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Waters & Stanton Ltd, Spa House, 22 Main Road, Hockley, Essex SS5 4QS

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Keylines

Don looks back on 2016, a year that, despite indifferent propagation, had plenty of interest for the hobby. He also looks to what 2017 might have to offer.

I'm writing this shortly before Christmas so perhaps it's a good time to look back on 2016 from an amateur radio perspective. It has to be said that HF propagation has been disappointing for much of the year although that hasn't stopped HF enthusiasts from chasing everything that moved, which has included a slew of special event stations all over Europe and elsewhere, just as an example. I get the impression that data modes activity has ramped up quite strongly, largely due to the introduction of new modes and improved software. On VHF, while the bands are deathly quiet for much of the time, unfortunately, at least there is significant support for the RSGB Activity Contests so there must be plenty of amateurs out there with VHF capability – the challenge is how to develop that back into the sort of daily activity we used to see in days gone by.

On the equipment front, several themes come to mind. There have been some great new products, many of them reviewed in these pages. These not only include some excellent SDR transceivers but plenty of affordable add-ons for the shack from innovative small companies such as SOTAbeams, SDR Kits (see the *News* item and their advertisement in this issue), Cross Country Wireless, Kanga Products and others.

Here at *PW* we have enjoyed a good year. I've been delighted at the feedback from readers, especially at events such as Kempton Park and Newark, and there has been a steady stream of great articles arriving in my inbox. What's more, there has been lots of reader correspondence, to the extent that I need to apologise here for holding some of it over. Hopefully I'll manage to publish most, if not all of your letters in due course but I have to squeeze in the occasional article too! However, it does emphasise the point that *PW* is still, as it has been for many years, a dialogue between publisher and readers rather than a one-way street and long may that continue.

Kits

Kits and kit building have been a significant topic of your letters recently, which is great. It's good to know that many of you still enjoy home construction and kit building is a great way to go, if only because it eases the chore of getting hold of the required components. **Tim Walford G3PCJ**, whose *Halse and Hatch* design we published this year, was asking me whether I had any ideas for future projects, perhaps somewhat simpler. He and I would welcome your input but please, no suggestions for an evening project to build a 10-band high-performance 100W transceiver for under £20!

The Future?

Having looked back, it might be time to think about what 2017 will bring. HF propagation certainly isn't going to improve for some years yet but the LF bands still have much to offer. Now that the 5MHz allocation is available to all Full licensees, maybe it's time to give that a whirl. Or perhaps it's time to get back onto VHF, which, as **Tim Kirby's** column demonstrates month by month, isn't just somewhere to go for contests or the occasional propagation enhancements (tropo, aurora, Es and so on). Some readers are operating there daily, making contacts over hundreds of kilometres under flat conditions simply by paying attention to good station design. Others are making DX contacts using digital modes to work meteor scatter or even low power moonbounce (see story this month). I am also continually amazed at what some of his correspondents achieve working through the satellites (and there are more amateur satellite launches planned for 2017). It seems that you can work great distances with simple handheld radios so none of us has an excuse.

As for construction, why not reorganise your workshop (see **Phil Ciotti's** article last month, for example) and plan some projects. I am particularly remiss in that regard. I have a workbench in my garage, with power and lighting. However, it's usually covered in stuff that I have simply dumped there and it's a major job to clear it when I have some constructional work to do. Perhaps that needs to be my New Year resolution!

Your local club can be a focus for your efforts too. I have more to say on that but space is running short so I will keep it for next month.

Greek Symbols

Finally, I apologise that the Greek symbols problem has occurred again in a couple of articles recently. When I proofread the original Word documents, the omega (ohms) symbol (which is the commonest although by no means the only offender) comes out fine but in the fonts we use for the final page proofs, it sometimes turns into a letter W (actually the same letter but in the Roman alphabet). It happened, for example, in **Tony Nailer's** *Technical for the Terrified* column in the December issue. Tex and I do our damndest to root them out but the little critters sometimes escape us.

Don Field
G3XTT

Practical Wireless

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BARTG News

BARTG (British Amateur Radio Teledata Group) contests are a long established part of the data contesting calendar. However, their rules and aims were set in the mists of time. To bring these contests up to date with current technology and operating practices and to appeal to a wider audience, BARTG are pleased to announce the following modifications to their contest portfolio.

First, BARTG are pleased to announce the introduction of their Championship to find the Diddler of the Year. There will be two championship tables, one for SOE and one for SOAB. All entrants into these two sections in each of the four contests will be entered automatically into the section table. The first place at the end of the four contest season will receive a BARTG Salver and the top five entrants will receive a commemorative certificate.

Second, for the 2017 season BARTG are changing the section rules for the Single Operator All Band (SOAB) section. Full details of the rule changes will be on the BARTG website under the relevant contest. To summarise, the changes to SOAB are to limit the maximum power output to 100W and SO2R (single-op, two radio) is not permitted. Remote operation will be permitted for all classes.

2017 will see the Multioperator (MO) section split into Multi Single and Multi Mult classes. This is to encourage participation from the contest groups.

Due to the lack of entrants, the SWL section has been withdrawn from the January Sprint and March HF contests and has been replaced with a QRP section where the maximum power output is 5W. All other SOAB rules will apply.

The automatic promotion criteria to Single Operator Expert (SOE) from Single Operator All Bands (SOAB) is being changed because the current system can discourage entrants who feel uncompetitive in the Expert class. The qualifications for the Expert list for 2018 will be altered so that the three years qualification is reduced to one. In SOE the three years qualification is reduced to two. In this way, the churn of stations in SOE will be increased.

Finally, BARTG is looking for a webmaster who is well versed in the dark art of website creation and maintenance to bring a fresh new look to their web presence. The position would be voluntary and will be a committee position. Ideally the applicant will already be a friend of BARTG. If you are interested in taking up the challenge, then please apply by e-mail to **Ian Brothwell G4EAN** via **secretary@bartg.org.uk**

www.bartg.org.uk

New Product from SDR Kits

SDRplay Limited recently announced the launch of a second Software Defined Radio product – the RSP2. Building on the popularity of their first product, the RSP1, the RSP2 delivers a number of additional features that result in a higher specification for specialist amateur radio users as well as benefits for scientific, educational and industrial SDR applications.

Here are the main additional features of the RSP2:

- 10 built in front-end pre-selection filters, with substantially enhanced selectivity
- Frequency coverage extended down to 1kHz
- Software selectable variable gain Low Noise Preamplifier
- 2 x SMA Software Selectable 50Ω RF ports (1.5MHz – 2GHz)
- 1 x High Impedance RF port (1kHz – 30MHz)
- Built-in software selectable MW/FM notch filters
- Highly stable 0.5PPM TCXO trimmable to 0.01PPM
- 24MHz Reference clock input/output connections
- 4.7V Bias-T option (on one of the software selectable antenna inputs)
- RF screening within a strong plastic case for the standard RSP2
- A Rugged metal box version – the 'RSP2pro' available in 2017

When used together SDRplay's own SDRuno software, the RSP2 becomes a high performance SDR platform. The benefits of using the RSP2 with SDRuno include:

- Highly integrated native support for the RSP2 professional grade software based upon class leading 'Studio 1', free of charge
- Calibrated S-Meter including support for IARU S-Meter Standard
- Calibrated RF Power Meter with in excess of 100 dB of usable range
- Best in class audio quality

Currently the RSP2 requires the use of SDRuno software but SDRplay plan to provide support for HDSDR, Gnu Radio, CubicSDR and are working with **Simon Brown HB9DRV/G4ELI** to get support within SDR Console.

The company believes that the RSP1 will continue to prove very popular as the lowest cost 12-bit SDR for applications such as shortwave listening or for use as a panadapter and are pleased that they can now offer more choice to the growing community of RSP users.

The RSP2 is expected to retail at approximately £156 inclusive of UK VAT.

www.sdr-kits.net

Product News from Nevada Radio

If hearing loss means your TV or amateur radio set is too loud for everyone else in the room, a TV Listener will help you to hear without annoying anyone, including the neighbours! The new amplicomms TV200 Wireless Headset allows you to choose your preferred volume, even if the television or radio sound is turned off. The volume on the new TV200 from amplicomms can be amplified to 112dB, that's as loud as a rock concert, while tweaking the tone and balance controls to enhance speech and clarity. The lightweight headset has a built-in microphone option, so conversations in the room can be picked up and the sound source turned off – you'll never miss out on chat.

Simple to set up, the base unit plugs directly into the sound source such as an MP3 Player, Mobile Phone, CD, TV or Radio, wirelessly transmitting the sound to the rechargeable headset. Using advanced infrared technology, the sound won't be interrupted if you leave the room or someone walks in front of you. Designed for comfort it's lightweight and easy to wear. The price is £59.99.

www.nevadaradio.co.uk

>

International Ham Stores Group

Three of the UKs leading amateur radio retailers and manufacturers have come together to form **International Ham Stores Group (IHSG)**, which will operate from a combined showroom and distribution centre at Portsmouth from April 1st. A 'soft start' migration to Portsmouth will commence for both Waters & Stanton and InnovAntennas from their current Hockley facility to Portsmouth this January. This strategy is being employed to ensure a smooth transition with least disruption to day-to-day operations so as to ensure a seamless migration from a customer's perspective.

Spokesman **Justin Johnson G0KSC** said, *"We are excited at the prospect of working in partnership, to bring new products and unparalleled service to the hobby radio enthusiast and professional alike. We have ambitious plans for growth and new ideas to engage with our loyal customer base. We will also be appealing to new customers that may not have considered our individual group members in the past, adding value with the vastly increased product range that IHSG will offer"*.

The three companies will continue to trade under their own names, but combine resources for logistics, marketing, repairs and customer service, which will streamline costs and overheads to provide a more competitive 'one stop shop' solution for customers.

DXtreme Station Log 12

DXtreme Software has released a new version of its popular logging program; DXtreme Station Log 12. New Features include:

- Automatic LoTW Upload
- LoTW Reporting
- JT65A and JT9 Contact Pre-fill
- Afreet Ham CAP Integration Expansion
- Quick Find
- Improv Imaging.
- Other Imaging Enhancements UX

Full details of these new and existing facilities can be found on the DXtreme website (below). DXtreme Station Log 12 retails for $89.95 USD worldwide for internet distribution. Reduced pricing is available for upgrading users, and CD shipment is available at a nominal surcharge. All prices include product support by internet e-mail. Further details from **Bob Raymond NE1I** at **bobraymond@dxtreme.com** **www.dxtreme.com**

Administrative Error in RSGB 2017 Yearbook

(from Southgate Amateur Radio News) The UK communications regulator Ofcom has admitted it released radio amateurs' private home address instead of their mailing address, where this was different. This information was published in the *RSGB Yearbook 2017* and the *2017 Callseeker Plus CD* and Flash Drive.

Ofcom has asked the RSGB to destroy all the unsold copies of the *Yearbook* and to replace those that have already been issued with a corrected edition.

You can read the RSGB statement at: http://tinyurl.com/z63y4bs

PW Book Store customers who have purchased the *RSGB 2017 Yearbook* from PW Publishing Ltd. should send back the front cover of the book to the RSGB directly, as instructed on their statement, for a replacement please.

60m Frequencies

(from the RSGB website) It has been brought to the attention of the Amateur Radio Observation Service that software commonly used by UK licensees for the production of signals in both JT65 and JT9 modes, uses a default preset frequency of 5.357MHz (JT65) or 5.359MHz (JT9) in the 5MHz band. UK licensees are reminded that, after applying the audio offset to the AFSK signal in JT65 mode, using these presets will, in the majority of cases, cause the transmission to fall outside of the upper band edge of the UK allocation of 5.354MHz to 5.358MHz. In the case of JT9, if the default of 5.359MHz is used all transmissions will be outside of the UK allocation. Many examples of this have been noted and it is imperative that these out of band transmissions cease in order that UK licensees remain within the terms of their Amateur Radio Licence.

South Bristol Amateur Radio Club News

Under the artistic guidance of Martin M0JEA and following his presentation at the Club a couple of weeks ago, SBARC have created a short video as a pictorial review of their special event and contest operations throughout 2016.

You can view the video on their YouTube channel or at the Club website: **www.sbarc.co.uk/club-activities**

News from RCQ Comms Ltd

Dave G3RCQ is offering the first ever Buy Back Scheme for used equipment. When you purchase qualifying used equipment from RCQ Comms Ltd a Buy Back (BB) sum is agreed at the time of sale.

An example might be an FT-1000MP, sale price £600, with an agreed BB of £450. Any time up to six months after the purchase, RCQ Comms Ltd will buy back the equipment at the agreed sum providing it is in the same condition as when sold. Customers have reported, *"it's great - I can change my equipment every six months and try something new"*. The cost of the above example, assuming the full six months is taken, is just 82p per day.

Some customers have said it's like hiring – there are no hidden charges and RCQ Comms Ltd arranges and pays for collection.

