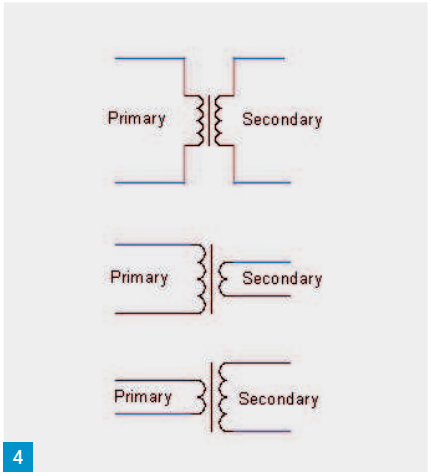
1



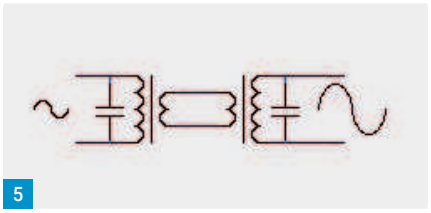
2



3



4


5

in frequency. Because the inductor has a resistance to AC (RF) current, the current lags behind the alternating voltage. The capacitor does the opposite, so that the current leads the voltage. The inductor and capacitor are opposite each other in that respect. The combined effect of inductive and capacitive reactances is known as impedance and, at resonance, the impedance is (close to) zero at the resonant frequency.

Rejector Tuned Circuits

The rejector tuned circuit is a capacitor in parallel with a coil. The values of both are set to allow all signals except the wanted signal to pass through. **Fig. 2** shows a rejector circuit used in a basic crystal set. L1 is the inductor and C1 the capacitor, which is variable to select the required stations. This 'tuned circuit' works by allowing all unwanted signals to pass through to the ground (earth) connection and allowing the wanted signals to reach the diode (detector). The wanted frequencies are allowed to bypass the tuned circuit because it is at high impedance when at resonance. In this case, resonance is achieved when the inductive reactance and the capacitive reactance are the same and this provides high impedance (resistance) to the wanted frequency so it does not flow through the coil to ground. The tuned circuit is a rejector circuit as it rejects all unwanted frequencies getting to the diode.

The rejector, or parallel, circuit has current flowing in the inductor and capacitor but they

are out of phase with each other because the current in the inductor lags behind the current into the capacitor. The current (RF signal) will flow into the capacitor plates and charge it. When it is fully charged and cannot receive any more voltage, it discharges through the inductor and will now charge the capacitor by the current flowing into the other plate of the capacitor, which will be in the opposite direction.

This charging and discharging will be at the rate of the incoming frequency and will continually charge and discharge in this resonant circuit building up a high oscillating voltage. This creates very high impedance at the resonant frequency.

Acceptor Tuned Circuit

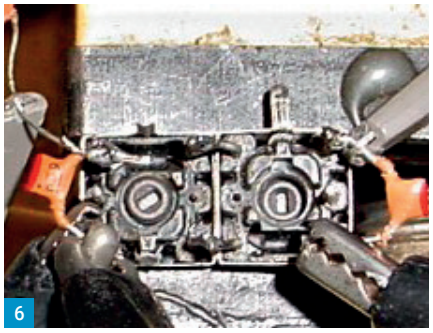
An example of an acceptor tuned circuit can be seen in **Fig. 3**. It is sometimes called a series resonator as the inductor and capacitor are in series. As the impedance of the inductor rises with frequency and the capacitor decreases with frequency there is a point where the two are equal and cancel out each other. The impedance at the resonant frequency is therefore zero and the required frequency, which is therefore allowed to pass through. It will have high impedance at all other frequencies. This is the opposite effect to the rejector tuned circuit.

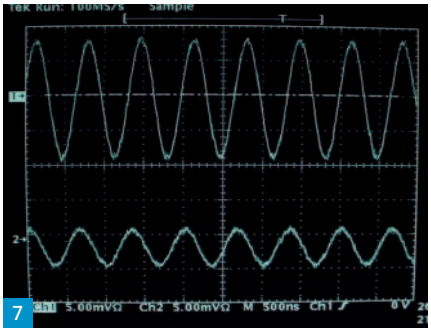
Mutual Inductance

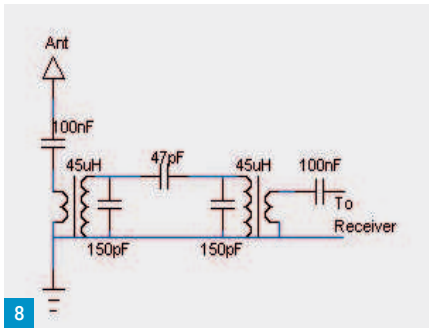
When two coils are in close proximity to each other, an EMF (Electro Motive Force) in one coil creates an EMF in another closely coupled coil such as in a transformer.

From *Wikipedia*, the free encyclopaedia: ***Electromagnetic*** *or* ***magnetic induction*** *is the production of an electromotive force across an electrical conductor in a changing magnetic field.* ***Michael Faraday*** *is generally credited with the discovery of induction in 1831, and* ***James Clerk Maxwell*** *mathematically described it as Faraday's law of induction.* ***Lenz's*** *law describes the direction of the induced field. Faraday's law was later generalised to become the Maxwell–Faraday equation, one of the four Maxwell equations in his theory of electromagnetism. Electromagnetic induction has found many applications, including electrical components such as inductors and transformers, and devices such as electric motors and generators.*

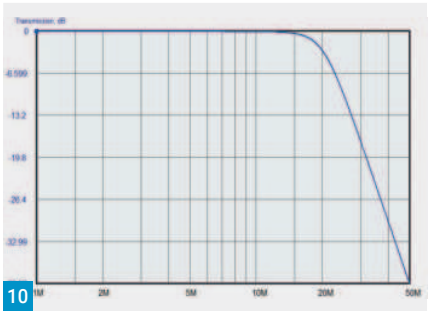
In a mains transformer the primary has the household mains connected to it and the secondary produces a voltage appropriate to the ratio of the two windings. In other words, if the secondary winding is smaller in the number of turns relative to the primary winding, the output will be a smaller voltage than the input. A typical transformer with a lower secondary winding is used in a low voltage power supply. Similarly, if the secondary windings have more turns than the primary windings, the voltage across the secondary windings will be greater and this can be used to step up the voltage from say, 110V to 240V. **Fig. 4** shows three transformers with different primary-to-secondary winding ratios. One with equal windings on both primary and secondary is a 1:1 ratio and will produce the same voltage at the secondary windings as placed in the primary windings. This type is usually called an isolation transformer and is used, for example, to isolate the household mains from the mains earth. The neutral power line coming into the building is linked to the earth so without isolation there is not only a high voltage potential across the live to neutral but also a high voltage between live and the earth connection. The isolation transformer removes (isolates) the earth connection. There is a high (mains) voltage across the secondary winding but not from any of them to an earth point. There are two other transformers in Fig. 3 with one that has a smaller number of turns on the secondary and a third showing a larger secondary winding. This is a step-up transformer where a larger voltage is taken from the secondary compared to the voltage at the primary. A typical type will be used where a high voltage power supply is needed for valve power amplifiers, with its output being many hundreds or even thousands of volts.

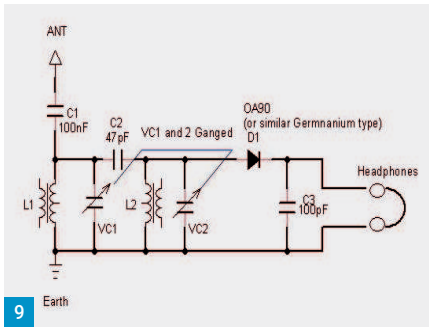

6


7

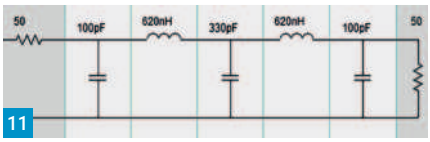


8


10



9

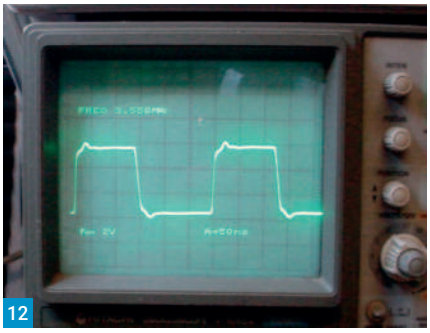


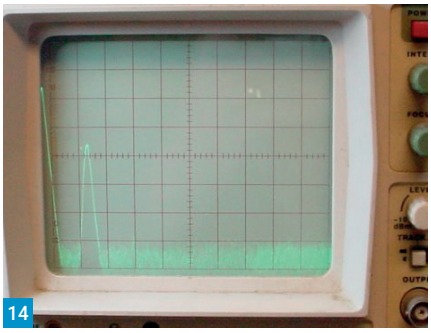
11

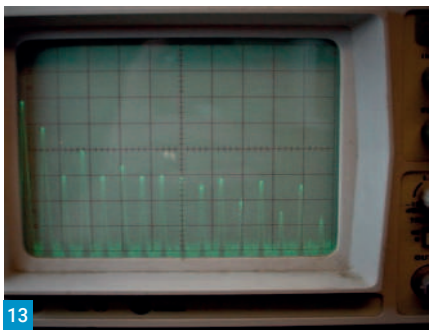
Fig. 1: Characteristics of the main filter types. Fig. 2: Rejector circuit.Fig. 3: Acceptor circuit. Fig. 4: Transformers with different turns ratios. Fig. 5: Back-to-back transformers. Fig. 6: The experimental setup.

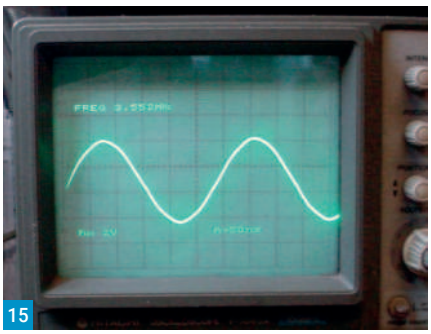
Radio Transformers

In **Fig. 5** there are two transformers connected 'back-to-back' – the secondary of each transformer is connected to the other. The primary of the left-hand transformer has a signal connected and the right-hand transformer has the same frequency signal but much larger. This is taking advantage of the principles of mutual inductance and the rejector tuned circuits. **Fig. 6** is the actual setup used. In this example, the transformers are 45µH types and the capacitors are 39pF each. The input is taken from a signal generator with a scope lead connected on channel two of a scope and tuned to 1.5MHz. The output from the second transformer has a scope lead connected to channel one on the scope. The transformer cores are adjusted (peaked) for


12


14


13


15

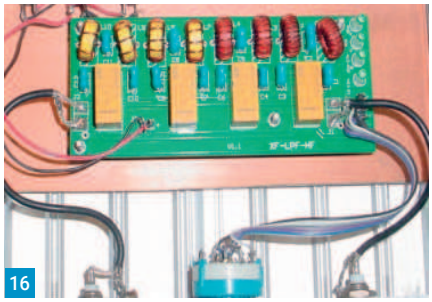

16

Fig. 7: Output waveform greater than input waveform. Fig. 8: Typical receiver front-end. Fig. 9: Crystal set circuit. Fig. 10: Characteristic of LPF for the 20m band. Fig. 11: Circuit for 20m LPF. Fig. 12: A square wave at 3.55MHz. Fig. 13: The harmonics of the 3.55MHz square wave. Fig. 14: The output after passing through the LPF – a single signal. Fig. 15: The output now becomes a clean sinewave. Fig. 16: homebrew multiband LPF.

maximum output from the right-hand transformer. Mutual inductance takes place as in normal transformer action and the transformers are rejector circuits so that the output is greater in amplitude than the input for the reasons explained in the rejector paragraph. **Fig. 7** shows the two waveforms. Both the 'Y' amplitudes are set at 5mV per division. The input signal is 5mV and the output is almost 20mV so a large difference in levels with no amplifiers other than the 'passive' transformer tuned circuits. Both 'Y' inputs on the scope are set to 1MΩ impedance. Normally when transformers are used as input from the antenna to the receiver, the antenna is connected to the lower windings and the higher windings are 'tuned' to the required frequency by making the coil high resistance (impedance) to the wanted signal to flow to ground. Two transformers (or more) are used for what is referred to as a bandpass filter (BPF).

Bandpass Filter

Bandpass filters are used in various places in receivers and transmitters to reject unwanted frequencies. A typical place is at the antenna input of a receiver to select particular bands of frequencies. Usually, a pair is used for each band, either with fixed tuning or variable tuning of the larger windings. The smaller windings for the receiver 'front end' are more suited for a 50Ω input and outputs, **Fig. 8**. A pair of 45µH transformers (TOKO KANK 3333 equivalent) is used, with a parallel 150pF capacitor across each coil and a coupling capacitor 47pF between the coils for the 160m band. It is broad-banded to fully cover the band. The parallel capacitors (150pF) can be replaced with a twin-gang variable capacitor to enable peaking on any part of the band. This is particularly useful when using a BPF as the input to 40m or a higher band, to make the receiver more sensitive in any one part of the band and for attenuating interfering near signals. A 160m AM (Amplitude Modulation) monitor 'crystal set' can be made easily using a pair of 45µH transformers and a twin variable capacitor. **Fig. 9** shows a circuit using two of the transformers and a ganged capacitor. The receiver antenna is connected to the higher winding via C1, 100nF capacitor. The ganged capacitor can be any that is to hand. The larger the value, the wider the band coverage and a 500pF for VC1 and VC2 will cover from 1MHz to 2.5MHz so will cover the medium wave (MW) band as well as 160m. Using smaller capacity gangs (VC1 and VC2 at 300pF) will reduce the total bandspread and lower values (say 150pF each gang) will reduce it even more, perhaps choosing values to tune only Topband or maybe just for MW coverage. The diode (detector) can be any Germanium type – an OA90 or OA81 work very well.

Diode Conduction

You will have been taught (or told) that a Germanium diode conducts when the 'barrier' voltage is greater than 200mV (0.2V). If that were strictly correct, the crystal set would not work. The diode conducts at much lower applied voltage with very low current but will not pass higher levels of current until the barrier voltage has been reached. What this means is that if the diode is connected to a load so that higher than very low off-air signal level current can pass through, then the barrier voltage theory applies. However, if the load is very light (tens of kΩ) there will be very low current allowed to pass through (Ohms Law). This is the reason for using high impedance headphones at the output of diode. If lower resistance headphones (3Ω, 16Ω, 30Ω etc) were used, current will not flow so no signals will be received. If high impedance headphones are not available, the output of the diode can be connected to an amplifier via a 100nF (not critical value) capacitor and signals can then be heard.

Lowpass Filter

Lowpass Filters are used for stopping or greatly attenuating signals above a certain frequency. They allow low frequency signals to pass but not higher frequencies. Low frequency in this context can be RF frequencies and not just audio. It refers to 'lower' frequencies to pass and limiting the flow of higher frequencies. A typical example of an LPF is at the output of a transmitter to help prevent out of band radiation. **Fig. 10** is displaying a 14MHz (20m band) LPF with a dB (decibel) level scale on the left-hand side. At the top of the graph it can be seen that the line is at 0dB and the line curves downwards to show the attenuation in dBs. At 20MHz it is −3dB (between 0dB and −6.599dB), so all frequencies above 14MHz are attenuated with 50MHz being at approximately −40dB. The circuit for this filter is at **Fig. 11** and is comprised of 'standard' inductors and capacitors. The impedance from the transmitter's antenna output is 50Ω, so a resistor of that value is represented in the design at the input to the filter along with a representing terminating resistor at the output. In both cases the resistors are

not there physically as they are the impedances of the antenna terminal of the transmitter and the antenna. The capacitors (100pF) at both ends are the same values along with the inductors (620nH = 0.62µH), which means the filter can be used either way round. The filter was designed with ELSIE (see Ref) and it was designed to use 'standard' capacitor and inductor values. Another typical use for an LPF is to change square waves to sinewaves.

Square Waves

Square waves can be useful in RF circuits for providing signals on amateur bands that are harmonically related, for example the harmonics of 1.8MHz are 3.6MHz, 7.2MHz, 14.4MHz and 28.8MHz. These are called even harmonics as they are 'even' multiples of the fundamental signal.

Of course, each harmonic will be weaker than the original but they are still useful for checking other bands on a receiver. Harmonics are also used in frequency multiplier circuits where the fundamental is changed to a second, third or higher harmonic to produce a higher band. The others, including the fundamental frequency, are naturally filtered out by the 'tuned' multiplier circuit. Third (odd) harmonics are three times the fundamental and their multiples. There are many harmonics and they are created by saturation of an oscillator circuit. The transistor or other 'active' device is switched hard-on (saturated) and fully-off (cut-off), which produces on-off pulses that are square in shape as seen on a scope. The transistor is turned on and after a very short duration is switched off again depending on the frequency of the oscillator, and thus produces the square wave.

Square to Sine

There will be a need to remove the harmonics when a clean signal is required as in a signal generator or VFO (Variable Frequency Oscillator) because it can otherwise cause spurious (emissions) signals that are not wanted and undesirable. This is where the LPF comes into use again as it can remove frequencies above the wanted one. The square waves contain lots of frequencies above the fundamental as explained earlier, so the LPF can be used to remove those not wanted. The LPF is designed to 'cut off' before the start of the first harmonic (even). **Fig. 12** shows a square wave with its fundamental frequency as 3.550MHz but as it is square it will have multiple other frequencies. This can be seen at **Fig. 13** on a spectrum analyser, where many harmonics can be clearly seen. Putting this signal through a LPF designed to cut off before the first harmonic, the result at the output can be seen at **Fig. 14** (spectrum analyser) and a clean sinewave can be seen on the scope at **Fig. 15**. A suitable multiband LPF for the HF amateur bands is shown at **Fig. 16** and is used at the output of a transmitter. Commercially built transceivers will have all the BPFs and LPFs built-in but home-brewed transmitters must have an LPF for each band used to avoid out of band radiation.

Highpass Filter

Highpass filters are used where there is a need to remove frequencies below the wanted one. In older 'vinyl' record players, they were commonly used to remove low frequency 'rumble' usually picked up from the turntable.

The 'scratch' filter was an LPF to remove high frequency noises collected from the scratches on the records. Direct conversion receivers are susceptible to picking up local mains hum and other low frequency noises, so one is placed at the front end (antenna input) of the receiver.

Reference

ELSIE the filter design program. Tonne Software.

Daimon Tilley G4USI
practicalwireless@warnersgroup.co.uk

1

Amateur Radio on a Budget (Part IV)

Daimon Tilley G4USI takes a canter around the various HF transceivers available at budget prices.

In many senses I think this particular instalment is going to be the hardest to write and do justice. Why do I say that? Well, because there is a truly enormous range of new and used equipment in this sector. So, in deciding how best to construct this article I returned to the notion of 'on a budget.' This term is clearly very open to personal circumstance – we all have varying budgets. What might seem like an expensive purchase to one of us, might actually be a frugal purchase from the point of view of the purchaser.

I decided to deal with this dilemma by setting myself a price limit for this article. I intend to look at new and used options, starting from as low as £40 up to £1,000, and I will divide the article into new and used rigs in those price ranges. I know that for many people £1,000 is an awful lot of money, so I have only included a small selection near that budget point (actually there is not much available) with the majority of the options we will look at coming in at, or below, £500.

Now, I am sure some of you are already wondering how you can possibly get on HF effectively at the lower end of this budget but, believe me, it can be done, and done well. Indeed, for £40 I will get you on the air on a single band with a superb kit, and for just over £100, I will get you on the air with a multi-mode rig that will cover 80 through to 10 metres, effectively, without lifting a soldering iron! Interested? Read on.

The first thing I will say here is that if you ever needed a reason to learn CW, then getting on HF on a budget is absolutely one of the top reasons. The simplicity of design and construction of CW rigs compared to SSB means that there are many kits available to build that are excellent performers and will bring you hundreds of contacts simply and cheaply. But, if your fingers will never touch a key, don't worry, there are still plenty of options.

So, to quote Lewis Carroll, I will adopt the King's advice from Alice in Wonderland: *"Begin at the beginning, and go on till you come to the end: then stop."*

New Equipment - not Kits

Not everyone is willing to wield a soldering iron in anger. So, what is available as an off-the-shelf, brand new package?

£800 - £1000

The choice here is a little limited. Right on the edge of £1,000, depending on the retailer, then the excellent Icom IC-7100 is available as a true shack-in-a box HF, VHF and UHF transceiver. Moonraker currently seem to be the cheapest for this rig at £999.95, although at the time of writing they were out of stock. This is a lot of rig for the money, and if I was looking to spend £1,000 this would probably be my choice, with the bonus of VHF and UHF into the bargain.

Below that, there are a few options I have researched. If you want a traditional rig from one of the 'big three' manufacturers, then the Kenwood TS-480SAT has to be high on the list at a shade over £800. Covering the HF bands and 6 metres, with a built in ATU, the rig is ideal as a base station or mobile piece of equipment with its removable head unit.

Perhaps you might like to try SDR functionality. The Elad FDM-Duo is a quality SDR transceiver covering HF and 6 metres. This is a QRP rig though, emitting just 5W, but has the versatility of being able to be used as a standalone rig, with its own control panel, or being operated through your computer to make best use of its SDR features. The current price is approximately £974, but if you want more than 5W, you need to factor in at least another £500 for a 100W amplifier.

Sticking with the QRP theme, the excellent Elecraft KX2 portable transceiver is available for £950, giving 10W out on the nine HF bands. Be aware, though, that this is for the basic rig and the cost of extras is high. It is an extra £80 for the microphone, £75 for the internal battery, £40 for the charger and £240 for the internal ATU. If you wanted one with all these goodies you are well over the £1k budget at more than £1,400.

It is interesting to note that Yaesu does not currently have an offering in this price range.

£500 - £800

In this price band, only Yaesu from the 'Big Three' has a presence. Until very recently, the FT-450 fitted in here as a good base station option, but this has recently been discontinued.

Yaesu have two offerings in this price point. First, the FT-891, a very compact HF and 50MHz offering that covers HF and 6m at a full 100W. When I first returned to the hobby, this is the rig I purchased, and I have to say it is a very good option at

Photo 1: The Icom IC-7100.
Photo 2: The QRP Labs QCX+ CW transceiver.

2

this price. I used mine for about two years before selling it on. I found its features to be good, with very good DSP (digital signal processing) functionality and I made a great many contacts on it with SSB, CW and digital modes. I confess that I did find it a bit tricky to get all the menu settings right to make digital modes work correctly, but once this was done, no further adjustment was required.

In my experience, if you don't mind menu-driven rigs, this would be an excellent choice. My main reason for sale was that I found the lack of knobs and buttons a bit frustrating. I found that when I wanted to change bands I mis-pressed the button and changed modes instead, or vice versa, but that was just a personal thing.

Also in this price range is the venerable Yaesu FT-818ND. This rig covers HF, VHF and UHF in a tiny box, which even has space for internal batteries. The rig has a huge following and has been around in various forms for many, many years. If you want a small and compact rig that can 'do it all', then this could be for you. Given its size, you will need to have decent eyesight to use it and be dextrous around the tiny buttons. The main downside from my point of view was the lack of DSP and 500Hz CW filtering. If you want narrow CW filtering, you have to pay about another £120 for a Collins mechanical filter. I reviewed this rig in detail in the December 2019 edition if you wish more information, and the current price is about £600.

At £650, the Ailunce HS2 transceiver is available. An SDR transceiver, this rig gives transceive from 160m to 70cm, and receive from 300kHz to 1.6GHz. Impressively it can operate from 5V to 32V DC and boasts built-in Bluetooth, ATU and USB sound card. Power output is claimed at up to 20W on HF and 6m, reducing to 5W at V/UHF. However, one review on the Moonraker website, claims power was below 9W on HF. It sounds as though it has a lot going for it but, on looking at the manual and pictures, the biggest potential downside is the lack of a VFO knob! Frequency changes seem to be either by direct frequency input using the keypad, or by using a left or right arrow button to tune. This could be really inconvenient unless you are controlling the rig from a computer. There is a mobile phone app for remote control available.

The Lab599 Discovery TX-500 will be available from pileupdx.com later this summer. It is a wonderful looking and very robust QRP rig that has just been CE approved. Reviews from those parts of the world who already have the rig are very impressive and this could be well worth a look if you want a robust portable QRP rig. The anticipated cost of £800, though, probably plus import duties, make this quite an expensive choice.

pileupdx.com

Under £500

There are still some good options for a fully featured HF transceiver below £500, although they are typically QRP options. So, what is available?

Well, in this portion of the market there are some very good Chinese offerings, particularly from Xiegu, who have three great choices in the market.

First is a rig I own myself. The Xiegu X5105, at just under £500, is a compact 5W portable transceiver with a lot going for it. Covering HF and 6m, the rig boasts an internal battery and an internal ATU that will literally tune just about anything. It also has a good SWR scanning feature, which you can use as a mini-VNA (antenna analyser.) With the latest firmware, this a very robust and reliable rig, which I enjoy using as a portable station. It has travelled Europe with me and is very easy to use. I recommend it.

Also from Xiegu is the G90. This is amazing value at £390 and is an SDR transceiver giving 20W on all HF bands (no 6m coverage). With a bright but small TFT screen the rig provides a spectrum display and also has an excellent built-in ATU. The rig looks a little utilitarian but has a detachable front panel. Reports from others in the various online Xiegu communities have been excellent, with many finding that 20W is perfectly adequate for plenty of good contacts and makes life a little easier than with 5W. The only issue to be aware of really is that for digital modes, many find that some extra cooling is required. After-market stands with cooling are available, but a simple PC fan is all that is required if wanting to use digital modes at full power.

The final offering from Xiegu is the G1M. A tiny all-mode SDR QRP transceiver operating on the 80, 40, 20 and 15m bands at 5W, but still boasting twin VFOs, built-in keyer and general coverage receive and at a tiny £240 price brand new!

These Xiegu rigs are available from a number of places, including online auction sites, etc. However, my personal recommendation would be to buy from the UK importer, Sinotel UK, as their customer service is regarded as first-class by the Xiegu community.

I am delighted to say that Sinotel recently agreed to send me the G1M and G90 for testing and review. They arrived just as I was concluding this article, but early results are very encouraging and I will be writing a review of the Xiegu stable for this magazine very soon.

At this point it is worth mentioning the Minion SDR transceiver. This ten-band QRP multi-mode SDR rig has quite good reviews and is available from www.qrpver.com in the Ukraine for £275 fully built and ready to use. The company also has some other HF offerings too.

www.qrpver.com

If you don't mind being limited to 10m on HF (conditions are picking-up!) then there are quite a few 10m multi-mode rigs

Photo 3: The Yaesu FT-891.
Photo 4: The Xiegu G90.

available for around £150 - £200. Offerings from Anytone (AT-5555N) and Alinco (DX-10) are just two. I have no experience of these rigs, but I suspect they are derived from CB transceivers, and the DX-10, for example, also has a CB channelised display.

My final offering in this category, although there are some other options, would be a fully assembled and tested single-band QRP transceiver from the excellent QRP-Labs.com. I have reviewed both the QCX and the QCX Mini kits in this magazine (Oct and November 2019, and May 2021) but these rigs can be brought fully assembled if you wish, for £70. You really won't find a better single band CW transceiver at this price, in my view.

www.qrp-labs.com

New Equipment, Kits, all under £150

A kit usually requires you to add and solder some or all of the components to the board, but there is one exception that I know of, and that is the uBitx from HFSignals.com in India. I reviewed version 3 of the uBitx in my articles in August and September 2019, when I built it into a 'go-box.' The rig is now at version 6 with a number of improvements. The biggest selling point here, is for those who don't have the confidence to build a kit. No soldering is required. You just plug the cables together onto the finished board and the only tool you need to use is a screwdriver!

HFSignals.com

The basic kit is £112 but does not include the enclosure, speaker and a few other bits that you probably already have lying around. The full kit is £148 and comes with everything you need for the finished rig. Power output varies a little by band but it provides up to 10W out on all HF bands from 80 through 10m, with general coverage receive, dual VFOs, SSB and CW modes with built in CW keyer, touchscreen, and it is good on digital modes too. Being an open-source project, there is a large maker community and many mods to improve an already good rig are available.

Revisiting the QCX Plus and QCX Mini from QRP labs, these can both be purchased as kits for £39 and you can add the optional enclosures for another £17 for the Plus and £14 for the Mini. I promise you that you would be amazed by these rigs. In my first review of the original QCX rig for 40m, after build, I switched on

3

4

and worked 13 countries in 30 minutes in a contest! In terms of construction, I recommend the QCX Plus for beginners as it is mainly through-hole components and there is plenty of space on the board to work. The QCX Mini, while having many SMD parts already fitted, is a much more fiddly build and I managed to blow my second one up in smoke when fitting it into the tiny enclosure, as tolerances between components and the boards and case are minimal. I don't say that to put you off the Mini, just to be aware of it, if you are new to construction.

There are plenty of other CW-only transceiver kits available and here are a few websites for you to consider to widen your choice:

www.qrphamradiokits.com

are based in Spain and provide a number of good quality single and multi-band kits both for CW and SSB at good prices.

www.qrpkits.com

are another US supplier of amateur radio kits and accessories.

And finally in this section, there are some single-band digital transceivers available for FT8 and the like. The website qrpguys.com in the US provides an 'AFP-FSK Digital Transceiver III kit'. This kit, for $80, allows 5W of digital modes on any band from 160m to 10m by means of plug-in modules (one per band). It is supplied with band module kits for 40, 30 and 20m as standard and you can buy PCBs for another four bands for an additional $10. This kit is interesting in that it uses SSB, whereas a number of other digital-only kits use DSB. QRPGuys have a good reputation for quality, but shipping can apparently be quite slow as it is very much a part-time business.

qrpguys.com

Other examples of this genre are the Phaser, a US kit from midnightdesignsolutions.com, and the FT8 transceiver from www.qrvtronics.com at just $45.

midnightdesignsolutions.com
www.qrvtronics.com

I should say at this point, that while there are many excellent value kits in the US, you need to be mindful of shipping costs and any import duties, which can significantly increase costs.

The Used Equipment Market

Well, there is a complete myriad of choice here, from all of the 'big three' manufacturers, depending on how far back in their line-up you are prepared to go. First, let's look at some of the issues you might want to consider when buying a used HF rig.

Reviews

The bonus of buying a used rig, apart from reduced cost, is that it is very likely that there will be a preponderance of reviews available to help you make your choice. For this purpose I find the 'reviews' section of the eHam.net website to be a complete treasure trove of user information and views. I refer to it more often than many other sites if I am looking to consider a used rig. There is hardly a model in existence that will not have at least some user reviews on this site. Users can rate their experiences up to 5 stars and write detailed descriptions about their use of the rig. My advice is don't buy a used rig without first looking at the reviews on this site!

eHam.net

Facilities

The further back in time you go, the fewer 'bells and whistles' will be available. For example, do you want DSP facilities, CW keyers, twin VFOs, etc. Is an internal ATU important? Do you want an internal PSU, digital display, and so on? Once again eHam reviews are your friend here, but also a number of manufacturers do keep data on discontinued models (at least recent ones) on their websites. Another useful reference when assessing a used rig is the rigpix website (below). Here will find pictures of the rig, some basic specifications and sometimes a link to the manual.

www.rigpix.com

Spare Parts/Reliability

The older a rig gets, then the more likely it is to need attention at some point in its life, but it does not necessarily follow that it will need it in your ownership, or indeed at all. Again, internet resources will give you a sense for the longevity and servicing needs of older rigs. A more recent issue has been the discontinuing of modern transceivers because the manufacturers themselves are no longer able to source the parts needed to build them – the Yaesu FT-450D is an example. This is a risk for you the purchaser of course. What if you have a part failure and cannot source a replacement? That is a risk, of course, but you need to assess how likely it is, with many transceivers giving decades of service without a single issue. Nonetheless, you should consider that if it breaks, can you, or someone else, fix it?

Honesty and Integrity

It is a sad fact that not all sellers are honest, and there are reports of a number of scams where people have purported to be genuine amateurs selling gear that does not exist! Caveat emptor. A little due diligence can help here, though, and there are simple steps you can take to protect yourself. If buying second-hand, I always try to engage the seller in a conversation, electronic or otherwise, to help assess their bona fides, ask for their callsign, etc. You also need to be aware of the risk of sellers being a little economical with the truth and not identifying known faults. Ask lots of questions and see where the conversation leads you. On this issue, my advice is never to pay by PayPal Friends and Family. Using this service is a popular request with sellers, to prevent them having to pay a 2.5% service charge on the sale price. Whenever I see this, I always offer to pay the asking price (or price agreed) plus 2.5%. This way, the seller is not out of pocket, and I can pay using PayPal Goods and Services, which gives me some consumer protection.

Where to Source the Equipment

The options are many and varied. Obviously, there are the well-known auction sites, the magazines, including *PW*, and sales by word of mouth, from other club members, etc. There are also some retailers who specialise in used equipment and who usually have an online presence, as well as the main retailers who often have used equipment advertised. Buying from these sources can give you a little more peace of mind, but ensure you are clear about warranties, service facilities and so on.