For full details e-mail **dave@g3rcq.com** or see the website below. **www.g3rcq.com**

Bake4Rory

The annual Bake4Rory cake sale took place at the BBC's New Broadcasting House in London, on November 8th, and raised a record breaking £4000. BBC Radio 4 presenter **Rory Morrison** died tragically young (49 years) in 2013, from lymphoma. The annual event, organised by BBC Newsreader/Announcer **Susan Rae**, sees Rory's former colleagues in BBC News, take to their kitchens to produce cakes and biscuits for sale in aid of the lymphoma charity WMUK (see link).

The photo (by **Jonathan Kempster M5AEO**) shows BBC Radio 4 announcers **Jim Lee G4AEH**, **Kathy Clugston** and Susan Rae behind the counter at the 2016 Bake4Rory cake sale.

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The Elecraft KX2

Editor Don Field G3XTT gets to grips with Elecraft's latest offering, the KX2 portable transceiver.

American manufacturer Elecraft have been around for a while now and readers will be familiar with many of their products, several of which have been reviewed in these pages. The company started very much as a kit supplier, offering the K1 two-band transceiver and the KX1 portable CW transceiver.

Things really started to take off though, with the K2 HF transceiver. Although a kit, the K2 offered state of the art performance, to some extent because, unlike the offerings from the major manufacturers, it reverted to an amateur bands only philosophy. This allowed the designers to optimise for amateur radio rather than trying to be all things to all people. The K2, though, was certainly not a beginner's project – it required many hours of careful construction and setting up. Quite an industry developed, of amateurs with constructional experience offering to build K2s for others or at least to step in and help. I happened to visit Elecraft's premises along with my good friend **Trey N5KO** on the day they were packing up to move to a larger facility, the result of the K2's success. At that time, other than the development facilities, the company was very much a packing operation, ensuring that customers got exactly the right set of components, carefully sorted into plastic bags.

The K3 changed all that. Its design is significantly more complex than the K2 and uses multilayer printed circuit boards and surface mount components. The K3, therefore, although offered in kit form, is a very different animal. The main units are assembled for Elecraft by professional subcontractors and the kit is a matter of putting the subassemblies together and then setting up the finished unit. In practice, the UK agent Waters & Stanton tell me that most customers opt to buy their K3 (or K3S nowadays) ready-built although they would undoubtedly have a better understanding of their rig by assembling it themselves. However, with an investment of £2,000 or more, it's understandable that they would want to be sure everything was 100%.

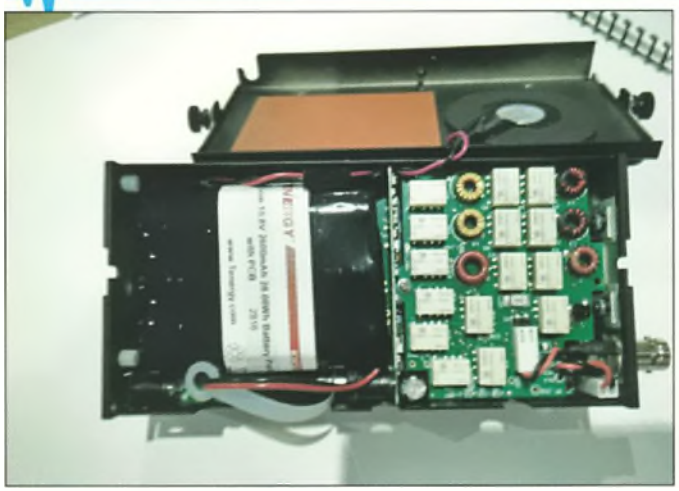
KX3 and KX2

The company's other products include the KPA500, which we reviewed in May 2014, and the P3 panadapter. More significant, though, in the context of the present review, is the KX3, a low power portable rig that has proved very popular. We reviewed it in the February 2014 issue and the KX2, reviewed here, draws very much on the KX3 heritage.

KX2 Market Positioning

When I looked at the Icom IC-7300 recently, I started by describing where I thought it fitted in the marketplace. I rather think a similar discussion is even more

KX2 with case open and no battery or ATU.



The KX2 with battery and ATU installed.

Carl 2E0HPI out portable with KX2 and data modes (laptop and MOAQC interface).

relevant with the new Elecraft KX2.

The KX2 raises a number of questions when you first encounter it. In some ways it's a cut down KX3 and yet the price is very similar (possibly even higher when you add in the sort of accessories you would need for regular portable operation). It's considerably more expensive than the Yaesu FT-817, which has been the mainstay of Summits on the Air (SOTA) and similar portable operations for a number of years now and against which the KX2 will be competing.

Let's Compare

Let's, then, start by comparing and contrasting. The KX2, unlike the KX3, comes only as a ready assembled unit (you can save money with the KX3 by buying as a modular kit). The KX2's features are very similar to the KX3 but it lacks the 160 and 6m bands and has no IQ output (to drive a panadapter or similar). The KX2 is significantly smaller and lighter than the KX3 so it is clearly designed for lightweight portable operations and has an interesting addition by way of an internal microphone so that you can use it as a handheld or similar with, say, a short whip antenna.

The Yaesu FT-817 is considerably cheaper than the KX2 and covers all bands up to 70cm, important for some SOTA activators because the main SOTA bands in the UK seem to be 40 and 2m. However, the KX2 has many more features than the FT-817, as I will describe, and, like the KX3, has a true SDR architecture with all the benefits that brings. The KX2 display is also much larger and clearer than that on the FT-817.

KX2 Features

Let's then, look at the features of the KX2 although a good start would be to reread our review of the KX3 because the underlying hardware and firmware are very similar. You get a compact SDR transceiver, covering 80 through 10m, offering SSB, AM, CW, RTTY and PSK, with an output of up to 10W, which can be powered from an internal, rechargeable battery pack or an external supply. With the (optional) antenna tuning unit (ATU), it will load into almost any antenna. The screen is the same size as that on both the KX3 and K3/K3S, providing lots of user information as well as showing decoded text when using data modes.

The specification, which you can easily find online (space precludes reproducing it in detail here) is extensive. The user manual runs to 72 pages and is suitably comprehensive. New firmware can be downloaded from the internet as and when available. There is lots of interfacing for microphone, PC, headphones and other external modules such as a VHF transverter or linear amplifier. Having said all that, as described above, I see this much more as a portable transceiver. If I was looking for a transceiver for home, for a similar price I would probably opt for one of the many other units available, covering a wider selection of bands and with a larger footprint. One of the disadvantages of the KX2 is that fitting so many features into such a small case while retaining the same display as on its bigger brothers requires every control to have multiple uses, which can be a tad confusing.

One feature that I found of interest, though common to its bigger brother, the KX3, is simultaneous receive within a 30kHz bandwidth (7kHz above and 23kHz below the main operating frequency). This allows you to, for example, operate split (see **Steve PJ4DX's** December 2016 article on split frequency operation for an explanation) and listen both to your own frequency and the other station at the same time. Usually the only way to do this is to buy a transceiver with a second receiver and these tend to be considerably more expensive. To use this feature, you need to be listening through stereo headphones or an external stereo speaker system.

For Morse (CW) operation, you can use an external paddle with the KX2's internal keyer and there are screw holes to attach an optional twin paddle key, rather than using a separate (often heavy) Morse paddle as you might use at home.

The built-in data modes capability uses an internal decoder for RTTY, PSK31 and PSK63. The decoded text scrolls across the display. For sending, there are two options. You can use preprogrammed macros or send from a Morse paddle, the KX2 converting the Morse to the appropriate data modes text. Of course, you can also interface to an external PC and use your favourite data modes program but carrying a laptop around with you rather negates the size and weight benefits of the KX2. That said, I daresay there are Smartphone apps nowadays that will replace the PC to do the same job.

In Use

My first task before firing up the KX2 was to fit and activate the internal ATU. W&S would have fitted this for me but I wanted to see how easy the job was. Actually fitting the ATU proved simple enough but replacing a couple of the small bolts with captive washer and nut proved to be quite a challenge, even with a pair of fine-nosed pliers to hold the parts in place. Changing the menu settings to activate the ATU was simple once I had realised that it was necessary to turn the radio off and back on again before the new settings took effect! The ATU appears to do what it says on the packet – I tried it with various odd lengths of wire and it loaded into them without problems.

The KX2 recognises whether it has an external microphone and, if not, defaults to the internal microphone. I checked my audio on both, listening on a separate rig. The internal microphone appeared to be more 'toppy' but otherwise fine and, in any case, you can adjust the audio equalisation.

Although the controls, as mentioned,

are mostly multifunction, I didn't find this a problem, perhaps because I have used other Elecraft rigs quite extensively. Receive performance appeared to be excellent, as anticipated, with signals coming through clearly on all modes on a busy 40m band on a weekend with a contest in full swing. This, when I first tried the rig, was on my high 40m rotary dipole, so there were plenty of very strong European signals – I well remember how my early transceivers used to suffer from severe cross-modulation in such circumstances. The excellent performance is no surprise. While I am in no position to make detailed measurements, a full set appeared in **Peter Hart G3SJX's** KX2 review in the January 2017 issue of *RadCom* and the KX3 is well-known for its very good receiver – see my comments in this issue in my ZL7G write-up.

I made a number of CW and SSB contacts and the results were as I would expect when running 10W – one 10W transmitter is much the same as another when all said and done. It's the antenna that helps a small signal go a long way. More to the point, as I said above, the receiver appears to be excellent, with the effect I have noticed with previous SDR radios, signals appearing almost to jump out of the band noise with great clarity.

What I did want to check out, though, was the KX2's data modes capability. I was intrigued by the idea of using the Morse key to generate text for transmission by RTTY or PSK. Would this really be a way of avoiding the use of an external PC or was it just a gimmick? In practice, it turned out to be very straightforward and as an experienced Morse operator I could see myself using the facility for straightforward contacts (perhaps in conjunction with some saved macros). There are limitations, if only because there are no Morse characters for some of the characters you might normally type from a keyboard but this is unlikely to be a serious problem. The KX2 goes into transmit as soon as you start keying. It adds a four second idle tone when you stop before reverting to receive but you can force it to receive mode more quickly should you so wish. As is usual with 100% duty cycle modes, you are recommended to keep the power to 5W or below for RTTY and PSK transmissions. This is not a lot for RTTY but PSK works very well at low power levels.

Carl 2E0HPI's Experiences

As I have said already, this is a radio that will be bought primarily for portable operations. *PW* readers will be aware

The KX2 really is a handheld HF transceiver. Here the subsidiary display is showing PA temperature.

that regular correspondent to our *HFH* column, **Carl Gorse 2E0HPI** has been using a KX2 for some months now for his portable activities. It was an obvious move, therefore, to supplement my own limited exposure to the KX2 with Carl's much more extensive experience. I am very grateful to Carl for spending time talking me through his thoughts on the KX2, which I have tried to summarise below.

Carl came to the KX2 having been an FT-817 user for a number of years. He was attracted by the range of facilities and particularly the option of using data modes although, not being an experienced Morse operator, so far he hasn't been in a position to use the option of keying in his text by that method. He uses a data interface from M0AQC together with his laptop in order to run JT65 and other data modes. As an alternative, Carl is looking at possibly purchasing a SideKar from QRP Works (see website below), a solution that is becoming popular in the USA.
www.qrpworks.com

Carl had previously looked at the KX3 as a possibility but was attracted by the smaller size of the KX2. It slips easily into his camera case, along with his photographic equipment (Carl is also a keen and experienced photographer). The lack of other bands was not a problem as far as Carl was concerned – he uses the main HF bands with a dipole or Alex loop antenna. Given that the dipoles are resonant and that the Alex loop can also be tuned to resonance, Carl has yet to invest in the KX2 internal ATU.

Carl has been very pleased with the KX2 in terms of its excellent receiver and its large, clear display. Both are significant improvements over the FT-817. However, he feels that the KX2 is less robust in terms of protection against the elements. For example, there is a hole on the rear panel allowing access to a connector that is only used during manufacture. It seems odd that this doesn't have some sort of rubber bung fitted in order to keep out the weather.

The KX2 is much less power hungry than the FT-817 and Carl's record so far is 138 contacts on one battery charge. As a dedicated QRP operator, Carl also loves the KX2's ability to reduce power down to milliwatt levels but, in any case, its battery life is excellent compared with other rigs. However, he has invested in a couple of additional battery packs for use on extended portable operations. At £70 a time, this is certainly not a cheap option. Changing the battery or removing it for charging (it cannot be charged in situ) requires opening up the KX2's bottom panel. The process is simple enough but there are two rather flimsy wires to the internal speaker and, Murphy's Law being what it is, sooner or later these are going to break. There is a small in-line plug and socket that can be disconnected but, more concerning, is that the speaker wire passes through a very small gap between case and one of the internal boards so that, to replace the back cover, the wire needs to be squeezed into this small slot each time if the cover has been removed completely.

Carl initially used the internal microphone and found it to be quite satisfactory although he now tends to use an external one. The internal loudspeaker is fine for indoor use but inadequate when, for example, operating in a windy environment or near the sea. In such locations, Carl uses his trusty headphones that have seen him through many such operations over the years. He finds the internal voice keyer a godsend when calling CQ repeatedly, helping to save his voice for actual QSOs!

One other aspect that Carl mentioned was that, in the summer when operating in direct sunlight, the KX2 tended to get very

hot. I gather that an additional heatsink is available for the KX3 for such situations and it will be interesting to see whether one becomes available for the KX2.

The Bottom Line

To try to summarise, the KX2 is a worthy addition to the Elecraft line-up and will appeal to those who want a compact, lightweight rig, particularly for portable operation. Its underlying performance is excellent and the user interface, while a little complex, allows a wide range of functionality. The main question, to my mind, is whether the pricing can be justified – the KX2 plus ATU plus microphone battery pack(s) and charger takes you to well over £1000, even before buying a carry case, Morse paddle and so on.

The performance of the KX2, along with the extensive interfacing, certainly mean that it could serve as the centrepiece of a home station, perhaps together with Elecraft's KXPA 100 amplifier and/or external VHF transverters although the controls are smaller and more fiddly than on a typical base station transceiver.

The KX2 decodes a CQ on RTTY. Note (to left of display) that the filter receives just the two RTTY tones, with a notch between them – something only digital filters can do.

The KX2 is sold by Waters and Stanton and priced at £859.95. The internal ATU is £219.95, battery packs are £69.95 and the external charger is priced at £33.95. Other accessories are available. Further details can be found on the W&S website and much more information is available on Elecraft's website. My thanks to W&S for the loan of the review transceiver and I am indebted to Carl 2E0HPI for sharing his extensive in-the-field experience of the radio.

http://hamradiostore.co.uk/search/?q=kx2

www.elecraft.com

Feature by David Beard G8FMX

• E-Mail: omegaorion@megaherz.plus.com

A Remote-Controlled Homebrew Screwdriver Antenna Part 2

David Beard G8FMX completes last month's Screwdriver antenna project.

The cover tube is made from clear acrylic with a wall thickness of 3mm and provides mechanical and weather protection for the coil. Its length should be about 150mm shorter than the base tube and its inside diameter should be sufficient to slide over the base tube with 3 to 5mm clearance. It is attached to the top of the PVC coil tube with a nylon collar cut from the chopping board, **Fig. 1**, and secured by three countersunk woodscrews placed around the edge. The acrylic tube is then fitted over the collar and should be a fairly tight fit. Adjust the cover tube with the coil fully inserted in the base tube, ensuring there is an equal gap all the way round, then drill three countersunk retaining holes around the top and into the collar. Start by using a 1.0 or 1.5mm drill-bit in a hand drill. Acrylic may crack and split if too large a drill is used to start with. Finish with a 2.0 or 2.5mm drill and countersink the holes by hand-twisting a larger drill bit in the hole. Secure with three countersunk brass woodscrews but don't over tighten. A plastic cover (I used the lid from a tin of de-icer) can be placed over the top of the cover tube and the collar to finish off the job neatly as in **Fig. 2**, which also shows a simple anti-twist device to dampen out any tendency for the coil to rotate as it moves up and down (see later description).

Preparing the Whip Sections

If you intend to use this antenna for mobile operation, the whole whip section should be a springy steel rod since it would be unwise to use 15mm pipe sections in that situation. One knock from a low branch would destroy the antenna in short order! Because the antenna has been designed primarily for fixed or portable operation, the use of the pipe sections adds some rigidity and wind resistance. There are two pipe sections topped by a telescopic whip. Each of them is 790mm (31in) in length, which includes a straight 15mm compression joint placed at one end of each pipe and screwed up tight with the olive in place. The top section is a telescopic whip 1.32m (52in) long and this is used for coarse tuning in conjunction with the coil inductance. For attachment to the copper pipe, I soldered the base of the telescopic whip to a straight 15 to 10mm brass reducer. I used a brass sleeve to obtain a tight fit into the smaller end of the reducer. For protection, the soldered joint was then covered with a small plastic cone slid down the whip to the brass fitting. At the other end of each pipe section is an olive and nut ready for attachment to the coil top or the second pipe. The photo, **Fig. 3**, shows how the couplings are arranged. When you have completed the

Fig. 1: The top of the coil with the cover flange fitted.

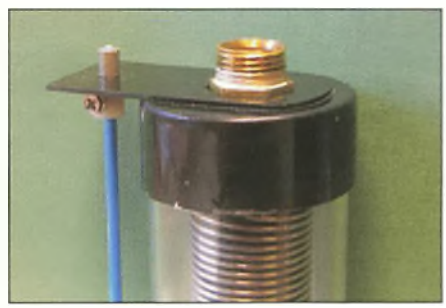


Fig. 2: With the protective cover and anti-twist arrangement.

Fig. 3: The three antenna sections, showing couplings.

Fig. 4: A close up of one of the holes drilled for the capacity hat.

Fig. 5: The capacity hat loops.

three sections, assemble them together and check they are straight.

In the compression joint at the end of one of the pipes (it doesn't matter which), drill a hole right through each of the flat faces on the hexagonal flange as shown in **Fig. 4**. These holes should be a clearance fit for the 14SWG aluminium wire to be used for the capacity hat loops.

Capacity Hat

The first patent for the use of a capacity hat was issued to **Sir Oliver Joseph Lodge** in 1898. For further information on the benefits of capacity loading there is a brief but good resume by **G4FGQ** at: **www.smeter.net/antennas/short-top-hat-loaded.php**

and by **K0BG** at: **www.k0bg.com/caphats.html**

Conventional wisdom dictates that the capacity hat must be mounted at the top of the antenna as far from the coil as possible so its efficiency is not degraded. The larger the capacity hat, the more effective it can be. However, practical considerations such as wind loading force a more pragmatic approach, the wind resistance of the antenna being traded off against a lower mounting position for the capacity hat wires. I arranged three detachable lightweight aluminium wires in a closed cloverleaf mounted at about 1.53m (5ft) above the coil with an effective diameter of 1.22m (4ft). Subsequent measurements indicated that this mounting position provided a wider bandwidth and required a lower inductance to resonate than with the whip alone.

Referring to **Fig. 5**, the capacity wires are formed from three 1.55m lengths of 14SWG aluminium florists' wire bent round to form a broad leaf-shaped loop. They fit into the holes drilled around the compression joint on the 15mm copper pipe whip section and should be a tight, self-supporting push fit. It doesn't matter whether they are not accurately in line because there is bound to be some upward or downward tilt on individual loops.

At frequencies above 18MHz, the capacity hat provided no practical benefit since, at that point, capacitance is too high and inductance required for resonance so low that the loading coil just 'runs out of turns'. Using the whip alone at these higher frequencies brings back the requirement for inductive loading and, in combination with adjustment of the whip length, the antenna can tune to the 6m band with half a turn inserted and a whip length of 77cm (30in). A good match as defined by low SWR and low residual reactance (X) can be obtained at the points of resonance.

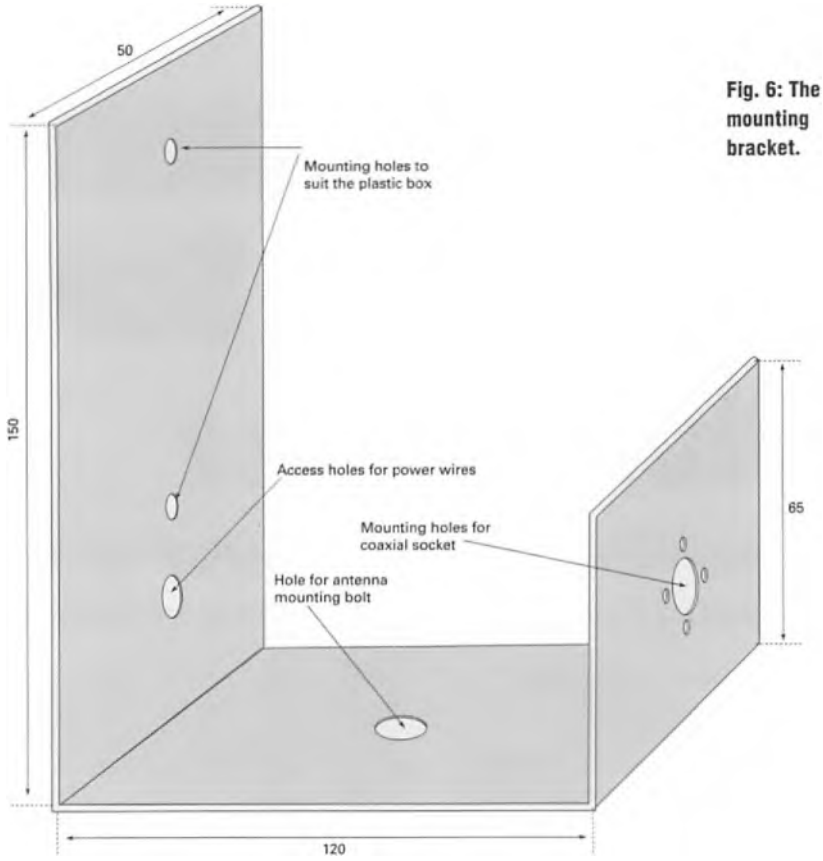


Fig. 6: The mounting bracket.

Preparation and Mounting of the Antenna

Before the antenna is mounted on the metal base, provision is made for a suitable connection of the RF feed. This may be done by means of either a solder tag drilled and tapped in the base tube or as, in this case, a copper or brass band around the lower end of the base tube, secured with a 55mm galvanised hose clamp. The copper band has a small pigtail on which to solder a wire from the centre of the SO239 socket. Next, a brass or aluminium U-bracket needs to be bent as shown in **Fig. 6**. I used a piece of 1.2mm thick brass, 50mm wide by 335mm long. On the shorter side of this bracket the SO259 socket should be fitted with four nuts and bolts while the other side provides a pillar on which to mount a 165 x 85 x 55mm plastic project box (Maplin) housing the wireless remote control unit and associated circuitry. The bracket will also accommodate the antenna's mounting bolt and a grounding strap.

I made the grounding strap from a short length of copper braid soldered to a large copper washer, drilled to accept the antenna's mounting bolt and ready for subsequent fitment under the brass bracket. The free end of the braid was screwed onto an earth rod clamp bolt.

For mounting the antenna, an aluminium panel 3mm thick, of sides 600 x 600mm, was used as the base plate. This size was a trade-off between portability, weight and a reasonable degree of mechanical stability while providing at least limited potential for capacitive coupling to ground. The plate was drilled in the centre to accept the antenna mounting bolt and a second hole was drilled about 200mm away from the centre through which a 4ft copper earth spike could be placed. When set up for use, the end of the earth spike should protrude about 50mm above the base plate to accommodate the clamp bolt.

Apply a large washer to the mounting bolt, followed by the brass bracket and earthing braid washer. Insert the bolt through the base-plate centre hole and fit another large washer. Apply the nut and tighten but not so much as to rotate the bolt inside the nylon plug. Ensure there is no electrical contact between the base plate and the base tube.

It is essential to provide extra stability for the base tube by means of a 'steady-post', which should be non-metallic. The photo, **Fig. 7**, shows the detail.

The top of the support bracket was cut from the nylon board then screwed to the top of a 25mm diameter wooden dowel secured to the base plate with an aluminium bracket. Prior to fixing, the

nylon board requires a hole to be cut in it that is 2 to 3mm larger than the acrylic cover tube diameter. The collar thus formed allows a sliding fit over the tube. The inner edge of the hole can be lined with felt or similar to take up any slack and to allow smooth movement during traversing of the coil.

Solder tinned copper wire from the coaxial socket centre pin to the RF feedpoint at the bottom of the base tube. The 'earthy' side will be in contact with the brass bracket, base plate and the earth rod. To add radials subsequently, the edges of the base plate can be drilled and fitted with small bolts and tags to accommodate these wires. However, in the design here, only earth rods are used.

A Word About Grounding

After hours scouring the internet and books on this subject, I came across a publication from *Signal*, March 1988, by a member of the US military and detailing an effective method of rod-earthing for field antennas. The 'take-home' message was as follows:

"Ground rods were driven into the earth at various depths and the resultant ground resistance and RF impedance measurements recorded. The tests were repeated with ground rods mechanically connected in series and driven to different depths in the earth. The use of four series-connected ground rods, driven only a foot or two into the earth, provided the most efficient ground system. These improved field grounding techniques should be applicable to amateur radio stations, particularly during Field Day operations".
Lt Col US (ret) David Talley W2PF.

I decided to adopt the series-connected approach with four ground rods of lengths 4ft. 2ft and two at 1ft arranged around the base plate. They were daisy-chained together with automotive earthing braid, the longest rod protruding through the base plate. All subsequent measurements and trials were conducted using this setup. As a future experiment, the effect of two 10m rolls of 25mm galvanised chicken wire laid out in a cross could be tried, the antenna being placed at the centre. In conjunction with the grounding rods, this should improve the performance noticeably.