On the subject of warranties, just beware adverts that say *"...there are still 'x' months of manufacturer's warranty remaining."* I know for sure, for example, that Yaesu warranties only apply to the first owner and are not transferable. Other manufacturers will have their own policies and you should check that out.

I have had quite a lot of success buying from Facebook groups. There are a number of Facebook UK amateur radio groups for buying and selling gear. Again, beware the scammer, but I have made several successful purchases this way.

So, having considered all of those issues, and having decided to go ahead and buy a used HF rig, what is available? For this final part of the article, some two months ago I decided to keep a note of all HF rigs that I saw for sale used at under £500 and to list them by price here. I do not intend to go into any details about each of the rigs, as they are too numerous, but instead I refer readers to the resources I have already listed. So, buckle up, here is a trip down memory lane!

Under £300

- **Yaesu FT-101ZD** between £225 and £295
- **Kenwood TS-440S** between £270 and £295
- **Yaesu FT-747GX** £295
- **Yaesu FT-757GX** £250
- **Kenwood TS-430S** between £255 and £285
- **Yaesu FT-817/818** between £250 and £385
- **Icom IC-737A** £300
- **Yaesu FT-301D** £250
- **Icom IC-706** £295
- **Alinco DX-70** £295
- **Kenwood TS-520S** £180 (my first rig!)

Between £300 and £500

- **Kenwood TS-50** between £325 and £485
- **Icom IC-718** £400
- **Yaesu FT-77 and PSU** £350
- **Kenwood TS-530S** £350
- **Kenwood TS-450S** £425
- **Yaesu FT-767GX** £375
- **Kenwood TS-940S** £425
- **Kenwood TS-680S** £350 to £375
- **Yaesu FT-920** £450
- **Yaesu FT-450** (recently discontinued) – £400 to £500
- **Yaesu FT-900** £500
- **Kenwood TS-850S** £380
- **Kenwood TS-830S** £395
- **Kenwood TS-570D** £450
- **Icom IC-7400** £500

To Conclude

So, to conclude this instalment of the series, I hope I have demonstrated that the HF bands are for everyone, regardless of budget. There really is something for everyone. The quality and capability of modern kits is excellent, but for those not confident in building, you can buy ready-assembled kits, or simply plug together the uBitx, or buy used commercial gear. I hope you have found this article informative and I hope to see you on the bands. In the next instalment of the series we will be taking a look at budget HF antennas.

Rallies & Events

Due to the Coronavirus situation, the Rallies calendar remains dynamic at the moment, and there will be more cancellations and postponements. All information published here reflects the situation up to and including 10th Juneww 2021. Readers are advised to check carefully with the organisers of any rally or event, before setting out for a visit. The Radio Enthusiast website will have updates, please check here regularly: www.radioenthusiast.co.uk To get your rally or event onto this list, please, e-mail full details as early as possible, to: wiessala@hotmail.com

4 July
DARTMOOR RADIO RALLY (NEW VENUE): The Yelverton War Memorial Hall, Meavy Lane, Yelverton, Devon PL20 6AL. Open 10 am. Admission: £2,50. (FP | TS | BB | R)
Roger: Tel: 07854 088 882
https://tinyurl.com/5hvrts7
2e0rph@gmail.com

11 July
EAST SUFFOLK WIRELESS REVIVAL (FDARS IPSWICH RALLY): Kirton Recreation Ground, Back Road, Kirton IP10 0PW (just off the A14). Opens at 9.30 am. Admission: £2. Trade tables from £ 10. GB4SWR HF Station. (BB | CBS | CR | RSGB | SIG | TS)
Kevin Ayriss, G8MXV
Tel: 07710 046846
www.eswr.org.uk

11 July
MCMICHAEL RADIO RALLY AND CAR BOOT SALE: Reading
CANCELLED
https://mcmichaelrally.radarc.org

25 July
FINNINGLEY ARS CAR BOOT BRING-AND-BUY: Outdoor only. Near J2, M18 Doncaster; starts at 10:00 am.
www.g0ghk.com/cbr21
kevin.g3aaf@gmail.com
martin.m0hom@gmail.com

1 August
WILTSHIRE RADIO AND CAR BOOT SALE: Kington Langley Village Hall and Playing Field, Kington Langley, Wiltshire SN15 5NJ. 9 am to 1 pm. Traders welcome.
Chairman@Chippenhamradio.club

1 August
THE 31ST KLARC GREAT EASTERN RADIO RALLY: Gaywood Community Centre (off Gayton Rd.), King's Lynn PE30 4EL (NGR – TF638 203). 9 am to 3 pm. Admission £3.
Ted G4OZG Tel: 01553 768 701
(Mob: 0794 683 8656)
http://www.klarc.org.uk/Home.php
Rally.klarc@gmail.com

21-22 August
BATC CONVENTION FOR AMATEUR TV 2021: Midland Air Museum, Rowley Road, Coventry CV3 4FR. AGC is Sunday afternoon. Test facilities available for 5.6GHz/Portsdown/Minitiouner/ Ryde/power amplifiers/preamps). (L [streamed])
http://www.midlandairmuseum.co.uk

22 August
GRAND FIELD DAY OUT: Willesborough Windmill, Ashford, just off junction 10 of M20. Gates open from 10 am to 4 pm. Free event. Various bands in operation, portable working at its best. Explore different modes and share tips and ideas.
Natter with friends you have not seen for a while or bring along things to sell from your table or car boot. All interested parties wishing to set up a station, please contact the e-mail below. Set-up is from 9 am, and clear-away from 4-5 pm. To have free access, we need to ensure all food/ drink on site is purchased from the Trust's Cafe/ BBQ. Thank you for your cooperation.
g0gcq@yahoo.co.uk

29 August
TORBAY ANNUAL COMMUNICATIONS FAIR: Newton Abbot Racecourse, Devon TQ12 3AF. 10 am (9 am D). Admission: £2. (BB | CR | FP | RSGB)
Pete: G4VTO Tel: 01803 864 528
Mike: G1TUU Tel: 01803 557 941
rally@tars.org.uk

30 August
HUNTINGDONSHIRE ARS (HARS) ANNUAL BANK HOLIDAY MONDAY RALLY: Ernulf Academy, St Neots PE19 2SH. Open 7 am (traders), 9 am (public). Stalls available. (FP | BB | CR)
Malcolm M0OLG: Tel: 01480 214 282
www.hunts-hams.co.uk
events@hunts-hams.co.uk

4-5 September
GQRP CONVENTION | TELFORD HAMFEST: Harper Adams University Campus TF10 8NB
Martyn G3UKV Tel: 01952 255 416
www.telfordhamfest.org.uk

12 September
CAISTER LIFEBOAT RALLY: Caister Lifeboat Station, Tan Lane, Caister-on-Sea, Norfolk NR30 5DJ. 9.30 am (8 am for sellers); easy parking; access via car park in Beach Road. Raffle. The museum will be open. (CR | TI [22])
Zane M1BFI Tel: 0771 121 4790)

12 September
EXETER RADIO AND ELECTRONICS RALLY: America Hall, De la Rue Way, Pinhoe, Exeter EX4 8PW.
Pete G3ZVI Tel: 07714 198 374
g3zvi@yahoo.co.uk

19 September
CAMBRIDGE REPEATER GROUP RALLY: Foxton Village Hall, Harman Road, Foxton, Cambridge CB22 6RN. Open 9.30 am (7.30 traders). Admission £3. (BB | CR | RSGB)
Lawrence M0LCM Tel: 07994 197 2724
rally2021@cambridgerepeaters.net

26 September
WESTON SUPER MARE RADIO SOCIETY 6TH RADIO & ELECTRONICS RALLY : The Campus Community Centre, Worle, Weston-super-Mare BS24 7DX. Opens 10 am (visitors [D: 9.30]) and 7 am (traders).
Dave G4CXQ Tel: 07871 034 206.
g4cxq@btinternet.com

3 October
THE 48TH WELSH RADIO RALLY: Rougemont School, Llantarnam Hall, Malpas, Newport NP20 6QB. Opens 10.30 am (D: 9.30); Admission: £3. (BB | CR | L | RSGB | TS | SIG)
Tel: 01495 220 455
mw0cvt@sky.com

16 October
ESSEX CW BOOT CAMP: 3rd Witham Scout & Guide HQ, Spring Lodge Community Centre, Powers Hall End, Witham, Essex CM8 2HE. Open 8.30 am (registration). 9 am (public). Finishes at 4.30 pm. Admission £10, with free soup/ drinks/ cakes. (CR | FP)
Andy G0IBN Tel: 0745 342 6087.
g0ibn1@yahoo.com

17 October
HORNSEA AMATEUR RADIO RALLY: Driffield Show Ground, Driffield YO25 3AE. Open 10 am. Admission: £2 (under 14s free). Raffle. (BB | CR | CBS | FP)
Les 2E0LBJ Tel: 01377 252 393
lbjpinkney1@hotmail.com

17 October
HACK GREEN RADIO SURPLUS HANGAR SALE : Hack Green Secret Nuclear Bunker, Nantwich, Cheshire CW5 8AL.
www.facebook.com/HGsecretbunker/

BB Bring & Buy **CBS** Card Boot Sale **CR** Catering / Refreshments **D** Disabled visitors **FP** Free Parking **L** Lectures **RSGB** (RSGB) Book Stall **SIG** Special-Interest Groups **TI** Talk-In (Channel) **TS** Trade Stalls

Roger Cooke G3LDI
roger@g3ldi.co.uk

A Morse Miscellany

Roger Cooke G3LDI brings another miscellany of Morse-related topics.

Phillip Brooks G4NZQ passed away on the morning of 26 May 2021. Philip was a long-standing RSGB volunteer in a wide variety of roles, up to and including the Board.

Phillip was not only an active member of the Society but also of the Norfolk Amateur Radio Club, extending his national society work into being our regional representative and GB2RS newsreader for many years as well as being a keen supporter of club activities, particularly when it came to promoting the hobby to the wider public.

Always a gentleman in all senses of the word, he really will be sadly missed by many, both on the airwaves and at the club.

Phillip was the Morse Proficiency Test Co-ordinator and also my first line of contact in getting the GB2CW pages updated on the RSGB website. He is shown in the picture, **Fig. 1**, at Barford Radio Active on the RSGB Bookstall, a place he occupied most years.

Sending

Self-taught CW operating can be fraught with problems. Again, I use my favourite analogy of learning the piano. A self-taught pianist usually has a selection of problems, ranging from the actual technique of addressing the keyboard, sitting at middle C, keeping the wrists up, fingering exercises, scales (arpeggios), reading music and so on. With CW, the correct technique is difficult to 'assume'. It really should be taught in the first instance. Looking at old films with a supposed CW operator will show exactly what I mean. Some of those shown in the films are terrible!

Fluency is necessary, no matter what speed is being sent. Spaces are as important as the characters themselves. I remember my first encounter with *"NAG here is Sid"*. I thought he must have a horse until I sorted out the bad spacing between M and E. Other examples are SOG for SOME, PLL for WELL and lots of others. Running text together is also very bad, making copying – especially head copy – an imposition for the person receiving. Imagine this: *Iliveinaverypleasantvillagewithlotsofwildlife allaround.*

This is not uncommon to hear on the air, perhaps not quite so exaggerated, but you get the idea! I even had a hard job typing that piece without inserting spaces automatically. Try it yourself and you will see it is not easy. That, coupled with poor character formation as well, can lead to zero QSOs!

However, in our present Covid situation, it is difficult to have face-to-face meetings in which these problems can be addressed.

2

Chatting with **Andy G0IBN** from the Essex CW group about this, he told me they have been conducting classes on Skype. So, this autumn Norfolk ARC are going to start similar classes locally to supervise sending techniques. Details have to be finalised but these classes will commence in October.

That brings me nicely to Bootcamps. Norfolk Bootcamps are traditionally held at my QTH, so I think it will be a while yet before we start them up again. Full Covid precautions are not viable in a bungalow. However, Essex CW Group are starting up again. I received the following from Andy G0IBN:

Essex CW ARC Annual CW Boot Camp

Essex CW are pleased to announce their annual CW Boot Camp will be held in Witham, Essex, on Saturday, 16 October, 2021.

Come along to meet your CW friends face-to-face and enjoy a friendly day of CW activities. Due to its popularity spaces are limited, so if you would like to attend please send an email to:
g0ibn1@yahoo.com

The Essex group hire a village hall for the event so it is easier to maintain the precautions necessary. I don't feel like flinging all my windows open in November! If any other Bootcamps are starting up again, please let me know:
roger@g3ldi.co.uk


1


3

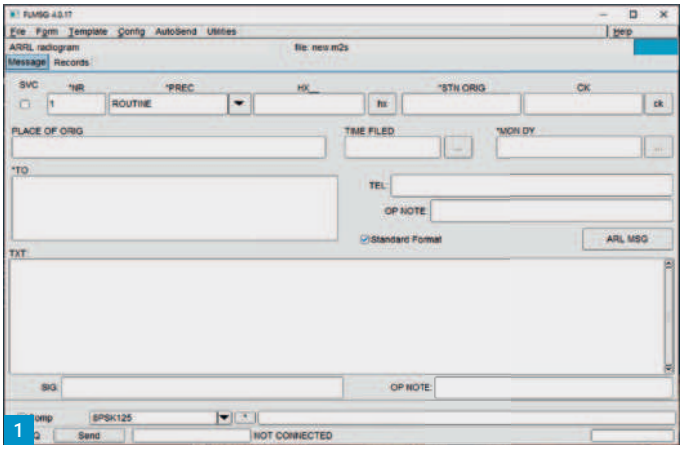
Fig. 1: Phillip G4NZQ (SK). Fig. 2: The underside of the YA1860 key. Fig. 3: Rob M0KCP.

Sending Iambically. Or More of the Big PWord!

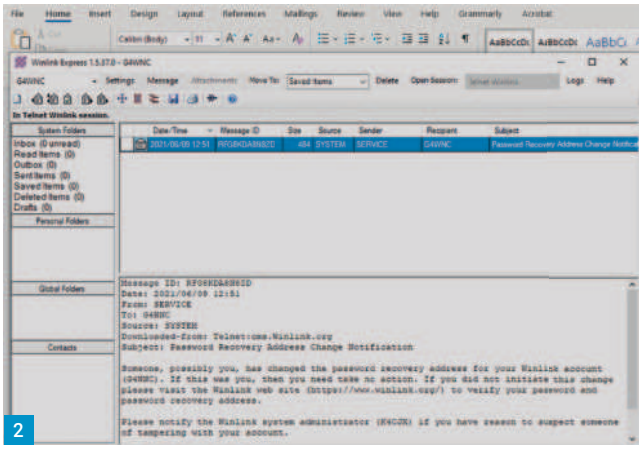
Having used a single lever paddle all my life, after 60+ years it is a bit late to change habits of a lifetime! I did consider it, but I felt that the time saved using squeeze keying and iambic sending was not really worth it. However, for somebody starting out with a dual lever paddle, practising from the start would be good.

Practice slowly, until your wrist and fingers get the habit and you don't have to think about counting dits and dahs but feel the rhythm of each letter and number. Then you can work for speed and don't try to go faster than your fingers are comfortable. Expect progress to be up and down with good days and bad days. Don't be discouraged if you plateau for a while.

Continued on page 58



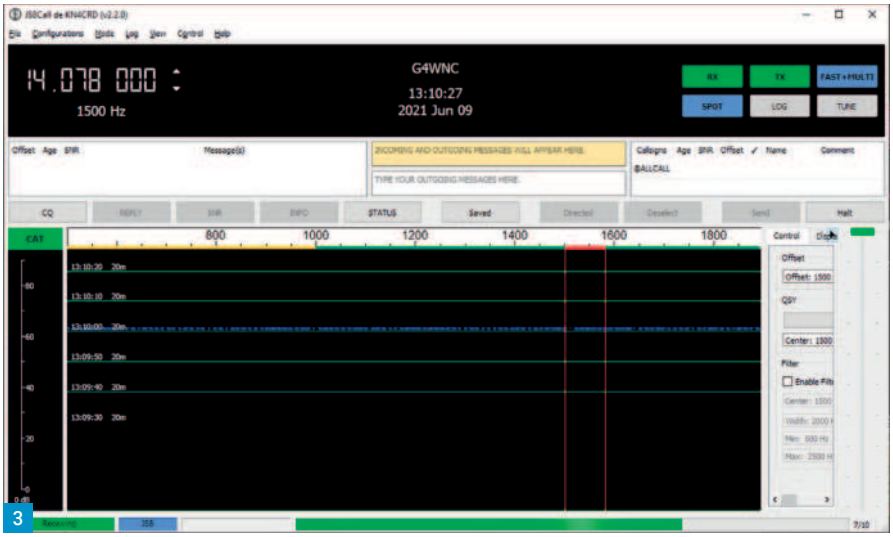
1


2

Start Communicating!