Base Matching Coil

For frequencies up to about 10MHz, some form of matching between the RF feedpoint and ground is required to obtain a low SWR. This can be done either by the use of two switched capacitors for

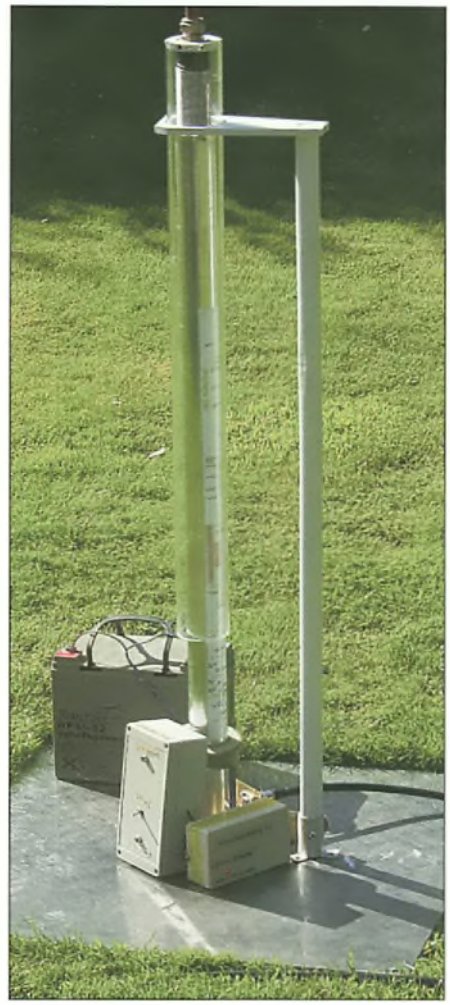


Fig. 7: The 'steady post' for the antenna base tube.

the 80 and 40m bands (usually around 800pF and 400pF respectively) or by a small inductor of approximately 0.5 to 1.5μH. The latter method is preferred for this antenna since it provides a DC path between the baseplate and the antenna and facilitates convenient remote selection of the optimal tap point for the 80 and 40m bands.

The photo, **Fig. 8**, shows the matching coil, which consists of 9 + 9 turns of 16SWG enamelled wire, centre tapped on a 1in former. One side of the coil is stretched to about 1.5in while the other side is compressed but individual experimentation is needed to optimise the SWR at say 3.55 and at 7.05MHz. The coil is mounted in a small plastic box and a 12V SPDT relay is mounted near the centre tap. The 'common' relay contact is grounded onto the brass mounting bracket and the 'NO' contact is connected to the centre tap of the coil. Energising the relay will cause only half of the coil (wider spacing) to be in circuit for the 40m band. 80 and 60m require the entire coil to be in circuit. Above 10MHz the entire inductance can remain in circuit since it plays no further part. The 'hot' end of the matching coil is taken to the SO259 socket centre

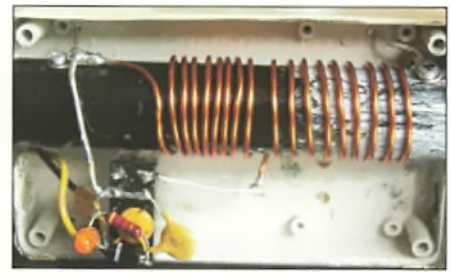


Fig. 8: The base matching inductor.

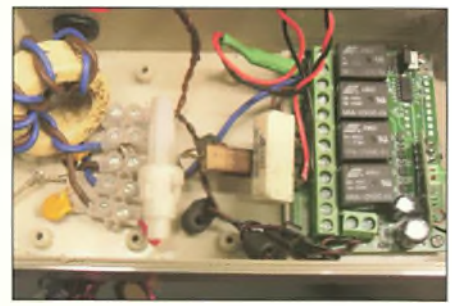


Fig. 9: The remote control receiver and relay board.

pin or to the RF feed point on the base tube (whichever is closer). Place an LED across the relay coil to indicate when the coil tap is selected. The actuating relay for the centre tap is a 'slave' and is energised via one of the relays in the remote controller, under the control of a button on the key-fob. The housing box can be conveniently secured to the baseplate with a couple of self-tapping screws.

Remote Controller

The direction and speed of the coil's movement in and out of the base tube and the base matching coil tap can be controlled with the key fob, which activates a four-channel wireless remote-control unit. This unit is mounted in a plastic box as shown in **Fig. 9**, secured to the longer side of the brass bracket at the base of the antenna. The wireless controller board runs on 12V DC and consists of a receiver unit operating in the 315MHz licence-free band, a decoder for the button codes and four relays with connector strips, which may not be arranged logically. For this reason, relay closure must be identified for each button using a continuity meter on the screws of the connector strip. Mark the relays A through D and determine which are the NC and NO contacts for each, making a note of the arrangement. There is also a jumper pin on the controller board and the position of this must allow the relays to latch such that the relay stays activated until the same button is pressed again. The schematic in **Fig. 10** shows the wiring diagram. The power leads to the motor are suppressed by means of clip-on ferrites and decoupling capacitors and a 1.5A fuse should be inserted into the positive battery line. I also mounted two

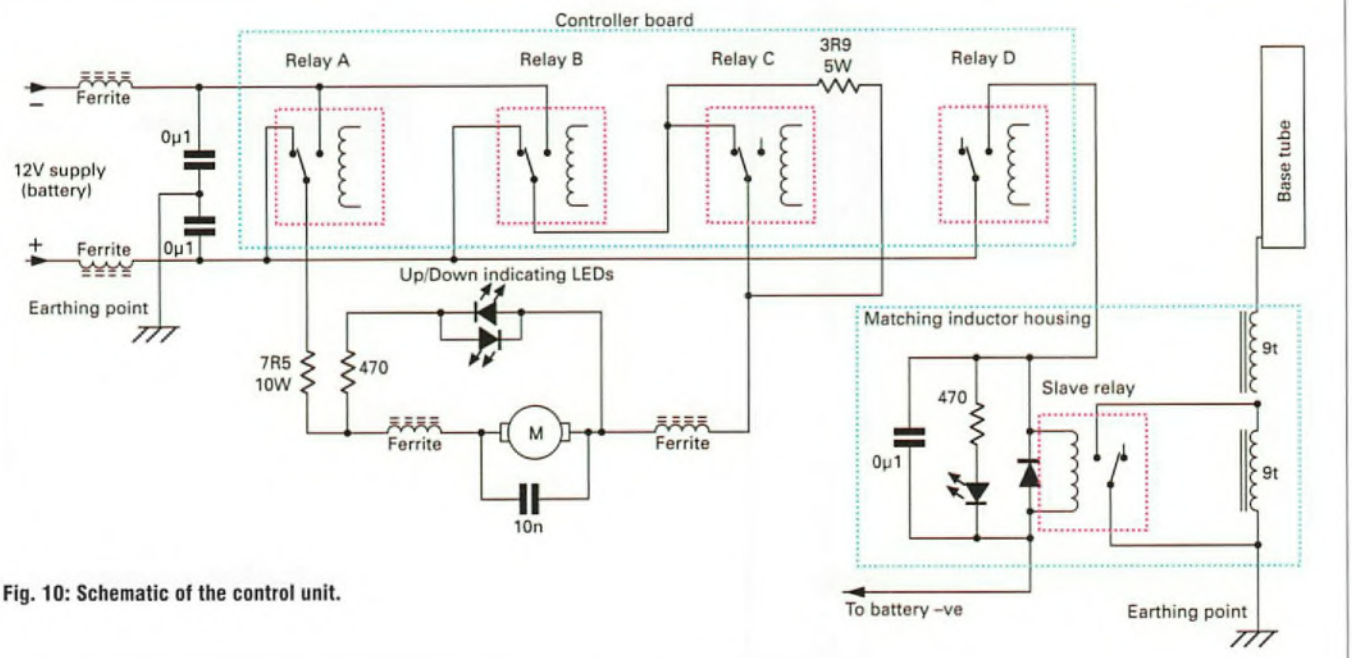


Fig. 10: Schematic of the control unit.

LEDs on the front of the box to indicate when the motor was activated either up or down. The leads to these LEDs were also given a few ferrite beads. Because the motor runs at about 2 to 4V, the 12V supply must be reduced. For my setup, a 7.5Ω 10W resistor in series with one of the motor leads provided the right speed. A slower speed for fine-tuning was added by using the relay controlled by button C to switch in or out an additional 3.9Ω of series resistance. Fit an on/off switch on the front panel to isolate the DC to the controller. Buttons A and B control the up and down movement of the coil and button C the speed while button D is wired to switch in the slave relay in the base-matching box. The power source I used was a 12V gel-cell battery positioned next to the antenna, thus removing the need for leads back to the shack or operating position. Battery leads should be individually suppressed with ferrite, as should the leads to the slave relay in the base-matching box. The key fob operated reliably over about 25m but should not be operated when the antenna is RF fed.

When you have completed wiring up the controller according to the schematic, check it and apply 12V from a bench PSU fitted with current limiting, in case of trouble. If all is well, press A on the key fob and the coil should go either up or down. Press A again to stop it. If it goes down when A is pressed, reverse the motor power wires. Ensure that button B causes the coil to wind in and A causes it to rise. The two LEDs should light, one for each direction. Activating button C will cause the motor to run at approximately half speed. Press D to activate the inductor centre tap for the 40m band, making sure that its indicator LED lights. Turning off the power will reset the logic and all the relays. Replace the PSU with the 12V battery. The power requirements are very modest (under 1A with the motor energised).

Calibration Scale

To aid location of the correct coil position for different bands, I contrived a frequency scale that consisted of a laminated paper scale fixed to the metal base tube. The bottom of the acrylic cover tube was used as the indicator. This somewhat crude but nevertheless effective method gave good repeatability. Temporarily fix a strip of paper to the base tube and set up the antenna with the four earth rods inserted (or your preferred grounding system). Then attach the whip sections at full length and deploy the coil almost all the way out. Now, using an antenna analyser (I used the Rig Expert AA54), adjust the coil for minimum SWR at 3.5, 3.6, 3.7 and 3.8MHz, with the entire base-matching coil in circuit. Adjust the turns of the matching coil by compressing or stretching to obtain the best match or compromise match between SWR and lowest residual reactance (X). You should obtain an SWR better than 1.3:1 over the 80m band so when you are happy with the result, mark the positions on one side of the paper strip at each frequency. Repeat this process for all bands at your favourite frequencies, ensuring that at 7MHz (and, possibly, 10MHz) the centre tap of the base-matching coil is selected and adjusted. Above that frequency all of the matching coil is in circuit but has no effect. The scale becomes cramped the higher in frequency you go. Make sure you adjust the length of the whip according to **Table 1**. The telescopic section is always in use and individual adjustment will undoubtedly be necessary. When complete, repeat with the capacity hat fitted, marking the other edge of the paper. You will find that the number of turns for resonance is much less with the capacity hat fitted and above about 14 to 18MHz the inductance required becomes too low to be usable so the hat can be removed. On completion, make a reference mark on the paper scale and the base tube for later alignment, then remove the scale and make a neater job of it. I scanned the paper scale into a graphics program (PaintShop Pro) for this purpose. Print out the final copy scale (same size!). It can be covered with adhesive clear plastic film before being relocated more permanently to the base tube using the reference mark.

Table 1: Antenna Length Guide.

Freq (MHz)	Total whip length (in)	Sections
3.5	114	3
3.6	114	3
3.7	114	3
3.8	114	3
5.3	104	3
7.1	104	3
10.1	104	3
14.1	104	3
18.15	90	2
21.2	90	2
24.95	72	2
28.5	60	1
29.5	60	1
51.0	30	1

And Finally

When the coil is moving up or down, the weight of the whip section (pipe plus telescopic section) and the light grip of the

fingerstock normally prevent the assembly from rotating. However, there may be a tendency for the coil to slip occasionally when the motor is providing full torque and rotating quickly. While it does not affect the operation, it can be a nuisance but is easily damped out. Refer again to Fig. 2 and note the plastic extension on the cover cap, which carries a plastic rod. This passes through a clearance hole in the nylon collar at the top of the steady post and moves in or out as the coil rises and falls. Providing the plastic rod is reasonably rigid, any tendency of the coil to twist is removed.

The stop nuts on the threaded rod are an emergency-only measure and it is advisable not to use these for stopping the coil routinely or the whole mechanism may jam because the motor develops considerable torque. Use the key fob and only move the coil to the point of interest on the calibration scale.

You have now completed the antenna – great work!

Testing the Antenna in the Real World

I set up the antenna on the back lawn with four earth spikes daisy-chained together and connected to the base plate. It was about 10m from the house and any shrubs or trees. For testing, I included the station's portable choke balun (19 turns of RG213 on a drainpipe former of 100mm diameter). This was sited close to the coaxial socket and connected with a short lead but was not used for measurements at 10 or 6m. RG213 cable was then run from the choke balun about 12m to the garden bench used for testing and was within easy range of the wireless controller. To start with, the whip was at its maximum length of 2.9m (114in) and the coaxial feeder was connected to the AA54 analyser.

The results are shown in **Table 2** without the capacity hat fitted. The data includes SWR, R, X, whip length, coil turns and the approximate 2:1 SWR bandwidth. This was then repeated as far as possible with the capacity hat in place, **Table 3**. In general, at resonance, acceptably low values of X coincided with lowest SWR although not always. Ideally, reactance (X) should be zero at resonance but measurement and other errors provide little confidence in that value. In practice, a close compromise between lowest SWR and lowest X value has to be made. The 2:1 bandwidth values probably have the worst confidence limits of all the measurements and increased more than expected as frequency increased, indicating possible deficiencies in coil efficiency (*Q*).