Mike Richards G4WNC reminds us that the hobby provides opportunities for us to self-train, make friends, share knowledge, help in disasters and more.

Mike Richards G4WNC
practicalwireless@warnersgroup.co.uk



3

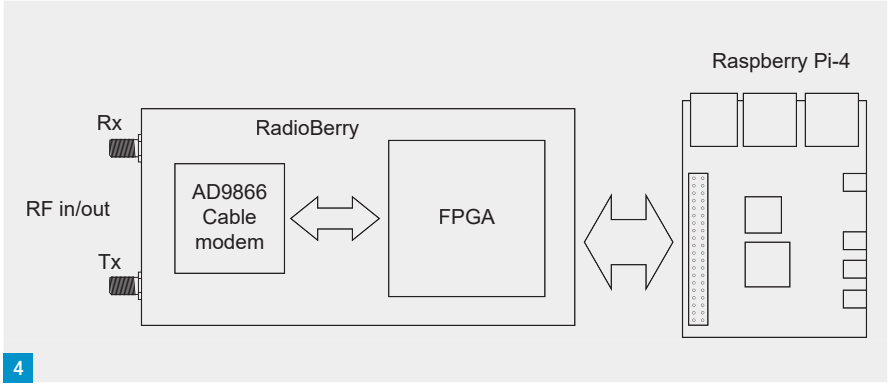
During my recent club talks, there have been several discussions about FT8 and its role in amateur radio. One experienced operator summed it up rather well as *"A great way to fill up your logbook!"* This is not a criticism of **Joe Taylor's** development team or the performance of the mode, it is just a reflection of the way it is used. FT8, like all the WSJT-X modes, is primarily designed to support weak signal operation. In addition, FT8 and FT4 have been further extended to provide improved performance for rare DX stations and contest work. However, when I tune around the HF bands, the FT8 signals are usually the strongest on the band! While the popular FT8, FT4 and WSPR modes provide an excellent indication of the propagation from your station, there is no real communication or knowledge sharing taking place. The net result is that operators are mainly working in isolation. No new friendships are being formed to help us understand and integrate with other cultures or expand our technical knowledge. I recently extracted some QSO data from PSK Reporter and discovered that, out of a sample of nearly 1.3 million contacts, 99.66% were using minimum information systems like FT8. That leaves just 0.34% using open systems such as PSK31, RTTY, etc. I fear that many of those were also rubber-stamp QSOs.

That brings me on to my next point. Although not often required in the UK, one valuable role for amateur radio is to provide communications in times of emergency. In the UK, emergency support is coordinated by the Raynet organisation: **www.raynet-uk-org**

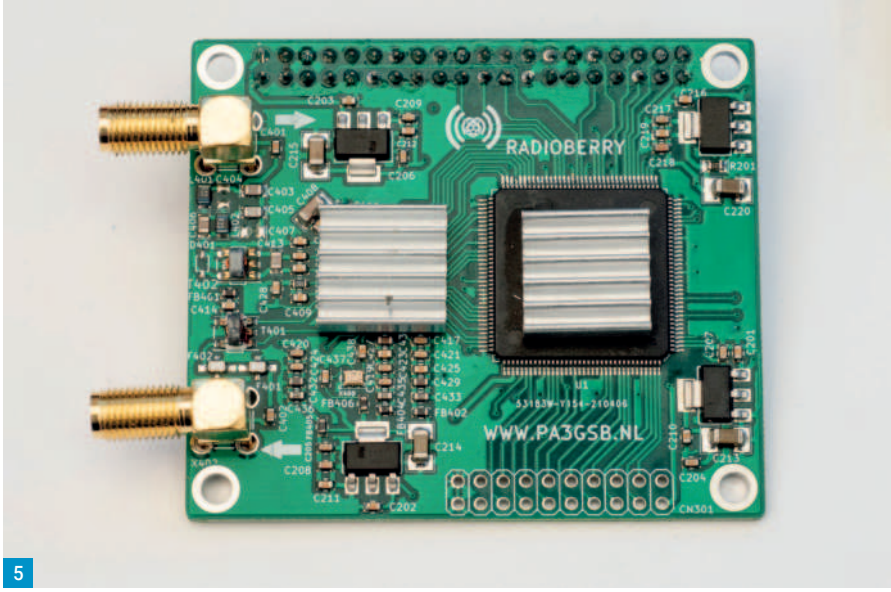
While we don't have the number of natural disasters experienced in many countries, we should still be ready. There is one huge vulnerability that could strike at any point, and that is the internet. Our lives are becoming inextricably linked with the internet. Our money is online, as are our health records, our phone systems, TV and even our logbooks. So far, there have only been a few relatively minor glitches in the internet, typically where a bank system falls victim to a bug and goes down for a while. However, there are industrial scale, state-sponsored, hackers out there who are constantly looking for ways to hack into our networked systems. These hackers are extremely clever and do not advertise their presence in a system. A good example can be found in what's known as the Lazarus Heist. This was a state sponsored hack of Sony Pictures that happened a few years ago. When triggered, that attack launched unreleased films on the internet and exposed thousands of sensitive internal emails. These had a damaging effect on both executives and employees.

When infiltrating a large system like Sony, the hackers only need to find a route into one computer or device. Once in, they will silently probe around the network to find more important computer systems to hack. As they move from computer to computer, they often clean up behind, leaving little trace of the previous infection. The same group has

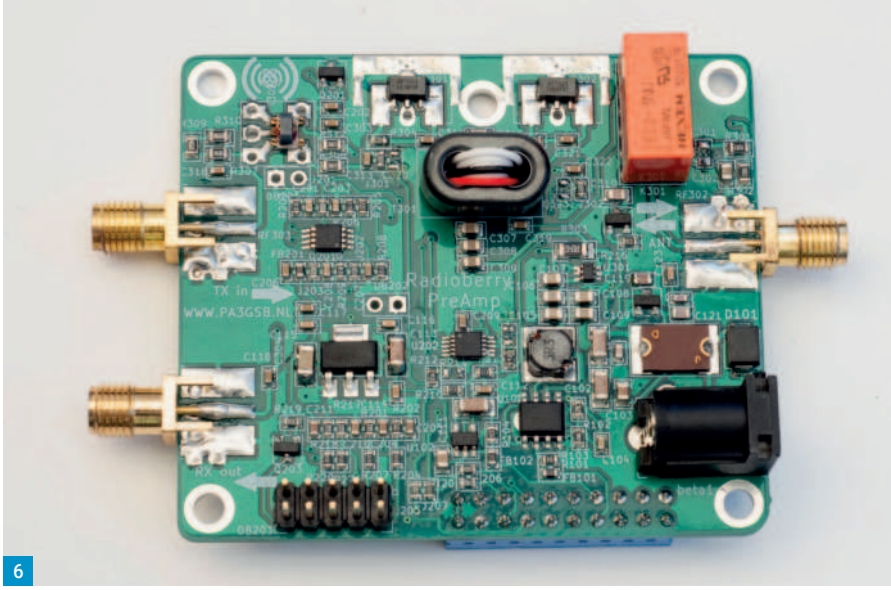
Fig. 1: Main screen of the FLMSG messaging application. Fig. 2: Winlink Express software for global amateur email. Fig. 3: JS8CALL and open message adaptation of FT8. Fig. 4: Block diagram showing the RadioBerry and Raspberry Pi. Fig. 5: Phone of the Chinese manufacturer RadioBerry. Fig .6: The RadioBerry 5 watt PA with Tx/Rx switching.



4



5



6

carried out other high-profile attacks, such as the attempted theft of £1billion dollars from the National Bank of Bangladesh. They very nearly got clean away with that one. If you want to learn more about these organised attacks, BBC Sounds have an excellent podcast running called the Lazarus Heist.

While I've reported a couple of specific examples here, you can be certain that all developed countries have teams that are finding ways to infiltrate each other's systems. The point here is that the internet is vulnerable, but we have yet to experience how disruptive an attack could be. It may be that our national defences are up to the job and we don't need to worry. However, amateur radio could have a significant role by providing an alternative digital network. We won't be able to match the capacity of the current network, but we could still provide useful capacity.

However, we need to be prepared. That preparation could be experimenting with microwave equipment to provide high speed data links via hill tops. We could also be looking at text messaging systems using adapted data modes like FLMSG. By tackling these projects, you will extend your technical knowledge while collaborating with others to provide a useful service. Radio clubs are an ideal catalyst for this type of development work and it would be great if a few of the more active clubs could get the ball rolling. As an individual, you can help by giving FT8 a break and using more free-form modes such as PSK31 and MFSK. One thing is for sure, if we suffer an attack, FT8 won't be much use!

Practical Ideas

If you want to build a wide bandwidth digital link, you need to be working with microwave or optical links. The best place to start looking for guidance is the UK Microwave Group (URL below). The UKuG have all the knowledge and contacts you will need to get started with Microwave work. Membership is just £6 a year and they even have loan systems and hard-to-find components available for members.

http://microwavers.org

For text messaging, try experimenting with FLMSG, **Fig. 1**. This is a messaging system that works with FLDIGI and is used by US amateurs to support their emergency communications systems. Also included in FLDIGI are a range of MFSK modes. Another popular and versatile messaging system is WinLink as it provides a Global email service that can operate without the internet, **Fig. 2**. Full details can be found here:

http://winlink.org

Don't forget about PSK-31, 63, etc. as the PSK mode makes for an excellent free-form messaging system and is remarkably resil-

ient. JS8CALL is also worth a look as this is an adaptation of FT8 that enables free mode messaging, **Fig. 3**. It's a slow system but can get through very poor conditions.

In my next column I'll go into more detail and show you how to use some of the other data modes.

Club Talks Available

One of the great things to come out of the pandemic has been the widespread adoption of Zoom conferencing. Although originally started to help clubs keep running, many have realised that Zoom opens the possibility to invite speakers from far and wide at little or no additional cost. Under normal circumstances, the range of available speakers is limited by travel distance but Zoom has cleared away that barrier. Several clubs have asked me to give talks over the past year, so I've created a range of talks that are now available for other radio clubs to call on. I make no charge for these talks and you can contact me via **mike@g4wnc.com**. Here's a summary of my current talks:

Pictorial Introduction to Data Modes: This talk is designed for those who are either new to data modes or are considering starting data modes. Topics include: What are data modes, Why bother, How they work, What do you need and Connections. The talk concludes with some FT8 operating techniques and a look at the future of data modes.

SDR Technology without Maths!: This is a look under the bonnet of SDR transceivers where I show you why IQ signals are important and explain how they work. The talk uses illustrations to show how SDR systems operate and avoids maths where possible. I cover a variety of SDR techniques and conclude with a look into the next generation of SDRs.

Raspberry Pi in the Shack: A run through the Raspberry Pi range, including the new Pico microcontroller. I cover several amateur radio orientated projects, including the RadioBerry direct sampling transceiver.

Introduction to Digital Mobile Radio: Intended for those new to digital voice. This talk explains the challenges of digitising speech and shows how the popular systems work. I also provide some jargon-busting explanations to help you make sense of digital mobile radio operation.

Affordable RadioBerry

Regular readers will know that I've been a keen follower of the HermesLite 2 and RadioBerry projects for some time. The RadioBerry is a small SDR transceiver board that mounts on top of a standard Raspberry Pi computer.

The RadioBerry has a great pedigree because it's derived from the HPSDR project that was the foundation for the Apache ANAN line of transceivers. The key difference between the Hermes and the Hermes Lite is the repurposing of a cable network transceiver chip to replace the 16-bit ADC (Analogue to Digital Converters) in the original design. The result has been an excellent, direct sampling, SDR transceiver (12-bit ADC) with continuous coverage from LF to 30MHz.

The Hermes Lite design is available as a fully assembled module from Makerfabs. There are three parts to the transceiver. The first is the main Hermes Lite 2 module at $225.70, then you need the Hermes Lite 2 N2ADR filter board at £52.70.

There is also a sign-written case available for just $16.90. When assembled and connected to one of the popular SDR software packages like SDR-Console, you have an all-band 5W SDR transceiver that can run two or more receivers anywhere in the LF-HF bands. The Hermes Lite 2 has been used as my main transceiver for the past couple of years.

The RadioBerry is an adaptation of the Hermes Lite 2 that uses a Raspberry Pi 4 to provide the networking and processing power, **Fig. 4**. Although the full design files and PCB layouts have been shared via Github, home construction has been the only way to get a working transceiver. I have a hand-built version, but it was not an easy task because most of the discrete components are 0603 size (1.6mm x 0.8mm) and then there's that large FPGA to solder!

The construction problem is now solved because one of the Chinese manufacturers has started producing ready assembled and tested RadioBerry boards. You can find them on AliExpress (URL below) and the cost is around £72 with free postage.

http://bit.ly/radioberry

I purchased one to check out the quality and It's performing well. I've shown a photo of the new board in **Fig. 5**. The designer of the RadioBerry project and several people on the user group have purchased the assembled version and all have reported good results. The designer has also developed what he's calling a pre-amplifier module, which adds a 5W PA plus transmit/receive switching and mounts on top of the RadioBerry, **Fig. 6**. This module is currently only available for self-build from Github files but, hopefully, it will go into production soon.

Continued from page 55

Incidentally, here is a list of all the words in Webster's II international dictionary with at least five iambic letters: blackberry, bricklayer, bricklaying, clarify, classificatory, electrify, falconry, flycatcher, freckle, gyrfalcon, huckleberry, hydrofluoric, monkeyflower, olfactory, quackery, quicksilver, Rockefeller

The Old Morse Test

This subject was being discussed on the FISTS group:

main@Fistscw.groups.io

There are some nostalgic memories there of Morse tests, long long ago! Some obviously had a similar experience to mine. I was accompanied by my Dad up to London and as I remember it was nearly the top floor of this building in St Martins Le Grand. It was 1956 and the examiner could see I was nervous. He gave me a 'test' piece to calm me down and then followed by some numbers. He said I had done quite well, so I sat waiting for the examination. Silence for a minute or so and I then asked when he would start. He just said, "That was it! I don't think you will have to come back again".

Before we returned to Norwich we visited St Paul's Cathedral. We had a look round and also went through some stone passageways. As we turned a corner a woman's voice said, "Is that you Henry?" We were alone and we retraced our steps to try to find who it was but found nothing. Very strange!

Have a read of some others' experiences. They are fascinating.

Victor Brand G3JNB

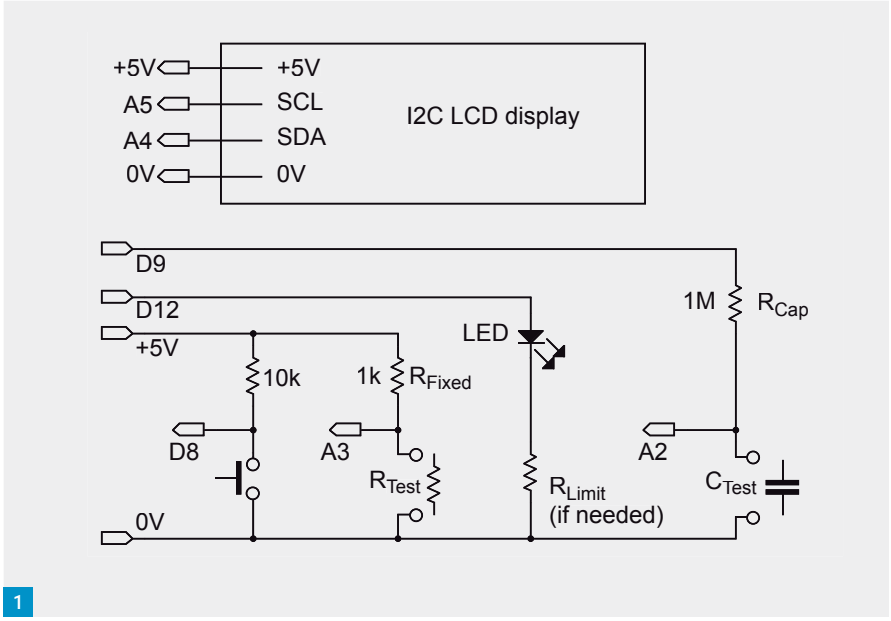
Godfrey G4GLM sent the following regarding the key featured last time from **Victor G3JNB**.

The key displayed by Victor G3JNB is a YA1860 as fitted to WWII British Field Telephone D MkV that had telegraphy capability. The type number will be etched into the underside of the 'Paxolin' base (illustrated, **Fig. 1**) and hence obscured in Victor's case.