Screwdriver Antenna Properties (no capacity hat)

Freq MHz	SWR	R	X	Length of whip section (inches)	Coil turns	Bandwidth KHz (2:1 SWR)
3.5	1.01	50.1	-0.9	114	151	41
3.6	1.12	52.5	-5.1	114	145	47
3.7	1.03	48.0	7.4	114	137	51
3.8	1.08	53.7	-1.4	114	128	52
5.3	1.09	53.2	-3.3	104	71	77
7.1	1.05	53.0	0.3	104	40	175
10.1	1.11	45.0	0.9	104	20	490
14.1	1.07	46.6	-0.7	104	10	1184
18.15	1.06	50.1	-2.7	90	5.5	2175
21.2	1.06	48.9	2.5	90	3.5	3136
24.95	1.05	48.6	-1.9	72	3	3524
28.5	1.07	53.4	-0.5	60	3.5	3978
29.5	1.05	49.1	-2.7	60	2.5	5007
51.0	1.14	47.5	-6.2	30	0.5	13317

Table 2

With the capacity hat in place, the measurements confirmed that the inductance required for resonance at a given frequency was drastically reduced, in line with theory and as indicated by the number of turns exposed. Additionally, the 2:1 SWR bandwidth was increased proportionately at all frequencies up to 18MHz after which the added capacitance was excessive and had to be removed. Comparing the values of SWR, R and X at resonance revealed rather variable but nevertheless acceptable values with and without the added capacitance of the hat. It was also felt that these results indicated that the grounding efficiency was passable but not brilliant.

Screwdriver Antenna Properties (with capacity hat at 1.58m)

Freq MHz	SWR	R	X	Length of whip section (inches)	Coil turns	Bandwidth KHz (2:1 SWR)
3.5	1.06	46.6	0.4	114	105	67
3.6	1.03	51.3	0.6	114	99	67
3.7	1.08	53.7	-1.3	114	93	71
3.8	1.10	54.6	1.8	114	89	72
5.3	1.27	44.7	9.9	104	47	108
7.1	1.08	54.4	0.3	104	24.5	287
10.1	1.10	48.2	4.7	104	12	856
14.1	1.16	43.2	1.3	104	4	2046
18.15	Not relevant					
21.2						
24.95						
28.5						
29.5						
51						

Table 3

Contacts were subsequently made around the UK and Europe with the antenna at ground level using four series-connected ground rods. If you construct this antenna, give it a good trial under your own working conditions. I would be very interested in your results.

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LED Lighting & Importing Equipment

This month Colin Redwood G6MXL looks at the use of LED lighting in the shack and some of the factors to be considered if you are planning to import amateur radio equipment into the UK.

There is no doubt that good lighting is important for home construction and maintenance work. In my shack, I found that I was sitting between the window and bench and between the main room light and bench, so I was always working in my shadow. I considered some type of desk lamp but I really didn't want to take up valuable desk space or to have to keep moving it to illuminate whatever I was working on.

A visit to the lighting section of my local DIY store really opened my eyes to the possibilities of Light Emitting Diode (LED) lighting. These days LEDs are no longer just the domain of indicator lamps on equipment or numeric frequency displays. Modern LEDs are available in a wide range of colours, including clear white, and can provide high levels of light. Even in white they are available in different colour temperatures to give warm white or daylight white.

There are a number of advantages of LED lighting. Firstly, LEDs use very little electricity, so they are very economical to run. Secondly, they produce virtually no heat, so can be installed in locations where conventional filament lighting would not be possible due to the amount of heat given off. Thirdly, some of the varieties are very small so they can be placed unobtrusively under shelves.

LED lighting is available in many formats, several of which are particularly suitable for under shelf situations. I've summarised a few that might appeal to amateurs looking to improve the light in their shacks.

One option is one or more LED bulbs in circular mounts, **Fig. 1**, to go in holes in the ceiling or a shelf above the workbench. The disadvantage is that this is likely to limit what can be stored on the shelf above the workbench.

A second variety is a round or square patch of LEDs that be stuck or screwed to the underside of a shelf, **Fig. 2**. Some of these have built-in battery supplies, which will need to be replaced or recharged, so there is no need to provide wiring to supply the light fitting. Otherwise you'll need to provide wiring to the lighting. Some also incorporate motion sensors so probably will not suit most radio amateurs' needs.

A third variety is a narrow box, often made of metal or plastic, containing a number of LEDs, **Fig. 3**, some of which are designed for use on vehicles such as Land Rovers, often called light bars, which might be useful for overnight portable contests. These latter two types tend to be more expensive than other varieties. They also require power to be delivered to them. In some cases they need an external power supply, typically dropping the mains down to 12V DC. In other cases they incorporate the power supply within them, and require a mains supply instead. Again some incorporate motion sensors.

The fourth variety are stick-down strips of surface mount LEDs with surface mount dropper resistors incorporated, **Fig. 4**. These are usually just a few millimetres thick and typically require a constant voltage 12V DC supply. They are very versatile because they can be daisy-chained in series or parallel and can also be cut to length. The capacity of the driver required depends on how many LEDs are being lit. These are often supplied on

Fig. 1: These LED ceiling lights use three super-bright LED chips to provide the same brightness as a 60W halogen bulb but use only 9W. They can also be installed in a hole in a shelf above a workbench.

Fig. 2: A round battery-powered LED light unit that can be stuck to the underside of a shelf to provide illumination to a bench below the shelf.

Fig. 3: A box-type fitting containing a number of LEDs can produce a lot of light.

Fig. 4: Strips of LEDs incorporating surface-mount resistors can be daisy-chained using suitable connectors. They are ideal for use under shelves to illuminate operating positions or work benches.

Fig. 5: Checking the proposed location of a strip of LEDs under a shelf using Blu Tack.

plastic reels that look a bit like old reel-to-reel tape recorder reels. They typically use between 5 and 20W per metre. Be careful to buy the correct connectors – there is a great variety and a lack of consistency between manufacturers! I used a few blobs of Blu Tack, **Fig. 5**, to try the strip in various locations before settling on the best, after which I removed the cover off the sticky back to install the strip permanently.

Whichever type you decide to buy, make sure that you select the type with a suitable colour temperature because some are available in a variety of single or multiple non-white colours, which might impress guests at a party on your LED illuminated patio but won't help you identify the colours on a resistor! You should also beware, particularly with mains powered LEDs, that they do not generate hash over the shortwave spectrum, wiping out your HF (or indeed VHF) reception.

Power Supply

While some LED fittings incorporate a power supply, so can operate directly from the mains, for others you'll need to consider the power supply requirements. Modern LEDs can draw more than the traditional red LED's 20mA. Put 20 or more LEDs in parallel and the current demands can mount up. The general advice is to ensure that the power supply is adequately rated (allow at least 10% extra). I would suggest using a completely separate power supply to the one being used to power your transceiver and related items, so that you don't risk starving your transceiver of the current it needs on peak output power.

I would also choose a low-noise power supply. This might mean avoiding switch-mode varieties and choosing a more expensive linear model. If you suspect the power supply might be noisy, try substituting it with a 12V battery as an experiment.

You'll also need to make sure that the power supply or driver has a suitable connector for the type of LED lights you are using. I would therefore suggest buying the driver at the same time as the lights so that you can get assurance from the shop that they are suitable for each other – both connectors and sufficient current.

In many cases, LED lighting is sold on the basis that the LEDs are not replaceable. This shouldn't be an issue because LEDs usually last many years. However, they will not tolerate excessive voltage so be careful not to connect them to a supply with a greater voltage than specified.

Importing Equipment

Now to a completely different subject. The editor asked if I could touch on the issues to be considered when importing amateur equipment into the UK. Firstly, to clarify, by this I mean importing equipment that was purchased outside England, Wales, Scotland and Northern Ireland. Essentially, the issue fall into three categories.

Technical

The specification of equipment for different parts of the world can differ. This can mean that equipment may not cover bands that are used in the UK. For example, Icom's IC-7100 and IC-7300 models intended for the UK can operate on the 4m (70MHz) band, whereas the same models intended for countries that don't have a 70MHz allocation are unlikely to have this capability. Conversely, equipment intended for other markets, such as the US market, may have the ability to transmit in the 1.25m (220MHz) or 33cm (902MHz) bands available to US amateurs but not to UK amateurs.

If you anticipate using imported equipment that can operate through VHF or UHF repeaters, I would suggest that you check that it provides for the repeater shifts used in the UK. This is probably not so much of an issue as in years gone by because many transceivers can be configured to a variety of repeater splits. Likewise, most of the world has now adopted CTCSS for repeater access so that lack of a 1750Hz toneburst is unlikely to be an issue these days.

For mains-powered equipment, I would also check that it can operate from 220/240V 50Hz AC. Some equipment can be adjusted to do so but it may be pre-set at the factory to operate on 110/115V 60Hz mains. Other equipment may not be suitably equipped. Either way, you are likely to need to provide a mains lead with a UK mains plug. Most handheld equipment is provided with a small plug-in power supply or charger suitable for the local mains sockets, voltage and frequency. For imported gear, you'll need to obtain a suitable power supply or charger with a UK mains plug on it.

Don't forget to check that any equipment you import has instructions in a language that you can understand.

Guarantees

The guarantee provided with most new equipment will generally only cover certain countries. This will vary between manufacturers and perhaps even different models. You cannot expect to rely on UK consumer legislation for goods you have imported, particularly if from outside the EEA, so you will be totally reliant on the guarantee, which you should not necessarily expect to be honoured by UK-based dealers and distributors.

Duty and VAT

At the time of writing in early December 2016, it isn't clear what changes to import duty and VAT will apply, if any, to importing goods into the UK following Brexit. What follows is a summary of the current situation but readers should always check because arrangements can change, sometimes at short notice.

Currently, for goods imported from countries in the European Economic Area (EEA), which comprises European Union (EU) and European Free Trade Area (EFTA), no import duty or UK Value Added Tax (VAT) will be payable. When importing from outside the EEA, you will be liable to any import duty and UK VAT. Don't forget that places such as the Channel Isles and the Canary Islands are outside the EEA.

If you are physically carrying the goods through customs and you are coming from outside of the EEA, then you'll need to go through either the Green or Red channel depending on the value of the goods and type of goods – see the Customs notices at ports and airports.

If you are importing goods by post, then Her Majesty's Revenue and Customs (HMRC) will deal with them according to the country of origin and the Customs declaration attached to the package. Goods with a value above a certain threshold will, in many cases, be subject to import duty and UK VAT. Note that VAT is charged on the duty-paid value. In addition, you'll also need to pay the Post Office handling charge of £8. VAT is chargeable on goods worth more than £15 (VAT is chargeable on all goods from the Channel Islands). You must pay any duty, VAT and the Post Office handling fee before HMRC will release the goods to the Post Office for delivery to you. Payment can be made by card online.

Duty is payable on goods depending on where they have come from and what they are (based on the Customs tariff code). It is normally waved where the duty payable is less than £7.
www.gov.uk/trade-tariff

Future What Next Columns

I am currently planning the *What Next* columns for the remainder of 2017. I'd be pleased to receive any requests from readers for topics that you would like me to cover.

Coaxial Cable Tests – Revisited

Tony Nailer G4CFY continues his explorations of coaxial cable loss but remains puzzled!

In *Technical for the Terrified (T4T)* in August 2016 *PW* I reported on experiments undertaken in May of 2002 on RG58, Mini-8 and RG213 coaxial cables, assisted by the late **Mike Reed M0NJR**. The tests were conducted on 50, 57, 105, & 144MHz and the results were disconcerting.

It is assumed that coaxial cable will have increasing loss with frequency and that larger cables will have lower loss than smaller types and foam dielectric types will have lower loss for a given diameter than solid dielectric types. This is displayed in most *ARRL Handbooks* as a graph with dozens of cable losses in dB/100 feet against frequency. I have scaled it for dB/10 metres for just RG58 & RG213 as shown **Fig. 1.**

When I conducted the tests on May 30th 2016 using just Mini-8 and RG58CU, I did achieve quite sensible results as shown in **Table 1.** These results were drawn on a linear by two cycle log graph and published in *T4T* in the August *PW*. They have been redrawn on a two cycle by two cycle log paper shown in **Fig. 2.**

You will note that the line for RG58 is amazingly close to a straight line with the data points. Mini-8 produced data points leading to a kinked plot. In the conclusion of the August article I stated I would undertake similar tests on RG213 as soon as I had some.

Since that time I have acquired some good quality RG213UBX and undertaken the same tests using the same signal sources, the same Bird Thruline meter and a variety of plug-in elements as before.

Cable Test December 6th

The cable was carefully unravelled to lay straight and flat in a very long U shape along the floor of my laboratory, just as I had done with the RG58 and Mini-8 previously.

As before, the transmitter was connected via a short patch lead directly to the Bird 43 meter with an appropriate plug-in and a Toyocom T200 dummy load. A reading was taken, the patch lead removed and the 10m RG213 cable connected in its place. Another reading was then taken and recorded. Then another transmitter was substituted, another plug-in connected and the reading taken with short patch lead and 10m RG213 cable.

The results, shown in **Table 2**, are all over the place suggesting something really wrong with the test set-up. Everything was checked and the tests on each frequency were repeated and found to be as near identical as to be not worth adjusting. I couldn't understand what could have gone wrong so I decided to think about it while dog walking as I usually do.

The conclusion of my deliberations was that it was possible

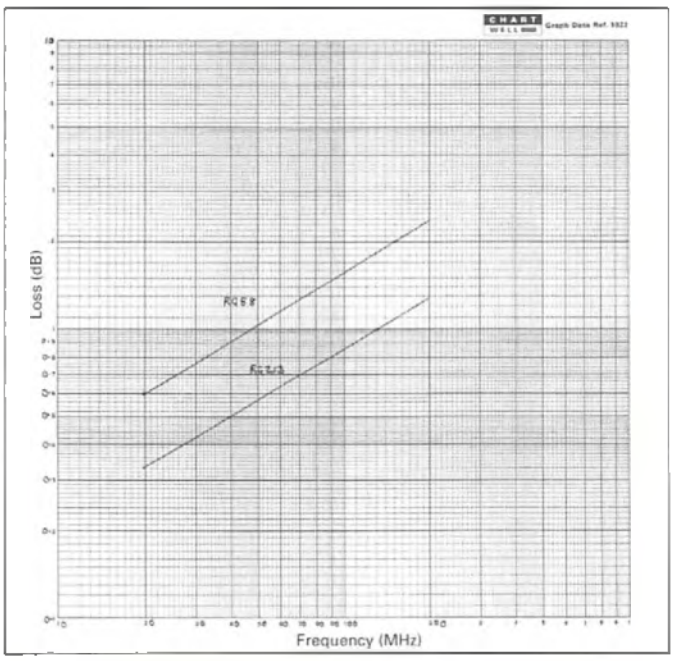

Fig. 1: Scaling the theoretical figures of loss/length shown in many text books to dB/10m, give these figures for RG58 and RG213 coaxial cables.

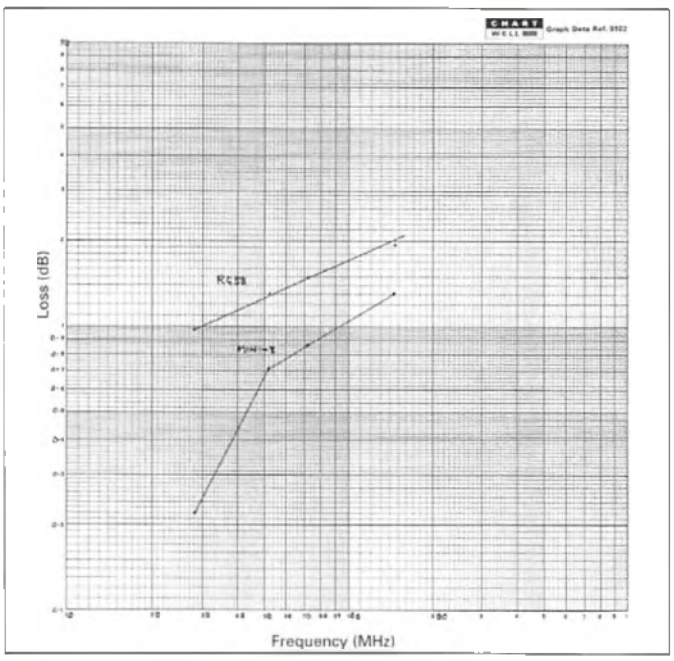

Fig. 2: The results of tests carried out in May 2016 using just Mini-8 and RG58CU from the results shown in Table 1.

Table 1: The results of tests carried out on May 30th 2002.

Transmitter	Freq (MHz)	Plug-in	Pwr In	RG58/dB	Mini-8/dB
Cobra 148	28	5A	5W	4.0W 0.97	4.75W 0.43
Spectrum Test TX	51	10B	10W	7.4W 1.31	8.3W 0.72
Spectrum Test TX	71	10B	10W	7.1W 1.49	8.2W 0.86
Seavoice RT100	145	10C	10W	6.4W 1.94	7.4W 1.31

Table 2: Test results of cable loss carried out on December 6th 2016.

Transmitter	Freq (MHz)	Plug-in	Pwr In	Pwr out	dB Loss
Cobra 148	28	5A	4.85W	4.3W	0.5
Spectrum Test TX	51	10B	10W	8.2W	0.86
Spectrum Test TX	71	10B	10W	9.5W	0.2
Seavoice RT100	145	10C	9.8W	8W	0.88

Table 3: Test results of cable loss carried out on December 7th 2016.

Transmitter	Freq (MHz)	Plug-in	Pwr In	Pwr out	dB Loss
Cobra 148	28	5A	4.65W	4.3W	0.34
Spectrum Test TX	51	10B	10W	8.15W	0.89
Spectrum Test TX	71	10B	10W	9.4W	0.27
Seavoice RT100	145	10C	10W	8.1W	0.92

Table 4: Test results of cable loss carried out on December 8th 2016.

Transmitter	Freq (MHz)	Plug-in	Pwr In	RG58/dB	Mini-8/dB	RG213 / dB
Cobra 148	28z	5A	4.8W	4.3W 0.43	4.65W 0.14	4.45W 0.33
Spectrum Test TX	51	10B	10W	7.2W 1.43	8.1W 0.92	8.1W 0.92
Spectrum Test TX	71	10B	10W	7.2W 1.43	8.4W 0.76	9.0W 0.46
Seavoice RT100	145	10C	10W	6.2W 2.08	7.4W 1.31	8.1W 0.92

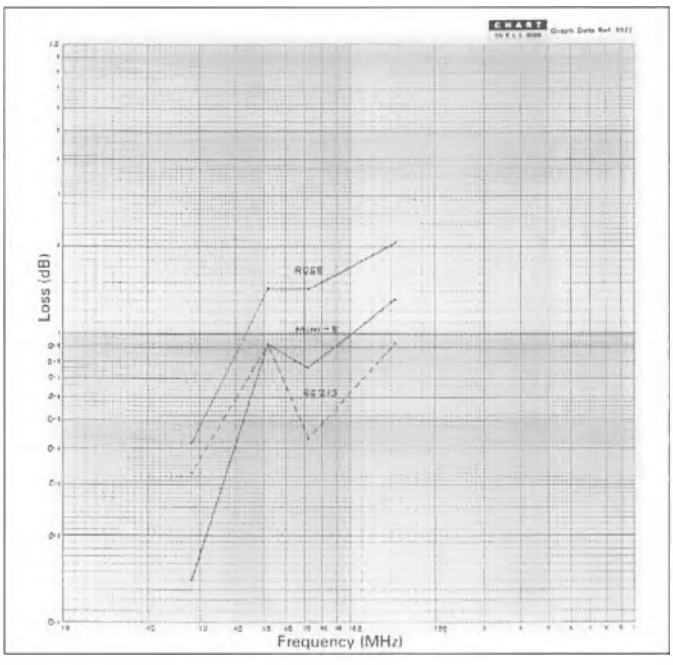

Fig. 3: The graphical display of the results tabulated in Table 4.

the two arms of the U were close enough to permit crosstalk although for most of the run they were about 0.5m (20in) apart and just about crossed over at the workbench to go to transmitter and wattmeter.

Cable Test December 7th

Now with the aid of my wife (because my shoulder is still mending), the cable that had been put away was stretched out again but laid out in the laboratory as a giant L shape, 5m to each leg. This meant now that I had to do a reading with the meter and short patch lead at the transmitter, then connect the RG213 to the transmitter and walk to the end of the cable to connect the meter and take a reading while my wife put the rig into transmit.

The results this time, **Table 3**, were slightly different than previously but still of the same order and proved that it wasn't cross coupling between the coax legs causing the problem.

Cable Test December 8th

Having proved that the U and L shaped layouts had no discernable effect on results and having no idea why the results for RG213 were so random, I decided to test all three cable types again so I would be comparing like with like.

These results, **Table 4**, are also plotted as a graph, **Figure 3**. Now the readings for RG58 no longer produce the straight line

achieved in the May test. Losses recorded for 28MHz seem too low and losses for 51MHz seem too high.

Looking for a Reason

The transmitters were the same for each date of test. The RG58CU and Mini-8 are the same cables used on both dates. The plug-in elements are the same used on each date. The short patch lead might have been different between the two dates but in each case was the only one used for the different frequencies on each test date.

I presume that regardless the accuracy of readout provided by a certain plug-in, once the power has been set to full-scale deflection then any lesser readings would be in the correct proportion. Logically the difference in power measured between using a short patch lead and a 10m test lead can only be due to dielectric losses and any phase difference between voltage and current at the termination end of the cable. It is notable that in the May test the Mini-8 exhibited a 1.3:1 SWR at 28 and 51MHz but a lower SWR on both 71 and 145MHz.

The effect of multiples of quarter-waves and half-waves was explored back in 2002 when comparisons were made using 10m of both RG58 & RG213 and 9.36m of Mini-8 to achieve multiples of half-waves. That did produce sensible results on 51MHz with losses of 1.25dB for RG58, 1dB for Mini-8 and 0.92dB for RG213.

Suspect 10B Plug-in

Readings on 51 & 71MHz for all cables are the clear problem so maybe it's something to do with the 10B plug-in for the Bird wattmeter. It is, after all, rated as 50-125MHz so it is near the lower limit of its accuracy range when on 51MHz. That shouldn't be the case when measuring 70MHz and it doesn't show up as much of an anomaly with RG58 and Mini-8 as it does with RG213.

Maybe that element is also sensitive to reactive and resistive voltages and the reactances of both Mini-8 and RG213 then produce the anomalous readings. The conclusion must be that the RG58 maintains a better L-C ratio along its length than the other cables, both of which have much lower inductance due to much bigger inner cores.

A test at low frequency revealed that the capacitances of the 10m lengths were 975pF for RG58CU, 770pF for Mini-8 and 1010pF for RG213. I haven't yet measured the inductance of the cables but intuition suggests that both Mini-8 and RG213 will have a higher C to L ratio than RG58.

The RG213 was laid out a final time and the SWR tested at each of the previous power levels and frequencies. It was 1:1 on 28MHz, 1.15:1 on both 51 and 71MHz and 1.2:1 on 145MHz. That suggests the explanation for the strange readings isn't a reactive mismatch at the load end.

I have no explanation at this time for the contradictory results. Results from 2002, May 2016 and August 2016 are consistent for 145MHz but quite a lot different for 28, 51 and 71MHz. Who would have thought that just measuring cable loss could be so complicated.

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Morse Key-board and Mouse

Matthew Nassau MONJX describes an entertaining project that is fun to build and can help you to learn Morse code when finished.

Morse code, or CW as it's generally known to radio amateurs, is alive and well and in daily use in our hobby. To many, it still conjures up images of Boy Scout badges or perhaps some poor castaway's attempts for salvation on a deserted island with SOS and a torch. Yet, Morse code's value in communication cannot be overlooked. It's a very efficient method of imparting information from one person's hand to another's ear over the complex processes and natural phenomena of radio waves and across the expanses of the globe. While perhaps eclipsed by later operating modes that capitalise upon computers and software, modes such as JT65 for two-way contacts and propagation tools such as WSPR, modes that truly dig out signals in the noise floor, CW remains incredibly effective in person-to-person communication. It can be sent from a very simple transmitter and has the added advantage, with the use of recognised abbreviations, of overcoming barriers of language.

This human element in the old art of CW and its demands of personal skill and resulting effectiveness on the air ensure that CW remains active today and is enthusiastically supported across the world.

My interest has slowly formed over the past three years that I have been in amateur radio. From the get go, I have listened to the HF bands and loved HF operating and you just can't miss those CW signals bubbling and twittering at incredible speeds in the lower portions of the bands. But what are those amateurs saying? Like listening to a Spanish or Russian QSO, you need to learn the language of CW to understand it. That takes time, practice and a willingness to try and to make mistakes along the way.

Luckily there are many programs and websites to help you on your journey to copying and sending code. Have a search online and you'll discover the enormous choice available. On my laptop, I make regular use of **Ray Goff G4FON's** Morse trainer (link below) while a favourite website is Learn CW Online (link also below). These, and many others, are great to help you listen to and copy code.
www.g4fon.net/CW%20Trainer.htm
LCWO.net

But what about sending? The general consensus is to practice sending only after you can copy to a reasonable proficiency. While that might be true in some cases, I feel that sending helps to build sound patterns and rhythms to aid recognition in copying code. **Chris Howard M0TCH** shared a fun website called **Morsecode.me** that is, in effect, a chat room where you interact via CW. You send with a mouse or PC keyboard, hear your sidetone and see your text printed in the chat room. Others in attendance can respond – you hear their CW and see their text. Good fun!