Essex CW ARC's New Chairman

Rob M0KCP, **Fig. 3**, has been appointed Chairman of Essex CW ARC. He says, *"It was a pleasure to be appointed Chairman of ECWARC. I must thank the outgoing chairman **Dean G4WQI** for his excellent work over the past three years. 2020 has been an unprecedented year for everyone and I hope that you and your families remain safe and well. Many radio events were cancelled including our own field days, lectures and Boot Camp/CW conference. Whatever 2021 brings, the ECWARC committee will continue to hold online training, nets and other activities to promote CW on the bands."*

Tony Jones G7ETW
Charles.jones125@yahoo.co.uk



1

Arduino CR Meter

Tony Jones G7ETW offers a design for an Arduino-based CR meter that brings together hardware and software in a useful piece of test equipment.

This article has been light relief for me. It's January, and I've recently written three theory-heavy pieces. So, I offer you an Arduino project, a practical mix of simple electronics and C programming. (In the text I refer to two versions of the code, but only one, V5.1, is printed and is on my website. That's not a mistake; readers can switch between versions by changing one line of code.)

The Hardware

An Arduino Uno R3 is the smallest fully 'pinned' Arduino available, with the least memory. Because of that, this project will work on any Arduino board.

The display is a 1602 I2C Serial LCD 4 (row) by 20 (character) type. This bigger display makes for a richer user-interface than 16 by 2 models allow. I prefer I2C-connectivity because it requires four pins compared to seven for an SPI display.

Fig. 1 shows the breadboard circuitry. Resistance and capacitance measurements rely on a potential divider, where I measure the voltage across an unknown component. Please ignore points A and B for now. The code is on my website, called ARDLCSV5.1.

Measuring Resistance

An A-to-D divides a fixed, DC voltage between a fixed number of steps. On an Arduino, 5V is divided into 1023 (two to the power of 10, minus 1) steps. Ohm's Law does the rest, making one resistance 'quantum' = (R_{fixed} + R_{test})/1023.

You see the problem. As R_{fixed} + R_{test} increases, one resistance step increases and the ability to tell two values apart decreases.

When R_{test} is small compared to R_{fixed}, the resolution is effectively set by R_{fixed}. But as R_{test} rises, the balance changes and by the time R_{test} is 10 times R_{fixed} the resolution has dropped significantly.

Please start off with V4.1 – this is the code, with gVersion = 4.1. R_{fixed} is 1kΩ. This value is a compromise. It can't be too low because of an Arduino's 40mA maximum current limit for a pin.

ARDLCSV5.1: Software and Hardware Improvements

The problem with V4.1 is that R_{fixed} is just that – a fixed single resistor – and this is rather a blunt instrument. Imagine I'm trying to measure an exactly 220kΩ resistor. R_{fixed} is 1kΩ.

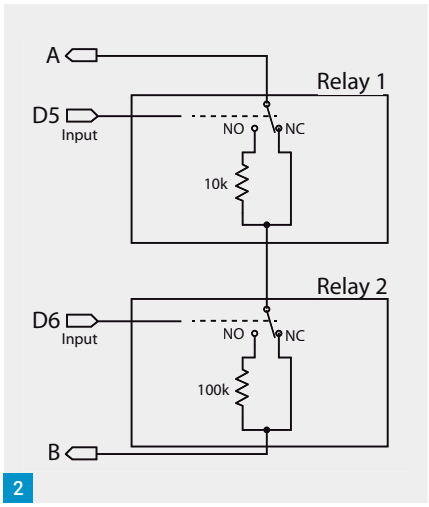
A to D integer reading (assuming downward quantisation) from pin A3 = 1023 × (220kΩ/221kΩ), which is 1018.

1kΩ is small compared to hundreds of kilohms, so a wide range of R_{test} values (204kΩ to 255kΩ in fact) will give this same 1018 read value. One fixed resistor is not good enough. (I never thought it would be, really.)

Table 1 shows some results I got with V4.1. I based the calculations above on 5V but look at the voltages! For this method to be accurate, I'd need the reference voltage to be a lot more stable than this!

Fig. 2 shows how to incorporate a relay board in the project. The relay contacts, connected together as shown, form an additional variable resistor between points A and B on Fig. 1. (The relay board also needs a 5V and ground connection, but these aren't shown.)

Please switch versions to V5.1 by changing gVersion to 5.1. This version manages the relay. Now, for a 220kΩ resistor, this (same) reading of 1018 based on the same 1kΩ resistor exceeds an 'auto-range required' trigger and the code, seeing this, switches in an additional 10kΩ, increasing R_{fixed} to 11kΩ.



2

A second reading gives 1023 × (220k/231k) which is 974 – still over my trigger value, but better. An additional 100kΩ is switched in. R_{fixed} is now 111kΩ and a third reading gives 1023 × (220k/331k), which is 679, nicely in the middle. R_{test} can be (acceptably) accurately calculated.

These relay boards work differently to

Fig. 1: The breadboard circuitry.
Fig. 2: incorporating a relay board.
Fig. 3: View of the breadboard layout.
Fig. 4: Charging of a capacitor.
Fig. 5: Simplified diagram for one-relay board.

'traditional' stand-alone units. To make a relay switch, its input must be grounded – look at the high and low settings for relays 1 and 2. See Sidebar: '**Relay Boards**' for more information.

Fig. 3 shows the breadboard layout (for V5.1, although it's almost the same for V4.1).

Table 2 also shows some results I got with V5.1. This change makes quite a difference with large values of R_{test}.

Measuring Capacitance

Measuring capacitance depends on R_{cap} (another fixed value) and a millisecond timer. 1MΩ slows the charging of nano- and micro-Farad capacitances sufficiently to measure their time constant (tau) accurately, but pico-Farad capacitors charge too quickly to be timed.

This speed-governing cuts both ways. What charges slowly, discharges slowly and the first time I measured a 470µF capacitor I realised what was happening and used the time to unload the dishwasher! I added the LED to indicate that discharging was in progress after that.

I don't measure a whole time constant by the way. I did some maths – see Sidebar: '**Capacitor Charging**' – and found a way to speed things up.

See **Table 3** for some test measurement results. These were done with V4.1, but for capacitors the two versions are identical.

Coding Aspects

This is not a programming magazine, but I'd like to highlight some of the programming tricks I used.

String Functions but no Strings

All the literals are character arrays. I didn't use string objects because they are memory hungry. But I did use Arduino's standard string manipulation functions, which manipulate character arrays, because these improve readability.

Compiler Substitutions

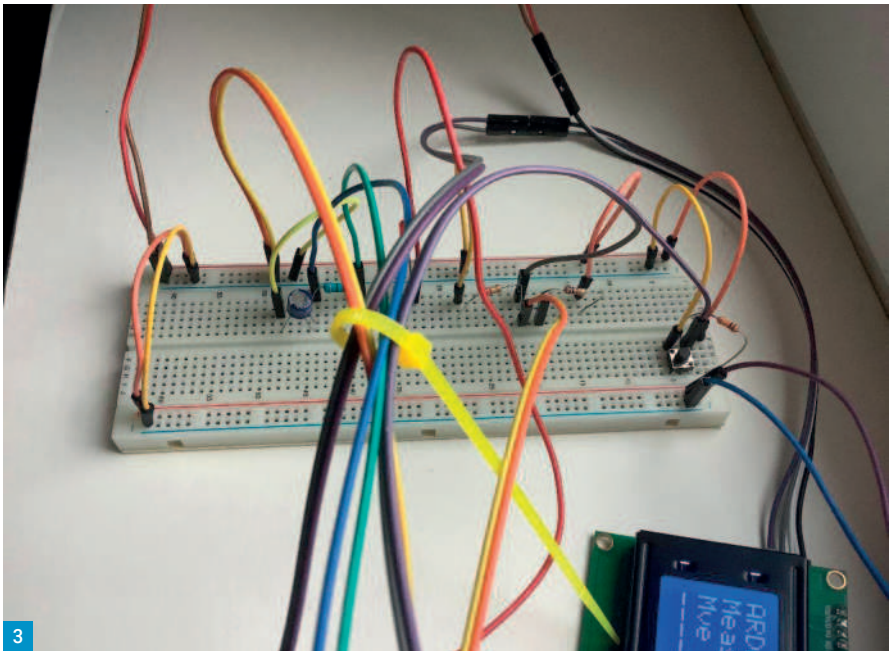
An Arduino UNO R3 has 2kB for variables. That's not a typo – I really do mean 2048 bytes.

Hence my use of define statements, which are labelled pieces of fixed text. When the sketch is 'parsed' (read for compiling), each of these is substituted. The compiler does not see 'LEDPIN'; it sees '12' instead. This saves space for variables that do need to change.

Real Programmers do use GOTO

Sometimes – not often, I admit – a GOTO is good coding. (I look forward to the *Letters* page!)

In this case I needed three analogRead blocks. I could have used R_{fixed} to determine the logic path, or even a Do-loop with an indexed array of resistor values, but it was just simpler (and more fun!) to have a GOTO.



Marked	DMM	ARDLCS V4.1	A-to-D value	V across R_{test}	V across R_{fixed}
2.2	2.3	6.9	7	0.01	4.88
22	21.9	27.11	27	0.1	4.81
220	221	257	209	0.88	4.8
2200	2170	2280	711	3.3	4.75
22000	21700	19000	972	4.45	4.68
220000	214000	127000	1015	4.76	4.85

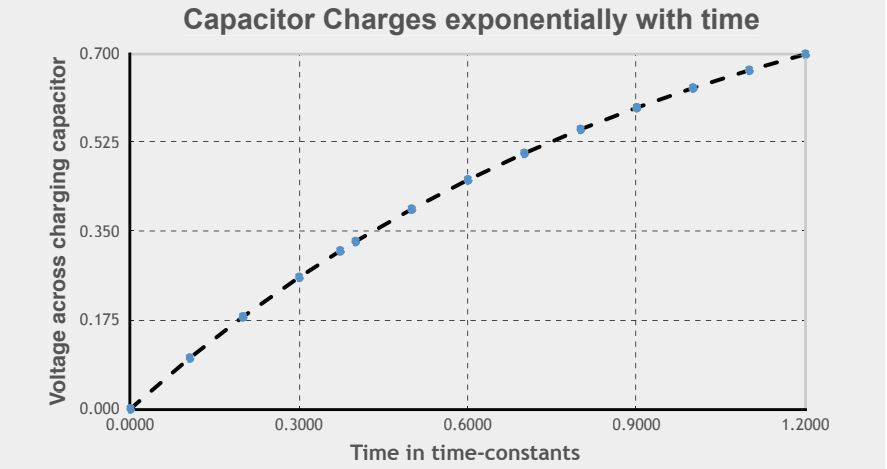
Table 1: Resistance Test Measurements in Ohms (no autoranging)

Marked	DMM	ARDLCS V4.1	A-to-D value	V across R_{test}	V across R_{fixed}
2.2	2.3	38.6	38	0.01	4.86
22	21.9	29.18	29	0.1	4.82
220	221	234	194	0.87	4.83
2200	2170	2200	703	3.23	4.71
22000	21700	21900	681	2.92	4.49
220000	214000	223960	682	2.92	4.42

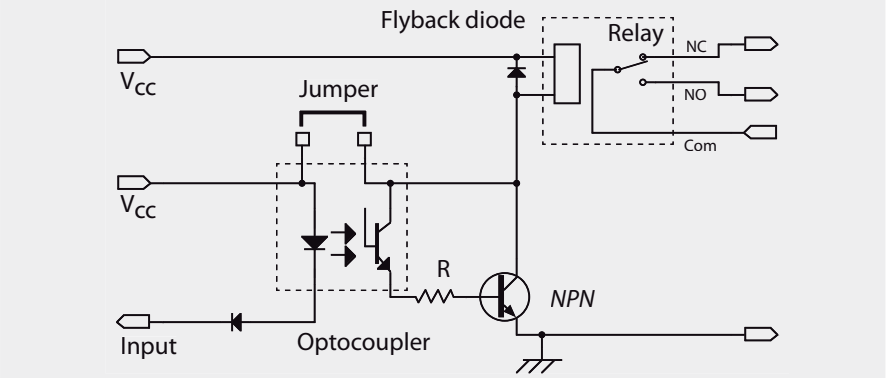
Table 2: Resistance Test Measurements in Ohms (with autoranging)

Marked	Atlas LCR meter	ARDLCS V4.1
1nF	952pF	Zero
10nF	10.24nF	9.52nF
47nF	46.97nF	47.62nF
100nF	94.12nF	114.29nF
2.2µF	2.28µF	2.58µF
10µF	10.1µF	11.54µF
47µF	46.66µF	53.6µF
470µF	423µF	505.5µF

Table 3: Capacitance Test Measurements



4



5

The Empty Loop

A classic while loop is coded as While (condition) Do actions. The logic is:

Perform the test

If and ONLY if the test evaluates TRUE, follow a series of instructions

Go round again

I needed analogReads to repeat while the capacitor discharged. I could have coded this as:

```
int X = analogRead(A2);
While (X > CAPMIN) {X = analogRead(A2);}
```

This would have worked, but it needed a variable and it's bulky. While (analogRead(A2) > CAPMIN) {} may look odd, it's brutally efficient.

Conclusion – and an Apology

When I started on this, I intended to make an LCR meter.

Just as Capacitance opposes the change of voltage, storing energy in an electric field, Inductance opposes the change of current, storing energy in a magnetic field. And inductors too have a time constant, equal to L/R.

I did some more modelling. To measure L this way (measuring an exponentially-changing voltage in a potential divider) is possible, but it's not easy. R_{fixed} would have to be tiny – a few Ohms perhaps – or the time constant would be large. And R_{fixed} being small brings me back to an Arduino pin's 40mA limit.

There are ways though, predicated on making oscillators (or at least tank circuits) and measuring frequencies and/or reactances. Such a design would work just as well for a capacitor of course, and I do plan to revisit this.

In the meantime, I hope this is of interest. As can be seen from the results, I don't plan to take my plans for the Arduinometer to the Dragons any time soon, but many (cheap) DMMs don't have capacitance ranges so this is, in extremis, of some use.

This was an interesting project and demonstrates why 10-bit A-to-Ds (and Arduinos) have their limitations. But if nothing else, it was fun!

Capacitance Charging

When a capacitor charges from a DC supply the formula is:

$V_c = V_{supply}(1 - e^{t/cr})$

Fig. 4 shows this. This is simpler than it looks if you know e. Let me take it apart.

e is the 'exponential constant', a fundamental constant of physics and engineering. Its value is approximately 2.718.

t/CR is a 'time constant' and has no units. t is in seconds, so Ohms times Farads must also come out in seconds. I'd never thought about before, but it does. (See Sidebar 'Time constant dimensional analysis').

Look at t = 1 on the graph's x-axis, where exactly one time-constant has elapsed. Substituting 1 for t/CR in the above formula gives

$V_c = V_{supply}$ (1 – e to the minus 1)

Anything raised to the power of minus 1 means the reciprocal of it. This simplifies to

$V_c = V_{supply}(1 - 1/e)$

E = 2.718, so $V_c = V_{supply}(1 - 0.367)$.

This is familiar territory - after one time constant a capacitor has charged to approximately 63% of the supply voltage.

I could have measured C this way, but there is nothing magical about one whole time period. Look again at the graph – when t = 0.105, the voltage level is 0.1. It took a little work in Excel to discover this but it's straightforward-enough maths using 'natural logarithms'.

This is why the code looks for an analogRead of 102. To get there takes 10.5% of a time period, and if we know that (and Rcap) C is easily calculated.

Time Constant Dimensional Analysis

We need to go back to fundamental SI units. 1 Volt is 1 Joule per Coulomb, 1 Amp is 1 Coulomb per second and 1 Farad is 1 Coulomb per Volt. To avoid confusion with C for capacitance, I'll use Q for Coulombs.

Ohms is V/I, which becomes J/Q divided by Q/S. This reduces to JS/Q^2.

Farads is Q/V, which is Q divided by J/Q. This reduces to Q^2/J.

Multiply Ohms by Farads and all the J and Q terms cancel out, leaving just S for Seconds.

Relay boards

See **Fig. 5**. This is a simplified circuit diagram for a one-relay board. There is a jumper on the board, which separates the circuitry on both sides of an opto-coupler. This allows the Arduino to be completely isolated from the switching circuit.

When the input line is grounded, a tiny current flows, which operates a transistor switch, which operates an ordinary relay. Very sensibly a 'flyback' diode is incorporated to protect the transistor from the coil's EMF generated as the magnetic field collapses.

Martin Waller G0PJO
Martin@The-Wallers.net

1

My ATUBox

Martin Waller G0PJO returns, experimenting with something new.