The downside is the dependency on using a mouse or keyboard to tap out your code. You press the space bar, '.' or 'e' keys or tap on screen with your mouse but it's just not ergonomic or realistic. I wanted

Fig. 1: An old mouse disassembled in order to access the left mouse button contacts. Remember, this switch is normally open.

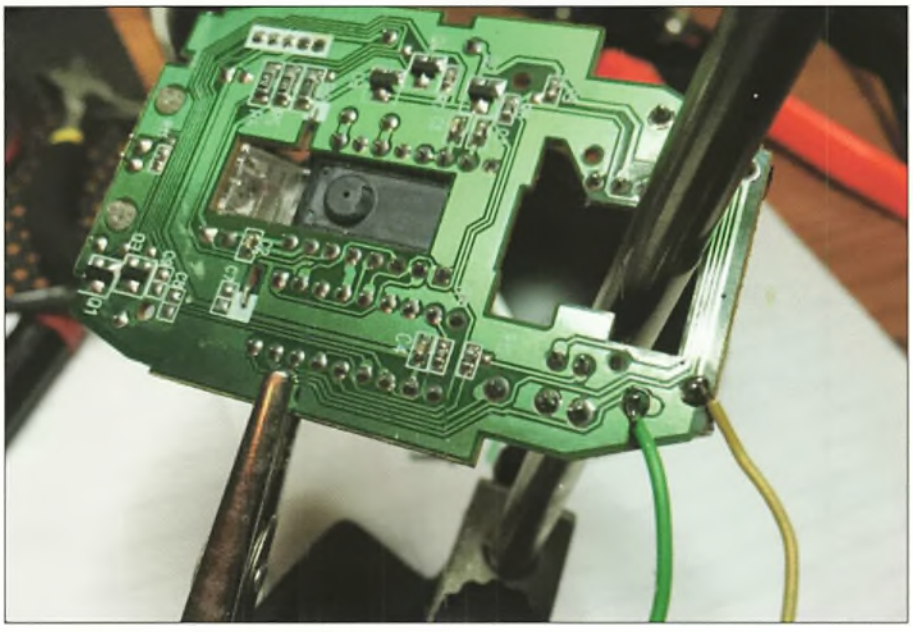

Fig. 2: Soldering two wires onto the left mouse switch contacts.

to use my straight key instead. Hence my first little project, to add a 3.5mm mono jack to a mouse to access a mouse button with a key or keyer output.

First Efforts

I opened up an old optical mouse, **Fig. 1** (I've seen these devices on sale in my local Pound Shop for, yes, £1, so you have no reason not to have a go with minimal risk!), and located the left-mouse button contacts on the circuit board. I simply added some wire to each contact, **Fig. 2**, and connected the other ends to a 3.5mm mono jack. Apparently, some mono jacks have two tabs, others have three. Locate the tabs on the jack with a continuity tester from a DMM tool so that the wires from the mouse button are normally open when no plug is inserted (that is to say, no beep from your continuity tester). This ensures that when no key is attached, the mouse button operates as 'normally open' – the usual arrangement for a mouse button. When you insert a plug that connects your key or keyer output to the mouse, the wires/tabs should also remain 'normally open' but now extend to the key or keyer – close your key to close the mouse button contacts electrically. The mouse should now operate as normal, albeit with the addition of the external jack socket, **Fig. 3**.

Since every computer format (PC, Mac or Linux) offers some form of on-screen keyboard as part of a universal ease of access for all users, you can always use a mouse to control keyboard keys. For example, on a PC under the Start menu, type and search for OSK. This means any CW training site that asks you to use a keyboard button to tap out CW can now be activated by the mouse and mouse button. So now you can use your key or keyer output directly into your mouse, which controls the keyboard or webpage to enjoy a real CW training session in sending, **Fig. 4**.

Further Development

Taking this concept further, why not use your CW key whenever you need to type characters, numbers or punctuation? Turn your CW key into your keyboard for e-mails, documents, PowerPoint or internet pages! This does require some more effort but the CW geek-factor is huge! Here's how.

The concept naturally falls into two steps:

1) Decode your CW sending into text characters and

2) send that text to the PC application.

Decoding CW lends itself well to some form of computer program that can

Fig. 3: The reassembled mouse with the subtle new addition of the jack. The mouse operates entirely as normal even when inserting the plug to your key. The key simply extends the use of the mouse button.

'listen to' or sample a high or low voltage associated with the Morse key opening and closing. It doesn't matter how the program is designed, as long as text is an output. The second point is potentially more complex. However, there are now developments in various electronic development platforms that make it surprisingly easy. One such example is a subset of the well-known Arduino family of boards.

I use an Arduino Micro board, which makes use of the ATmega32U4 microprocessor. There are other Arduinos and their clones that use this chip. The ATmega32U4 includes native USB support (other and older boards, such as those that carry the ATmega328 have a separate chipset for USB management). The advantage of this design is the enhancement and simplicity of using USB connected device classes for Arduino projects. In short, you can access libraries of code that support the HID (Human Interface Device) class and can make your project behave and appear to a PC as though the project is a mouse or keyboard. The details are hidden from you to make coding very straightforward and simple examples of USB keyboards can be found at the website below. So, in principle, this takes care of Point 2. **www.sparkfun.com/tutorials/337**

To address Point 1 in decoding CW into text, I discovered an effective and very readable tutorial by **Budd Churchward, WB7FHC**, on his webpage: **http://mypetarduino.com/ReadCode/readCode.01.html**

This tutorial explains in clear detail how to create an Arduino sketch (program) that listens to your CW sending, adapting to your speed and weightings of dits and dahs, and converts the results to text into the Arduino serial monitor window. It's a wonderful example of Budd's skill in simple programming and his ability to communicate how it works. The adaptive technique of his sketch listens to your dahs (dashes) and determines dits and spacing to tune into your particular speed of sending CW. It helps the program if you start by sending a phrase that includes dahs and a few dits such as 'CODEX' to allow the sketch to track your style of sending. Once matched, it will continue to track and decode well, even if you get a bit quicker (which is always a nice progression for the learning CW operator).

You may have experience of your own Arduino sketch to decode to text and that should work well too. Try your own (or another) decode sketch and experiment with this project!

Making it Happen

Putting these two elements of sketch and Arduino board together, you can export

Fig. 4: An example of a Windows PC on-screen keyboard used in conjunction with the morsecode.me website.

the resulting text outside the Arduino program for use in any PC application that looks at a keyboard. There are some limitations insofar as the text is defaulted to capitals (that's my personal choice of resulting text in the sketch) and there are no provisions made in the sketch to invoke other keyboard functions such as modifier keys (SHFT, CTRL, up-arrow and similar) simply because they do not relate to typical CW characters or needs. The **keyboard.h** Arduino library that is used in the sketch can emulate them but it has limited use from a CW practice perspective. But why not expand and extend the current sketch – experiment!

A simple high impedance piezoelectric sounder is driven from PIN 3 on the Micro to let you hear your CW as you send it and is connected to PIN GND (Ground) to complete the audio circuit. If you use a lower impedance speaker or headphones, you may want to introduce some volume control (logarithmic potentiometer or resistor) because the default output is quite capable of driving a small speaker. Since the Arduino Micro is very small and draws all power from the very same USB plug that we use to communicate with the PC, this project makes it very easy to take your key to work. Replace the piezoelectric sounder with a piezoelectric earphone or headphones and you can practice sending CW quietly in your office while you deal with your inbox and lunchtime internet perusals!

The schematic for connecting your key to the Micro, **Fig. 5**, shows how your key closes through an external 10kΩ pull-down resistor, which is sensed by PIN A5.

The resulting sketch can be found on my Google Drive at:
http://tinyurl.com/zlt3jmn

I packaged mine in a small project box with captive USB cable and two mono jacks: for audio output and key input. It makes for a very portable Morse Keyboard. **Figs. 6, 7** and **8**.

October 2016 Update

Having completed the project as described, in the spirit of adventure, I took my fun projects to Spain for a trip to be with my family but, alas, during an airport security search the Arduino boxed project was lost or somehow misplaced and not returned to my hand luggage. This was actually a perfect excuse to remake one and take it to the next level: combining the mouse key hack together with the Arduino in one device – a mouse of course!

The process of accessing the mouse left button and the programming, wiring and USB connectivity of the Arduino are just the same as noted earlier. The extra addition of a bus-powered USB hub means that the mouse and the Arduino can be connected as USB devices to the hub, which is then connected to the PC, enabling a clean and simple single package for the project – the mouse body itself.

I purchased a 4-port USB hub, the type that uses USB bus for power and is not

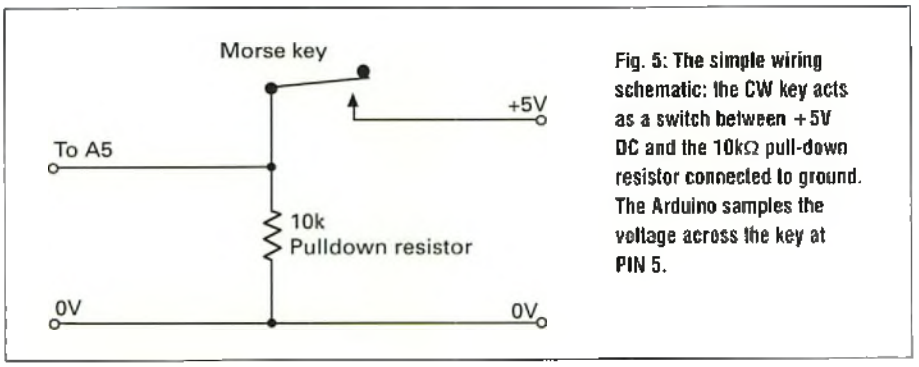

Fig. 5: The simple wiring schematic: the CW key acts as a switch between +5V DC and the 10kΩ pull-down resistor connected to ground. The Arduino samples the voltage across the key at PIN 5.

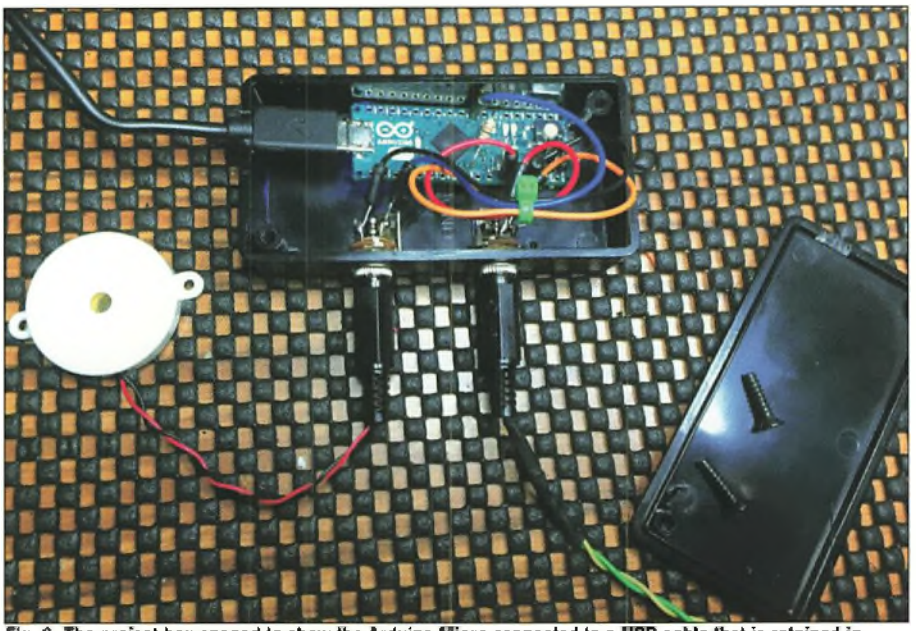

Fig. 6: The project box opened to show the Arduino Micro connected to a USB cable that is retained in place and two mono jacks: an output jack for audio (piezoelectric sounder shown with red/black wires) and an input jack for your CW key (green/yellow wires).

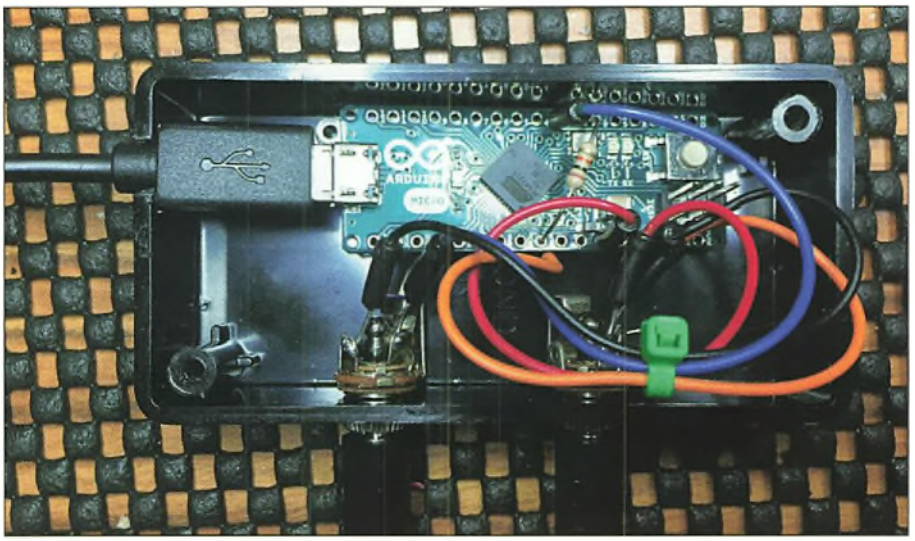

Fig. 7: Close-up of the four wires used: the audio output is from PIN 3 (blue wire) and returns to GND (black wire). The key input is in the path of PIN +5V DC (red wire) and PIN A5 (orange wire). Notice the pull-down 10kΩ resistor (black, brown, orange) from PIN 5 and GND (there are conveniently two GND pins on the Arduino to share connections).