For the last few years, I have been using a multi-band End-Fed antenna fixed to the back of the house and going down the garden. It was home-made and based on a design published by **John PD7MAA** (URL below). For those of us with long, thin back gardens the design is quite convenient as the feed from the antenna to the shack is generally short. I have been pleased with it; it runs without the need of an ATU, but is limited to the 80, 40, 20, 15 and 10m bands. Recently I have been looking around for a replacement to give me access to more bands.

https://tinyurl.com/zz5eyn45

I realised that a replacement would need a new antenna feed from either halfway down the garden (for a multiband dipole or similar) or from the bottom of the garden for an inverted-L. In these configurations it also seemed better to have a remote ATU as close as possible to the antenna feedpoint. Remote ATU devices are not cheap, and I was very hesitant to make such an investment.

Early in May 2020 I was browsing eBay and noticed a kit for an ATU designed by **David N7DDC**, being sold for just shy of £40. The price seemed right, I decided to find out more. The design is documented on GitHub:

https://tinyurl.com/279k46ta

The repository contains the circuit diagram, latest software, and extensive documentation. The documentation suggested that it supported an 'Automatic Mode'. In this mode, the tuning operation is triggered when the device detects a poor SWR.

This sounded perfect as I would not need to be near the device to push a 'tune' button! My only apprehension was the number of SMD components there were on the board. I have built a few projects using SMD technology in the past, but they only had a handful of components and some failed spectacularly. I decided to buy one and see how I got on.

The kit arrived promptly and was very well packaged, **Fig. 1**. The PCB was surprisingly small, 60 x 120mm, and so were the pins on the main processor, in this case a PIC 16F1938. The enclosed documents suggested the PIC had already been programmed with V3 of the firmware. At that time this was the latest available software so no further programming was required.

Starting the Build

Before starting the build, I collected my tools together. These included an old Antex XS soldering iron with a standard 2.3mm bit, an old tin of flux that I had used for plumbing jobs, glasses, and small pair of tweezers. I also built a simple tool to hold the components in place when being soldered – my 'third hand'. It is made of two lengths of dowel with a cocktail stick mounted at one end with a band of lead to add weight, **Fig. 2**.

The kit came with limited documentation, but the PCB detailed all component values and the SMD components were all well labelled. The toroid winding details can be found on the circuit diagram. I started the build by soldering all the SMD capacitors and resistors. For each one I added flux to the pads using a cocktail stick, positioned the component with tweezers, and then held it in place using 'my third hand'. Once happy with the orientation and position I applied the smallest amount of solder possible to the tip

Fig. 1: The kit on arrival. Fig. 2: The author's home-made tool for holding components in place. Fig. 3: The IC after soldering in place. Fig. 4: The finished toroids in place. Fig. 5: The assembly after 3D printing some suitable supports. Fig. 6: 3D printed insulating bar. Fig. 7: VSWR curve for the balun. Fig. 8: The balun boxed up. Fig. 9: Inside the finished ATUBox. Fig. 10: The ATUBox in situ.

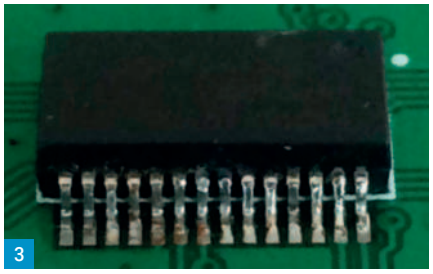
of the iron and applied it to one end of the component. I was then able to remove 'my third hand' and repeat the process on the other end of the component. Once complete I used a tissue to remove all excess flux keeping the PCB as clean as possible.

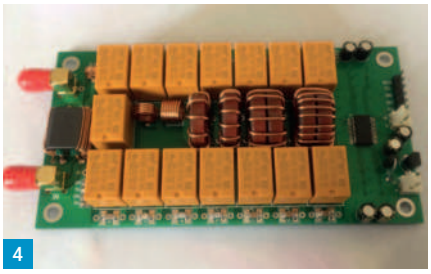
With boosted confidence I then tackled the PIC processor. These devices have many legs that are remarkably close together compared to the width of my soldering iron tip. I would never have been able to solder each leg individually, so I decided to go for the flooding technique. I added flux to all the pads, positioned the processor and held it in place with 'my third hand'. Once happy that the processor was the right way round and all the legs aligned well with the pads, I soldered two pins that were diagonally opposite each other across the processor. Having checked again that the processor was in the right place I flooded all the pins on one side with solder. I then used some solder wick to remove the excess. This worked remarkably well, **Fig. 3**.

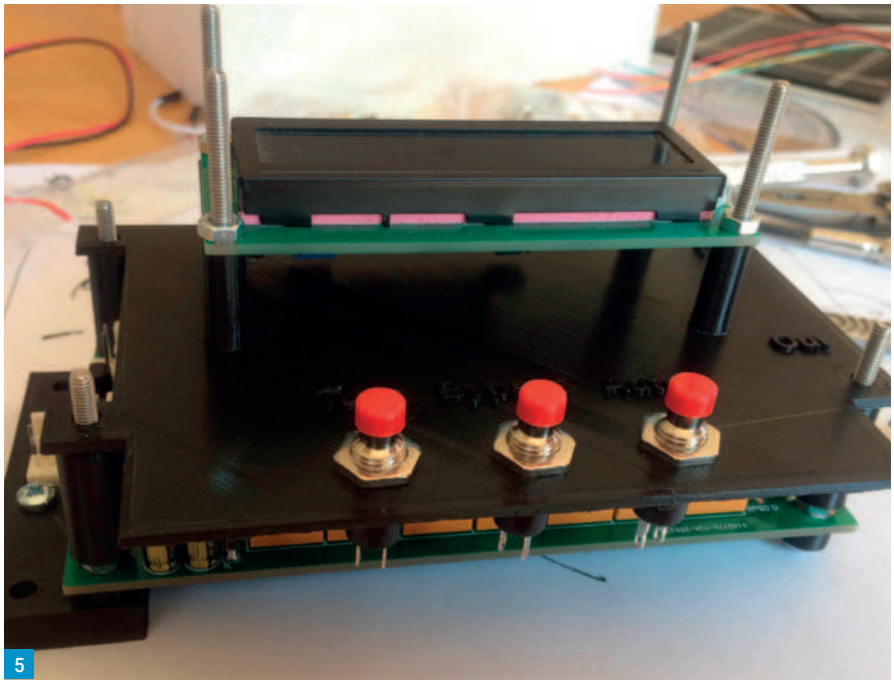
I repeated the process on the other side and the processor was done. I was slightly concerned about the health of the processor as the flood technique and the subsequent wicking required a lot of time and heat!

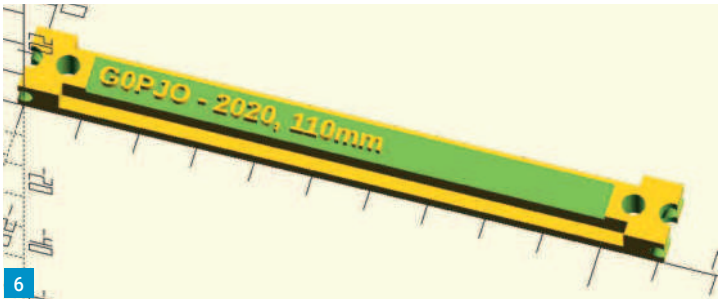
The kit does not come with a display, but the PCB and the code are configured to drive one. The display is beneficial because it provides details of the tuning operation, including power output, SWR, inductance and capacitance. I realised that, if I added a few more components and a display, I could power up the ATU and hopefully prove that I had not damaged the processor. By default, the software supports the classic 16x2 LCD display with an I2C serial interface board set to the default address. I added the extra components, connected a display, powered the board up from a PP3 battery, and all was not well! The display lit up but displayed no text. I knew the display worked because I had just borrowed it from another project. I checked the address being supported by the I2C serial interface board and found this did not match the one expected by the software. Changing the address on the I2C boards is easy and once changed it fired up


2

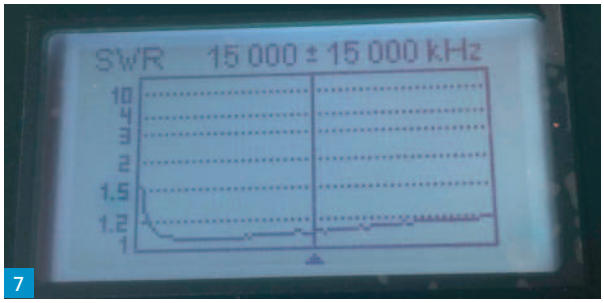

3


4


5

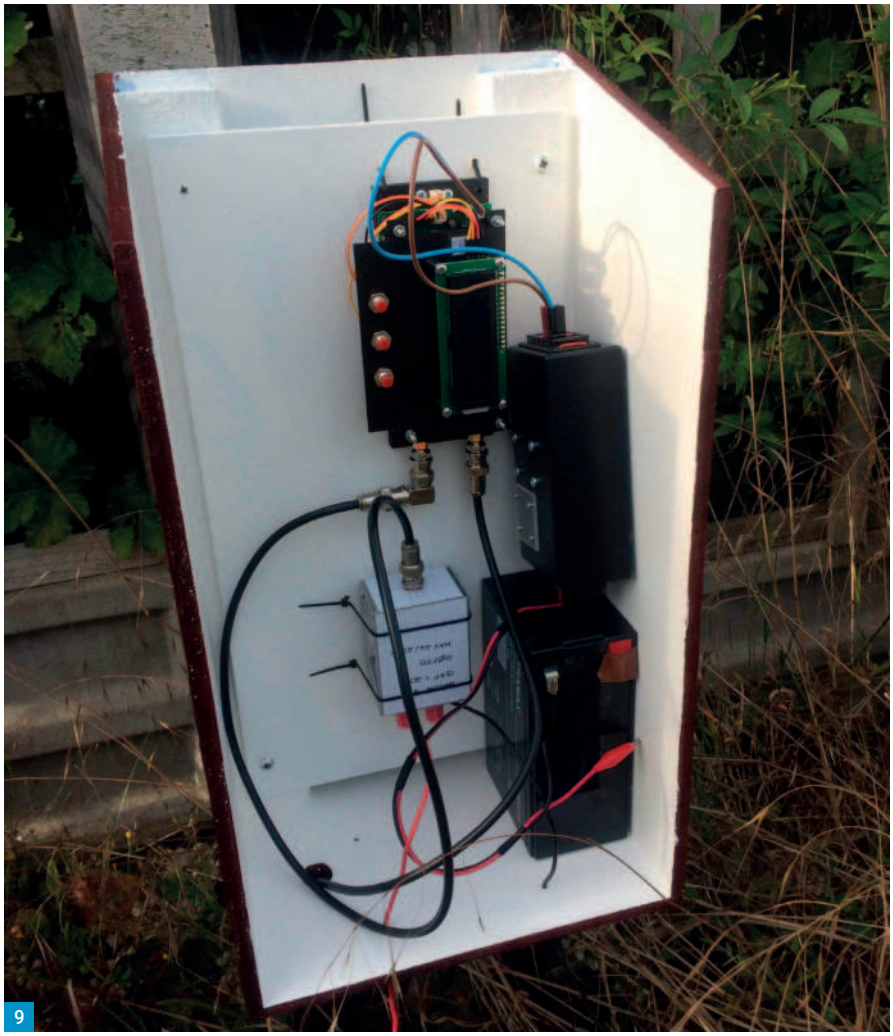


6



7

8


9

and displayed what I expected – the processor seemed to have survived the heat! The rest of the build was easy. The toroid winding details were found in the circuit diagram and I had no further issues, **Fig. 4**.

The PCB has a connector for the main 'Tune' button, but two further buttons can be added to provide 'Bypass' and 'Auto' functionality. Sadly, the connections for these buttons require connections soldered to pads on the back of the PCB. When assembled with the display and three buttons there were wires everywhere. To help manage the situation before the final boxing up, I designed and printed off some supports, **Fig. 5**.

The Doublet

For the Doublet, I pulled apart a length of old black and red, two core and earth mains cable. I realised that the copper would probably stretch but I thought that the ATU would correct for this and I did not want to spend too much on antenna wire until I was sure it was all going to work. The Doublet also required a balanced ladder-line feed. I had never used one of these before and was not quite sure where to start. I found that **Rick DJ0IP** has a published a document talking about ladder-line design and I decided to try some 40mm insulating bars, with the document suggesting this would result in an impedance of approximately 400Ω.
https://tinyurl.com/9dyzbjju

I designed and printed some 40mm insulating bars. These were attached using short cable ties, **Fig. 6**.

With the Doublet having a balanced feed and the ATU supporting an unbalanced feed, I also had to include a Balun. Many years ago, I built a 4:1 balun from two BN43-202 binocular cores. The design is called the 'Backpacker Balun' (URL below). Testing it with a 200Ω resistor, the balun seemed to be performing well. It was limited to low power, but I would be driving it with a KX3 with 10W output, **Fig. 7**. Again, to solidify things, I boxed it up, **Fig. 8**.
https://tinyurl.com/29apk8sx

The Acid Test

All the parts were now in place, I could take down the End-Fed and put up the Doublet.

My initial tests did not go too well. I connected the ATU to my KX3 with a 25m length of RG58. This length was chosen because it would be like that of the final setup. I was hoping the ATU would start tuning when I hit the TUNE button on the KX3. This button causes a CW carrier to be transmitted at the selected power setting. The ATU did start to tune but then froze. To recover I was forced the cycle the ATU power. Repeating the process, I could see the ATU starting to tune but at the same

Band (m)	Freq (MHz)	SWR at ATU	PWR at ATU	SWR at KX3
160	1.836	2.32	8.8	2.1
80	3.560	1.13	8.1	1.2
60	5.262	1.95	7.6	1.4
40	7.030	1.17	7.4	1.1
30	10.106	1.01	5.9	1.1
20	14.060	1.18	5.6	1.0
17	18.086	1.08	5	1.2
15	21.060	1.1	4.2	1.1
12	24.906	1.19	4.5	1.3
10	28.060	3.4	4.3	1.4

Table 1: Output power and VSWR

time the KX3 was noticing a high SWR and reducing the power output.

The ATU and KX3 seemed to be working against each other. Something had to change. The ATU documentation says that, by default, the ATU will only work with an input power of at least 5W. The 5W requirement can be changed by tweaking a byte value – referred to as the 'minimum power cell' - stored in the PIC processor EEPROM. Changing this value is not easy and requires a PIC programming device and associated software. Fortunately, I had access to a PICKit 3 (URL below) and, after a bit of trial and error, I managed to set the threshold to 1W.

https://tinyurl.com/2vfsp65k

This change made all the difference and testing resumed. The ATU seemed happy to auto-tune the antenna across all HF bands with the KX3 seeing an average SWR of around 1.2:1. Feeling confident, I started calling CQ on 12m – a new band for me – and ended up in a 559 both ways QSO with a Scottish station. A few minutes in to the QSO my power supply blew a fuse and my nostrils were being offended by the smell of burning! Fortunately, the smell radiated from the ATU and not the KX3! It turned out that an SMD capacitor across the DC supply line had blown and most of it had vanished. Not knowing the quality of the supplied devices, I bought some new capacitors from a reputable dealer, replaced the blown one, and I have had no further issues.

The ATU is now housed in my ATUBox, a wooden box halfway down the garden and powered from the shack, **Figs. 9** and **10**.

Running tests with the KX3 set to 10W output, the SWR and power out reported by the ATU and the SWR as seen by the KX3 are given in **Table 1**.

The power out does seem to reduce

10

quite rapidly at the higher frequencies so there is more experimentation to be done. Replacing the RG58 with something better will be my first followed by some balun changes.

Overall, I am quite pleased with the result. I have moved from being limited to End-Fed antennas to a setup that easily allows experimentation with centre-fed antennas. As for the ATU, it seems to be £40 well spent. The only downside that I can see is that if you need to change configuration values stored in the EEPROM, and there are many, then you will need to be familiar with, and have access to, PIC development tools. If you do decide to build the ATU, be careful which kit you buy. Searching for N7DDC on eBay produces many variations. Some just selling the PCB, some come with a small display, some come already built and boxed. I chose to buy one that originated in China but claimed to be shipped from the UK and clearly showed the PCB along with all toroids, relays, and SMDs.

Radio Round-up

GB0WYT AND GB2DWM: During the weekend of 3/4 April Huntingdonshire Amateur Radio Society (HARS) members ran their first special event station of 2021 by using the callsign GB0WYT for Royal Air Force Wyton in Cambridgeshire, as part of RAFARS Airfields on the Air.

For the weekend Cadet Adult Force Volunteers (CAFV) and HARS team members were co-ordinated on a rota basis by David M0SKT who under normal conditions would run the event from 'inside the wire' at RAF Wyton and would be operating using local RAF Air Cadets who regularly attend the event. This year again they worked from their home stations using HF Voice, CW and Data modes. 214 QSOs were made.

New HARS operators who came on board this year were Dale G5DKT, Ian D G3NID and Ian T M0XCF who enjoyed the activity.

Thanks go to Steve G1KWF, Mervyn G4KLE, Andy G8OHM and Clive G3NKQ for assigning time and putting the effort into making the event a success while keeping the GB0WYT callsign alive during the current situation.

Then during the weekend of 8/9 May, HARS activated the callsign GB2DWM for Duloe Mill in Eaton Socon, Cambridgeshire for the National Mills on the Air event, which is celebrating its twenty-fifth year. The callsign was operated from homes due to current Government guidelines, by various local operators who live nearby or have run the special event station at the Mill in previous years.

This year was the eighth year of the club operating the callsign and 100 QSOs were made over the weekend.

Thanks go club members Mervyn G4KLE, Steve G1KWF, Clive G3NKQ who assisted organiser David M0SKT during the weekend.

30 YEARS OF INDEPENDENCE AWARD: The Slovenian Amateur Radio Union will celebrate the country's 30 years of Independence by issuing a special award. It will be eligible to amateur radio enthusiasts all over the world.

For this event only, starting 26 June 2021, 0000 UTC and until 31 December 2021, 2359UTC, Slovenian amateur radio stations can use special callsigns. Those will add the number '30' into the suffix. For example: S50ZZ will be S5030ZZ, S51A will be S5130A, S57XXX will be S5730XXX etc.

In order to obtain the award a foreign amateur radio station must have at least 30 contacts with S5 stations (regular and special callsigns apply), out of which 10 or more must be with special prefixes ('30'). The use of any band/mode counts for the award. Send the log (list of contacts – date, time, call, band and mode) to **scc@hamradio.si.**

Tom Morgan ZS1AFS/ZT1T
zt1tzs1afs@gmail.com

It's radio, Jim. But not as we know it

Tom Morgan ZS1AFS describes a Mode with Nodes, but is it Internet or Radio?

Not having a station in the UK meant I was restricted to mobile (not easy in a hire car) or a handheld from one of our daughter's upper floors. I was staying with her when I first visited Chippenham Radio Club. So, I was very interested in the 'MicroHUB' demonstrated by **Jon G0IUE**. This all-in-one-box looked quite attractive – another means of communication with other amateurs, across the internet, in poor conditions. The system he was using was AllStar.

G0IUE's MicroHUB could be connected through the internet to other 'nodes', some of which could have other nodes connected to them, called 'hubs'. I liked the idea of connecting to the World but could not digest all of the information in one hit. And subsequently, I made a several contacts on 70cm with my handie through G0IUE's node from our daughter's house.

Many repeaters have AllStar access. But there's always a radio and a radio amateur at both ends. Several operators such as **Matt KN4ZXV** and **Glade KD7BCR** stateside, and many in the UK, work mobile through their local repeater that's connected to a hub. I spoke to amateurs in the UK during the lockdown (from South Africa) just sitting in their gardens with a handheld.

Various diagrams on the Net show the system and network maps to explain the structure. **Fig. 1** is a simple representation of a contact between my daughter, who lives in the UK, and me.

So, How Did I Get My Own Node?

Having time on my hands while in the UK, I read up on the Net and got totally lost! But I did fathom out that for a node you needed a radio (preferably with a 6-pin mini-DIN data socket), a sound fob and a computer. I thought, this could turn out to be expensive! But the MicroHUB I saw had a Pi computer (not expensive) and a stripped-down handheld. The 'bit' between them was a sound fob. Several people on the Net had modified commercial fobs, but I was not keen on that route.

On an outside stall at the last Hamfest in Lincoln, USB AllStar Sound Fob Interfaces were being sold for £25. So, I bought one, **Fig. 2**. The golden rule, learned when blue water sailing and subsequently in Africa, is 'If you see it and think you will need it, get it'! Talking to one of the stallholders, he said I could buy an SD card for a Pi computer with the 'system' on it. Yes, my FT-8900 has a suitable socket. There was just one small proviso. I had to supply my node number and the data for my own location, callsign, etc. before an SD card could be 'flashed'. I agreed to send the information when I got back to South Africa.

So, I signed into the AllStar website (below) and registered my details. After acceptance by email, I applied for a node. It's important to keep a printed record of your AllStar Node Configuration. But little did I know, then, I was taking a leap into the dark!

www.allstarlink.org

I bought a Pi 3 B+ Kit on the internet and was advised to get it with a pre-configured SD card, a case and PSU. It even came with a USB card reader! After sending all of my information to the amateur from whom I bought the interface, he sent my SD card to our daughter. She brought it out with the Pi from the UK. He emailed me that the login and password were both 'admin'.

While waiting, I read the likes of **Chris Hood WB4ULK**, articles by WA3DSP, and **crompton.com**. I purchased a pair of Baofeng BF-888S radios (cheap) with battery eliminators, etc. also brought out from the UK. Was modifying a handheld the way to go?

Later on I had a few problems checking the wiring of the fob to the radio with the supplier. As he wrote, he goofed up! This was after I suggested I'd cut off the mini-DIN plug to connect a stripped-down HT directly. In the event I'm running the node and monitoring my local VHF repeater from the FT-8900. It's two radios in a box.

There's a lot of information about Pi and AllStar on the internet. I'm sure there's scope and need for most of it. However, **Scott Nimmo** summed up my dilemma on allstarsetup.org. *"No one seems to have put together a simple, logical, easy to follow set of ABC type instructions designed for those with zero*

Fig. 0: The node at ZT1T. Fig. 1: The Hub. Fig. 2: The AllStar Sound Fob Interface. Fig. 3: Admin menu. Fig. 4: Map of nodes from the AllStar website.

previous knowledge and very limited constructional abilities". This has led many people to think it's an internet-only mode.

Quite a few people who use a Pi computer as the 'brains of an operation' prefer to obtain pre-loaded SD cards from reputable sources. As an example, the ORARI (Indonesian Amateur Radio Association) document *Setup Raspberry Pi for Ham-Radio* advises readers/enthusiasts if they don't want to install the amateur radio programs, they can obtain pre-loaded SD cards, from *PW* columnist **Mike Richards G4WNC** at:
https://photobyte.org

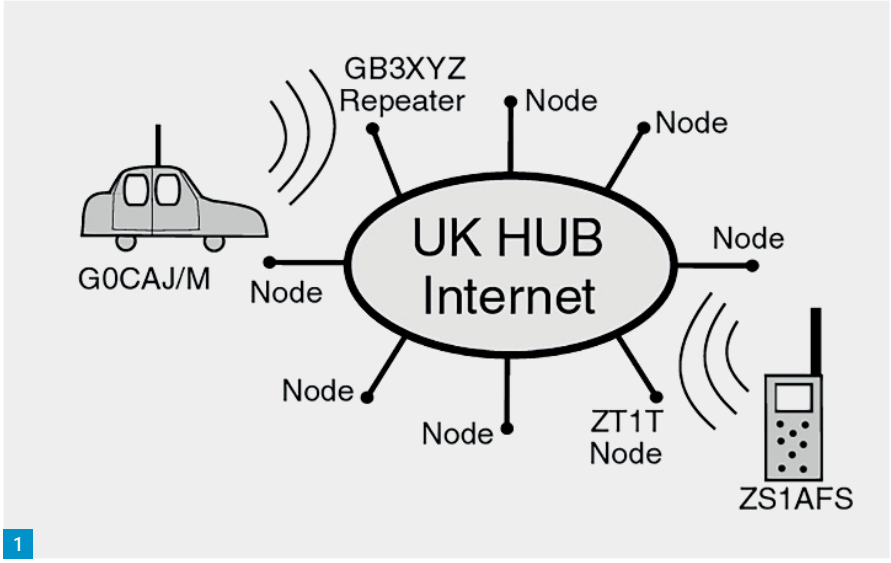
I was glad I didn't have to do the download stuff. I'm all for the easy option. So, the big day arrived. Well, it didn't! I had installed the SD card, switched on the Pi and watched the program lines scroll up the screen. It stopped scrolling and cleared with the command line: ZT1T login: So, I typed 'admin'. Then I was prompted, password: So, I typed 'admin'. And the ZT1T login: prompt came up again! There were a few repeats!

What was the login name? I tried everything I could think of, from my AllStar logins and even my node password. Finally, I emailed the amateur who had created the card. And to my amazement, in the reply he confirmed both had been set to a different word! At least I got to another screen. See Admin Menu List in **Fig. 3**.

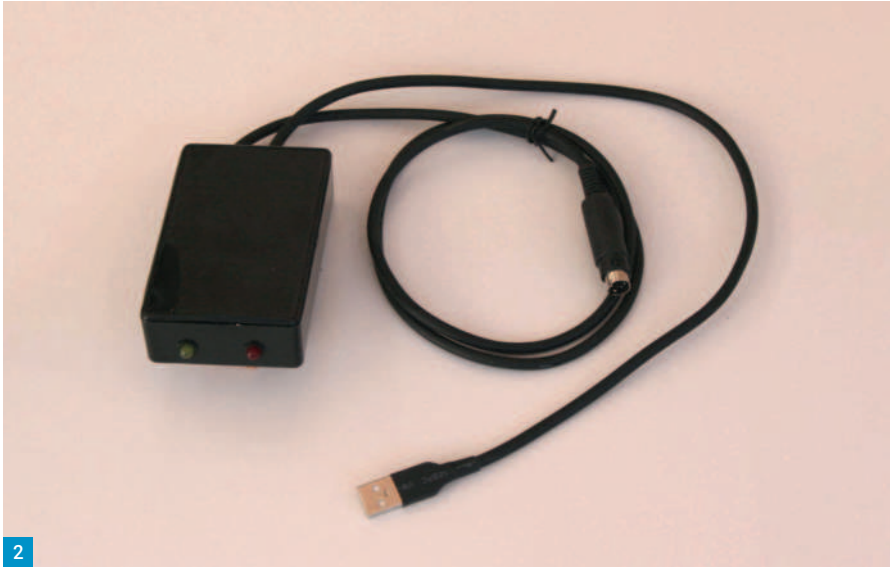
Even though I checked out the AllStarlink.org site I found that the Admin Menu List screen was as far as I could go. What did the listed functions do? Finally, I emailed the amateur who had flashed the SD card, to find out how to go from there. But I got the impression he did not understand my problem. Then, my friend who is a Pi enthusiast had a look. He was stumped like me.

Some months later during the lockdown, I had an epiphany! What if I had got to the point where I could log into the network, i.e. I could connect! But I was still no wiser. So, I went back to the Net. And there I searched and found:
https://tinyurl.com/3pwwbnuj

My questions were being answered. This step-by-step–from–the beginning document, dated 4/12/2019, covered the whole procedure. It was written well after I had been scouring the Net! It even covered the 'flashing part' using WIN32 Disk Imager. And in Section E, Phase 4 Final Configuration, it directed the reader to:
https://tinyurl.com/4c65a77r



1

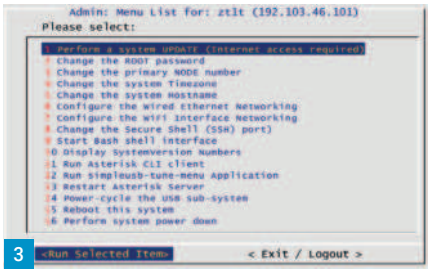

2

Surprisingly, this README file had been written quite a bit earlier, in January 2017. It explained that the stages to getting a node running had been streamlined as from version 1.5. If only anyone of those I asked for help had told me where to look, it would have saved me hours of time and I would have been up and running over a year sooner. If you have a pre-flashed SD with all your information, you should come out with the menu in Fig. 3 after logging on.

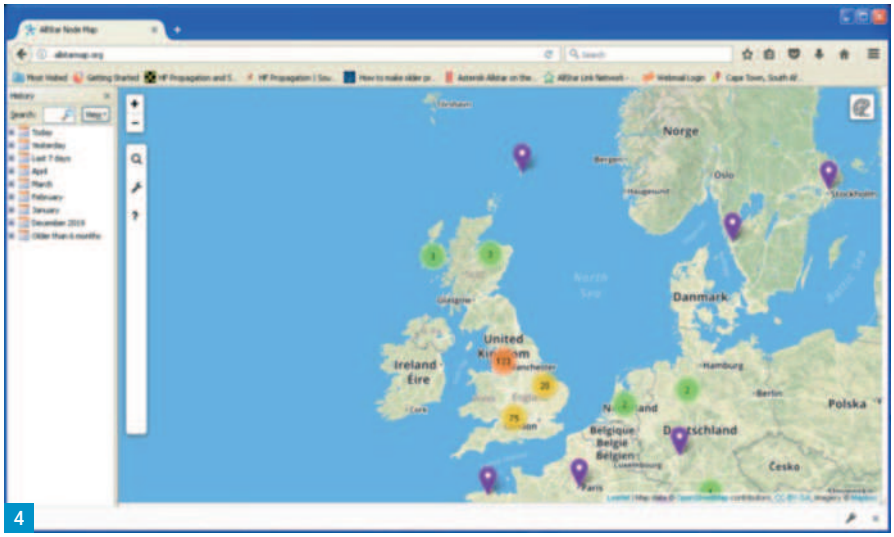
Up & Running at Last

I found it most helpful to consult both documents I have mentioned while checking the Admin Menu List. I realised the two main ones are 11: Run Asterisk CLI client, and 12 Simpleusb-tune-menu options (below). I thought their order could have been reversed because 12, 'simpleusb-tune-menu Application' (below), is needed to check operational issues.

12 Simpleusb-tune-menu menu options
Active simpleusb device stanza: [usb]
S) Select active USB device stanza
V) View COS, CTCSS and PTT Telemetry using real-time display
P) Print Current Parameter Values
2) Set Rx Voice Level (using display)
3) Set Transmit A Level
4) Set Transmit B Level
B) Toggle RX Boost Mode (currently Enabled)
C) Toggle Echo Mode (currently Disabled)
D) Flash (Toggle PTT and Tone output several times)
E) Toggle Transmit Test Tone/Keying (currently Disabled)
K) Manually key COS (currently Unkeyed)
F) Toggle PRE-emphasis Mode (currently Disabled)
G) Toggle DE-emphasis Mode (currently Disabled)
H) Toggle PLfilter Mode (currently Enabled)



3



4

I) Toggle PTT Mode (currently active LOW)
J) Change COSFROM Mode (currently "usbinvert")
L) Change CTCSSFROM Mode (currently "no")
M) Change RXONDELAY value (currently "0")
N) Change RXAUDIODELAY value (currently "0")
W) Write (Save) Current Parameter Values
0) Exit Menu
Please enter your selection now:

It is not my intention to duplicate both PDFs here. However, I did find it helpful to have both open on my laptops for the final stages. A command worth mentioning is 'W'. Whenever you change a parameter, you need to Write (Save) it before exiting. It caught me out a couple of times. My problem with internet-based instructions is that I need to see them when I am utilising them. Obvious?

Problems en Route

My main problem when I first connected to the system was distortion of the automated messages (time announcements, etc.) on my Baofeng UV-5R. Reducing the Transmit level in the software (3 above) to 75 cured this, before first attempting to monitor any activity. In the menu Transmit is what the node transmits (you receive on the HT). RX is what the node receives (you transmit from your HT).

Once Option 11 is open, another node can be connected. You will receive automated confirmation. If no connection is made, then you receive regular time checks.

Commands you need are listed in the files but the basic format from the keyboard is:

'rpt fun [your node] *(Command number) [other node]'

Note the single space between rpt, fun, your node, and *.

There is no space between *(command number) and [other node]

e.g. rpt fun 49559 *341288

(*3 for connect, *1 for disconnect and *2 for monitor)

The format is the same.

DTMF commands from the handheld can also be used.

Then I tentatively connected to the UK Hub. The automated message said I had done so, but the operator that I spoke to told me my audio was too low. I disconnected, exited, and went back to Item 12 of Fig. 3. I adjusted my audio as instructed in the guide by KG8MM. I raised it from 500 to 700, using 2) Set Rx Voice Level (using display) (above). Then I reconnected to the UK Hub and my audio was fine. I have since been told that I could have connected to a Node that echoes my audio – the Parrot.

I tried to connect to nodes belonging to Chippenham Radio club members. It was No Go! So, I messaged **Brian G6HUI** to tell him that I'd tried to connect. He alerted **Peter Kendall G7RPG** (g7rpg@hotmail.com) well known for his MicroHUBs. And fortunately, Peter solved our problem. Apparently, neither of us could receive calls from each other, but we could connect to a hub! The reason, as explained in the first of the PDFs, is 'You have not configured your router to forward UDP port 4569 to your AllStar node' [1]! I'm still not sure what that means. Hence the question posed in the title.

The following morning, I had a great catch-up chat with a couple of members. I will be finding a way to connect to any node, and receive. Apparently, 'forward porting' could compromise my internet security. But I'm sure someone can tell me how to minimise the risk. I will try to let readers know.

Most of my problems of 'not knowing how to proceed' with AllStar would have been minor if I'd known to look for https://hamvoip.org instead of seeking for assistance at https://allstar.org Personal requests and Google searches had minimal effect on my progress.

For reference, my node is ZT1T South Africa and numbered 49559: I will be standing by on arranged weekday evenings for fellow club members through MB7AKL. And I will be monitoring, or connected to, the UK hub some of the time. My latest contact of note was with 8P4JS.

In conclusion, I should mention one excellent facility that helped me to locate hubs and nodes. It is allstarmap.org (see screenshot, **Fig. 4**) Obviously, very recently activated nodes may not be on the map. But this interactive map of the World shows the vast majority of the hubs and nodes. Finding information about a particular node, using the list on the **AllStar.org** site, with the intention of making a connect is another story ...

Reference

[1] See Section E. Phase 4, sub. 12 in the first PDF.

Supplementary Notes:

On the FT-8900 (and most modern radios) the 6-pin mini-DIN socket is called a data port, but in reality it is only an audio port. The audio might be from 100mV to 300mV. The volume control of most radios will be bypassed.

So, using software commands to adjust is preferable to inserting resistors. See WA8LMF's internet site and look for 6-Pin Mini-DIN Packet/Data Connector.

Modifying a handheld for an AllStar node is well documented on the Net.

Web searches: RSGB Emerging Technology Coordinating Committee.

Google searches: AllStar repeaters + UK, UK AllStar Hub.

Specialist Dealers

Antennas

Bantenna.co.uk

Modern aerials for portable or permanent installations

Work around the globe on aerials SOLD around the globe!
Cards, PayPal or bank transfer accepted

www.Bantenna.co.uk
info@bantenna.co.uk

Scotland

TENNAMAST
General Steel Fabrications
Radio Masts | Masts | Boat Cradles | Trailers

A complete range of Multi purpose Masts
The best of Scottish engineering!
Tel: 01505 503824
www.tennamast.com
sales@tennamast.com

Somerset

LINDARS RADIOS

'A Modern Company With Old Fashioned Values'

USED AMATEUR RADIO EQUIPMENT PURCHASED AND SOLD
www.AmateurRadioSales.co.uk
01935 474265

South Yorkshire

LAMCO | VINE antennas

LAM Communications Ltd.
5 Doncaster Road
Barnsley
South Yorkshire
S70 1TH
01226 361700
sales@hamradio-shop.co.uk
www.hamradio-shop.co.uk
/lamcomms

Suffolk

www.itender.co

Monthly communications tenders!
Ex Police Service
General comms company stock

Contact: 07788 498962

TechnoFix UK

We supply a variety of accessories for amateur and professional transceivers, including

Programming and CAT cables
Linear switching cables,
Microphones
and much more!

For these and other great items go to
technofix.uk or
www.technofix.co.uk

TOP PRICES PAID FOR ALL YOUR VALVES, TUBES, SEMI-CONDUCTORS AND ICS.

Langrex
VINTAGE ELECTRONICS

Unit 4, Daux Road, Billingshurst, West Sussex RH14 9SJ
Tel: 01403 785600 Fax: 01403 785656
www.langrex.co.uk

SCAN HERE TO GO TO OUR WEBSITE

SCAN HERE TO GO TO OUR WEBSITE

Bargain Basement adverts cost just £5.00

BY EMAIL Firstly email your advert's wording to **kristina.green@warnersgroup.co.uk** and then call **01778 392096** to make your payment. **BY POST** Send your advert to: **Bargain Basement, Practical Wireless, Warners Group Publications plc, West Street, Bourne, Lincs. PE10 9PH** Please write your advert in BLOCK CAPITALS up to 30 words, plus 12 words for your contact details and send it together with your payment of £5 (subscribers can place their advert free of charge as long as they provide their subs number or mailing label). Cheques should be made payable to Warners Group Publications plc, credit card payments also accepted. Advertisements from traders or for equipment that it is illegal to possess, use or which cannot be licensed in the UK, will not be accepted. No responsibility will be taken for errors and no correspondence will be entered into on any decision taken on any of these conditions. The Publishers of Practical Wireless also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

Kit Suppliers

Phoenix Kits
Kits for the Radio Enthusiast

A wide range of low cost but High Quality Kits with a leaning towards CW and QRP enthusiasts.

Some of the Kits from our range:-

Morse Tutors, Magic Eye Tuning Indicator, Keyers, Dummy loads, Practice Oscillators, Flat Pack CW Key, and many more....

www.PhoenixKitsOnline.co.uk
sales@phoenixkitsonline.co.uk

Mid Glamorgan

SANDPIPER AERIAL TECHNOLOGY
Unit 5, Enterprise House
Cwmbach Industrial Estate, Aberdare
Mid Glamorgan CF44 0AE
Tel: (01685) 870425 Fax:(01685) 876104
A full range of transmitting & receiving antennas available for the amateur commercial market.
www.sandpiperaerials.co.uk
e-mail: sales@sandpiperaerials.co.uk

Classified Adverts

Antennas

G4TPH MAGLOOPS Remote tune and manual tune models. 40m through 10m, 100 Watts, SSB.
See PW review on website.
Details at www.g4tph.com

Valves

VALVES & ALLIED COMPONENTS in stock Ring for free list. Valves/books/magazines wanted.
Geoff Davies (Radio).
Telephone: 01788 574774

Repairs

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

Wanted

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

For Sale

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

TO ADVERTISE IN PRACTICAL WIRELESS
Contact Kristina Green
Telephone 01778 392096
kristina.green@warnersgroup.co.uk

Bargain Basement

For Sale

RADCOM MAGAZINES. Complete: 1994, 1995, 1996, 2000, 2010 £10 per year. Not Complete: one month missing from each: 1993, 1997, 1999 £8 per year or £70 for all.
Malcolm: 0191 3731585
or malcolmbrown1944@gmail.com

AOR AR-DV1 RECEIVER in mint condition including the box. £750 buyer collects. for more info. **Pete 07909 783247** NORFOLK

FREE FOR COLLECTION **VARIOUS RADIO MAGAZINES** 1962-2020 Some in binders, others loose. Collection only. Email for list
Peter: gw8arr@msn.com

VINTAGE DF GONIOMETER £20 + carriage, FT290R SK sale £40 + carriage. For other LF items and test equipment email for list.
John: 07976 268662, g3wkl@btinternet.com
NEWPORT PAGNELL, BUCKS

FREE **MULDIVO MENTOR INSTRUCTIONS BOOKLET** for Model WSR160 hand-crank calculator. First person to tell me their postal address gets it sent with my compliments.
Godfrey G4GLM: (020) 8958 5113
or cgmm2@btinternet.com

Wanted

UNILAB TEACHING APPARATUS 1960s/70s science/physics/electronics. Characteristically black plastic cases with white engraving. What Have You? **Godfrey G4GLM: (020) 8958 5113**
cgmm2@btinternet.com

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

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

5G

Dear Don,

John Dunton G1RXC in his letter in July *PW* has perhaps missed the main purpose of 5G, which is to completely replace the old legacy 2G and 3G systems. Mobile phone companies are already planning the switch-off of 2G and 3G and the repurposing of the frequencies for 5G operation.

5G will provide the user with faster internet access, for web browsing and YouTube, and be able to handle the ever-increasing bandwidth demands as the traditional broadcast services (TV/Radio) continue the transition to delivering all of their content via the web instead of 'on-air'.

Perhaps John is making a joke at the end of his letter when he says he thinks a 10W power limit will be introduced? There is, of course, no intention to do any such thing but his letter may inadvertently heighten fears at a time when many amateurs are very concerned about the new EMF regulation.

From what I've seen so far, the new regulation will have virtually no impact on current amateur operations at home or portable and while it introduces what I view as a completely unnecessary paperwork exercise, at least the new RSGB Calculator makes it quick and easy to comply.

Trevor Hawkins M5AKA
Chelmsford

PW Reviews

Dear Don,

I enjoyed the review of the Yaesu FTdx10 in the July edition, as I did much of the rest of the magazine.

While I'm sure the review is entirely objective, it's obviously rather open to criticism when we allow those producing the magazine, reliant as they are on big-brand advertising, to review the products that manufacturers and their sellers want to promote (and do) within that same publication.

It's important to all readers, contemplating an expensive purchase like a transceiver, that reviewers not only uphold strict objectivity and independence, but are seen to display those characteristics, too. That is best achieved, I would suggest, by using a range of reviewers who have no direct involvement in the magazine's production, other than as an occasional contributor.

Beyond that, it is also required of any hobby magazine to go ahead and publish reasonable criticism of a product, and not censor any such criticism. It's a challenge, I know. But standards and the appearance of standards do count.

John Rowlands MW1CFN
Anglesey

*(**Editor's comment**: Thanks John. While I take your point, no reviewer is going to be totally exempt from the possible accusation of pandering to the magazine's advertisers. And finding reviewers who are consistent in their approach, can write well and understand the requirements of potential users of equipment is easier said than done. But I must also admit a degree of self-indulgence here because I enjoy HF operation and the opportunity to try out new transceivers that come along – a perk of the job, if you like. In the case of the FTdx10, though, I was unable to get my hands on a loan transceiver from either of the UK importers because units were selling as quickly as they arrived. So, in this instance, I actually bought my own in order that* PW *could be first in the UK with a review.)*

Next Month

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

REVIEW: Richard Constantine G3UGF gets hands-on with the Wouxun 2/4m Anniversary Pack.

THE VC999: Tony Jones G7ETW takes a look at a piece of test equipment that might just appeal.

A WIRE DIPOLE: Vince Lear G3TKN offers a design for a dual-band wire dipole for 6 and 4m.

VALVE & VINTAGE: Bernard Nock G4BXD returns with some classic Eddystone sets for the museum.

KITS & MODULES: Geoff Theasby G8BMI recommends some more low-price devices to help and amuse in the shack.

There are all your other regular columns too, including HF Highlights, World of VHF, What Next, Making Waves, Notes from a Small Station, Doing it by Design and Data Modes.

Analyse This!

See www.HamRadio.co.uk
for our full range of antenna analysers

MyDEL

SARK110 Vector Impedance Antenna Analyser
Only £349.95

Pocket-sized Antenna Analyser providing fast and accurate measurement of vector impedance, VSWR, vector reflection coefficient, return loss, and R-L-C (as series or parallel equivalent circuits). Typical applications include checking and tuning antennas, impedance matching, component test, cable fault location, measuring coaxial cable losses, and cutting coaxial cables to precise electrical lengths.

SARK-110-ULM Antenna Analyser
Only £199.95

The SARK-110-ULM is the entry-level model of the SARK-110 antenna analyser series. This is a truly pocket-size device, so you can take it anywhere. The built-in battery lasts up to eight hours on a single charge. It features a graphical display and an intuitive user interface that makes it easy to operate.

Deepace KC901S+ 4GHz Handheld Network Analyser
Only £1299.95

KC901S+ is a multipurpose RF instrument integrating a VNA (vector network analyser), spectrum analyser, field strength meter, and an extra low-frequency signal source. It can do complete single port vector measurement and 2-ports simple vector network analysing.

MetroVNA-180 & 250 Antenna Analysers

Both available from stock, Large clear 16k touch-screen display, Internal Battery, BlueTooth, either 100kHz-180 or 250MHz, WIN10 or MAC or Android interface.

MetroVNA-180: £269.95. 250 version: £289.95

Metropwr FX700 RRP: £319.95

miniVNA

mRS miniVNA Antenna Analysers

Perfect for checking antennas and RF circuits for hams and commercial users.

MiniVNA Pro 2 with Bluetooth 100kHz-200MHz **£392.95**

MiniVNA Tiny
Huge coverage, 1MHz-3GHz, Android controllable. **£409.95**

RigExpert

AA-1400
Powerful antenna analyser designed for testing, checking, tuning or repairing antennas and antenna feedlines..... **£599.95**

AA-230 ZOOM Bluetooth Version
00kHz-230MHz, Graphical SWR, PC Connection, Built-in TDR **£389.95**

AA-55 ZOOM
60kHz-54MHz, 100kHz-54MHz, Graphical SWR, PC Connection, Built-in TDR **£279.95**

Stick 230 100Khz-230MHz Analyser
The analyser is designed for measuring SWR (standing wave ratio), return loss, as well as other parameters of cable and antenna systems in the range of 100kHz to 230MHz. **£265.95**

Stick Pro
SWR measurement range: 1 to 100 in numerical modes, 1 to 10 in chart modes

R and X range: 0…2000, -2000…2000

Display modes: SWR, return loss, R, X, Z, L, C, Magnitude, and Phase Angle at a single frequency, SWR chart, 100 points. SWR chart at fixed HAM bands by IARU Regions, 100 points, Multé mode – to check your multiband antenna promptly, Cable tools (Velocity factor & Cable length measurer, Stub tuner, Cable loss chart, Cable impedance chart), TDR. **£324.95**

AA-650 ZOOM
100kHz-650MHz graphical display, 1kHz resolution **£509.95**

New! AA-1500 ZOOM
100kHz-1500MHz professional analyser available from stock **£699.95**

AA-2000 ZOOM
Frequency range: 0.1 to 2000MHz. Frequency entry: 1kHz resolution

Measurement for 25, 50, 75, 100, 150, 200, 300, 450 and 600 Ohm systems

SWR measurement range: 1 to 100 in numerical modes, 1 to 10 in chart modes

R and X range: 0…2000, -2000…2000

Display modes: SWR, return loss, R, X, Z, L, C, Magnitude, and Phase Angle at a single frequency, SWR chart (100 points). SWR chart at fixed HAM bands by IARU Regions (100 points), Multé mode, Cable tools (Velocity factor measures, Cable length measurer, Stub tuner, Cable loss check), TDR.

Optional open-short-load calibration in SWR, R, X, or Smith/polar chart graph modes. **£845.00**

Those listed with "ZOOM" capability makes graphical measurements especially effective.

MARTIN LYNCH & SONS LTD. The WORLD FAMOUS HAM RADIO STORE

ML&S

www.HamRadio.co.uk

SAFE ONLINE SHOPPING. E&OE

0345 2300 599

Wessex House, Drake Avenue, Staines, Middlesex TW18 2AP
E-mail: sales@hamradio.co.uk
Opening Hours: Mon - Fri: 8.30am to 5pm. Sat: 9am to 4.30pm.
International Tel: +44 1932 567 333

Have you watched ML&S TV yet?
Every week there's something new. One simple URL
www.MLandS.TV YouTube

FOLLOW US ON TWITTER AND FACEBOOK
HamRadioUK

Have you listened to our ML&S Podcasts yet?
Listen right now on Spotify, Apple Podcasts & Pocket Casts
Apple Podcasts Pocket Casts

YAESU
The radio

C4FM/FM 144/430MHz Dual Band Mobile

High Visibility and Resolution QVGA Display with Exceptional Operability

Real Dual Band Operation V+V/U+U/V+U/U+V & Simultaneous C4FM Monitoring

FM Friendly Digital : AMS (Automatic Mode Select)

System Fusion II Compatible

WIRES-X Portable Digital Node Function

- Wide Range RX Coverage : 108 ~ 999.99 MHz
- Easy to Operate II (E2O-II) : New User Interface for Easy Operation
- New Memory Auto Grouping (MAG) Function
- New Multi-Channel Standby (MCS) Function
- High-Speed 61 Channel Band Scope
- Easy Hands-Free Operation with Built-in Bluetooth® Unit

C4FM/FM 144/430 MHz DUAL BAND
50 W DIGITAL MOBILE TRANSCEIVER

FTM-300DE

YAESU
The radio

YAESU UK Ltd
Unit 12 Sun Valley Business Park, Winnall Close
Winchester, Hampshire SO23 0LB

For the latest Yaesu News , visit us on the internet at www.yaesu.co.uk

More from us...

If you've enjoyed Practical Wireless here are six more magazines from us to try

RadioUser
At the forefront of emerging trends in both broadcast and two-way radio.

MMM
The Motorhomers' magazine packed full of inspiring motorhome travel features.

Caravan
For new and experienced caravanners with top holiday ideas in the UK & overseas.

Diecast Collector
The UK's only diecast model magazine featuring the latest news, releases & reviews.

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

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

Leave us a review

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

The Battle of Britain
IN COLOUR

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

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


THE BATTLE OF BRITAIN IN COLOUR

The Battle Looms

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

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

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

Predicted Catastrophe

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

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

BACKGROUND TO BATTLE

THE RAF FIGHTER PILOT

THE RAF FIGHTER PILOT