Fig. 8: The completed project. No batteries needed as all power is drawn from the USB connection itself.

dependent on an external power supply. I only needed two ports so literally cut off the extra ports 3 and 4. Ports 1 and 2 still worked as normal so I passed this small test in the construction.

I removed the main USB mouse cable from the mouse board and spliced and soldered it to the output of the USB hub. This would become the main cable to the PC. I used old USB cabling to create new wiring for the mouse to port 1 of the USB hub and the Arduino to port 2. That's all there is to it. Both mouse and Arduino operate as normal, through the hub to the PC.

Since the mouse and Arduino projects would use three mono jack sockets and I didn't have the space in the mouse body, I moved to a more compact choice of a standard IDC 2 x 5-way connector and ribbon wire. Connections to the external piezo sounder and Morse key can use simple jumper leads with pin end connectors to insert into the connector: two for the mouse button access, two for the Morse key and two for the sounder access. The ribbon cable is connected to the various parts just as described above, **Fig. 9**.

The biggest challenge with this idea is the space. You do need to consider starting with a reasonably sized mouse to begin with. This is often the case with older devices from an old laptop or tower PC that you might have. These are certainly common in boot sales or perhaps a hamfest. Depending upon your mouse design and arrangement of plastic tabs or flanges, you will need to improvise on the location and positioning of the components. Try something, close the mouse, try something else, close the mouse. Remember the old adage: measure twice, cut once!

When stacking and placing boards on top of other boards, do be aware of possible short circuits or other unintended electrical contacts. Try using a single layer of electrical tape underneath the boards to remove an unwanted contact from below or above. See **Figs. 10** and **11** for a better idea of what I am trying to describe.

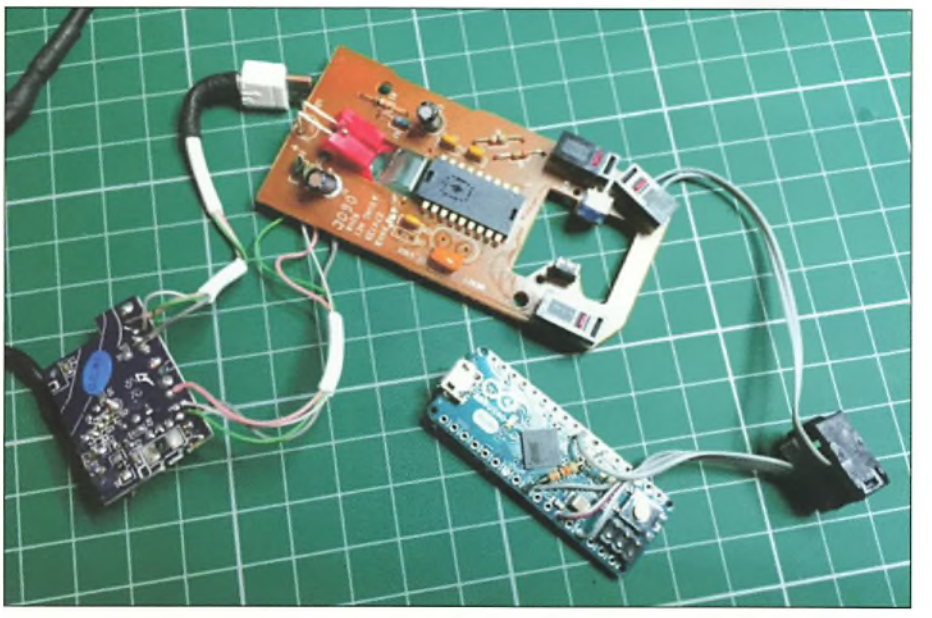

Fig. 9: The optical mouse board (wheel removed) is wired to an input port on the USB hub (purple), while a USB cable (white and black cable at top left, with some reduction of the USB plastic plug moulding visible) for the Arduino is wired to another input. Ribbon cabling and connector take care of the external access by a Morse key and sounder.

Fig. 10: Combining an optical mouse (brown board), Arduino Micro (green board) and 2-port USB hub (purple board) entirely inside the mouse itself.

Perhaps more than ever, you can take your Morse key and connect it to your PC/Mac/Linux machine and be able to practice sending via this simple Morse Key-board (or should that be Mouse Key-board?). Having just one mouse in your bag, that also opens up your PC to a Morse key, is pretty special. I hope you are inspired to think about putting some things together, like this project, and having fun. I confess I did not use my key to type this article – but I could have!

Fig. 11: The finished weekend project: a fully functioning normal PC mouse, with added CW spice!

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Continuing with SSTV

Mike Richards G4WNC completes his description of how to run slow-scan TV on the Raspberry Pi.

This month I'm going to continue my look at QSSTV on the Raspberry Pi. If you missed last month's introduction, I'm sure *PW* will be able to supply a back copy. You can also find installation instructions on the program author's website at: http://users.telenet.be/on4qz/qsstv/manual/index.html

The first task, if you've not already done it, is to calibrate your soundcard clock. An accurate clock is essential for the transmission and reception of properly synchronised SSTV signals. With QSSTV running and your USB soundcard plugged in, go to the Options menu and choose Calibration. This will automatically start the calibration process that will run for several minutes, **Fig. 1**. For this process to work properly, you must have your Pi connected to the internet because it uses internet-based NTP servers as the timing reference. During calibration, the OK button is greyed out but as soon as this becomes active again it signals completion of the calibration process. When you hit OK the calibration factor is automatically stored and used for all future SSTV signals. It's worth repeating this process from time to time because crystal oscillators tend to change frequency with age.

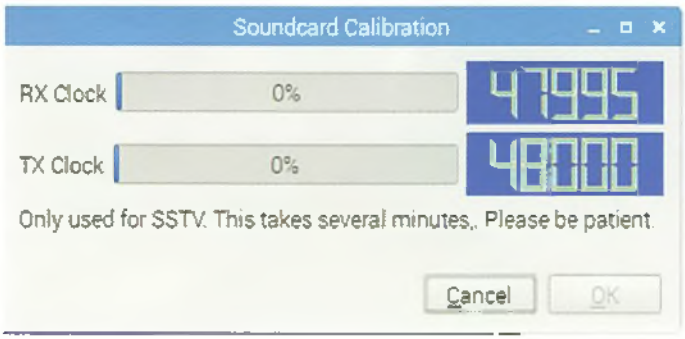

Fig. 1: QSSTV soundcard calibration in progress.

Gathering Images

If you've done as I suggested and spent some time listening to SSTV signals, you will have noted that amateur SSTV bears little resemblance to commercial TV because it is all done with still images. In many ways it's closer to being a FAX mode than conventional television. As a result, you will need some prepared images that you can send. There are two elements to an SSTV image and these are the image itself and the overlaid text. The image can be anything you like so long as it doesn't include advertising and maintains good taste. The CQ image is the first that you need to create and this should be relatively simple with plain areas where you want to overlay the text. If you have a very busy image, the text will be difficult to read, especially if your signal is weak, so you will miss contacts. I've shown an example of a good CQ image in **Fig. 2**.

Once you've found a suitable image, you need to get it into QSSTV and the easiest way is to put it in the tx-stock folder that you'll find in the /home/pi directory. I suspect that the images you'd like to use may well be stored on your PC along with all your other photos. There are a number of ways to transfer files between a PC and the Pi but the simplest I've found is to use WinSCP. This is free software that you can download onto your PC. You will find the software here: https://winscp.net/eng/index.php

Simply download the program and install it. Once you have it up and running you will be presented with the login screen, **Fig. 3**. This is where you enter the details of the computer you want to connect with. For use with a Pi, you need to know the your Pi's IP address. Once you have that, you enter it as the Host Name, set the File protocol to SFTP and enter the username and password for your Pi – usually pi/raspberry. You can leave

Fig. 2: Example of a clear CQ image.

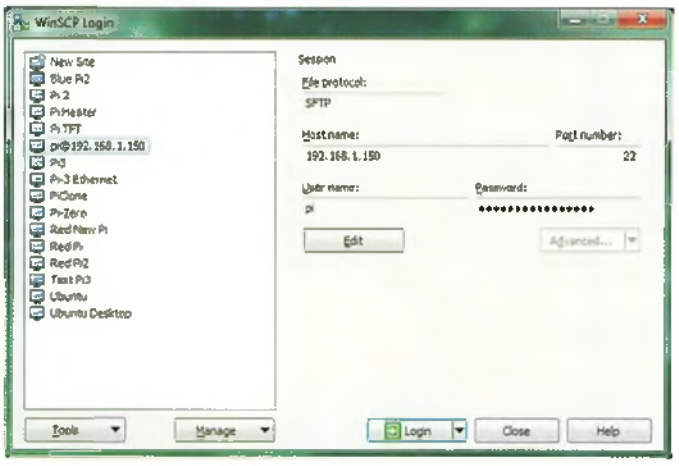

Fig. 3: WinSCP login screen.

the Port number set to 22. When you've finished entering the connection details, click the Save button and you will see the Save panel. In this panel, change the Site name to something that describes your device and you can change the start directory although root is fine for what we're doing. I usually click the save password button because that makes future connections quicker because you won't have to enter the password every time.

At this point you're ready to go, so hit the Login button to start the connection. You should see a connection panel appear that will show the progress of the link setup. Once the link is established, the connection panel disappears and you should see the main WinSCP workspace that consists of two file explorer panels, **Fig. 4**. The left panel shows files in the selected directory on the host Windows computer while the right panel shows the files in the /home/pi directory on your Pi. The two file explorer panels are very intuitive and you can easily navigate to other folders on both sides of the link. For use with QSSTV, the main requirement will be to move image files from the Pictures folder to the tx-stock folder on the Pi. Once you have the Pictures folder showing in the left panel, you can select the desired image and drag it across to the Pi. It's as simple as that! If you want to move multiple images, you can use the conventional Ctrl-click or Shift-click to select them. WinSCP is very useful tool and can be used any time you want to move files between your PC and the Pi.

Before you actually move your images to the Pi you might want to consider resizing them for SSTV. As you will have noticed when monitoring SSTV, the images are low resolution with a common size being 320 x 256 pixels, which is close to a 4:3 aspect ratio. If you're a photographer, you probably already know how to resize images so can do that by whatever method you prefer. For those not familiar with picture resizing don't worry, we can process the images inside QSSTV so go ahead and move the full size images.

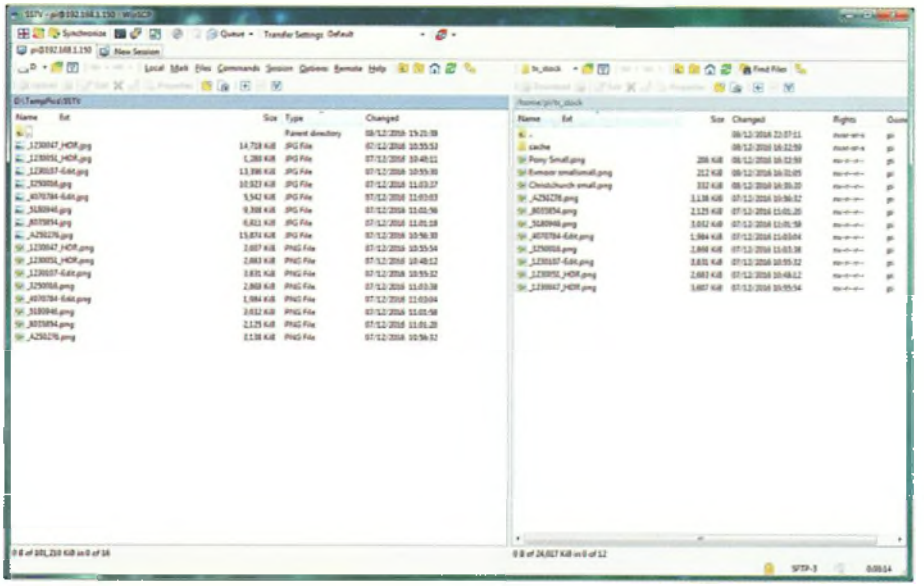

Fig. 4: WinSCP file transfer panels.

Fig. 5: QSSTV main screen.

Preparing Images

Now that you have a selection of images on the Pi, you can start preparing them for use with SSTV. The first thing to do is to give them descriptive names because this will help you quickly find the right image during a QSO. The next step is to resize the images so that they are suitable for transmission. Here's a step-by-step guide on how to do that with QSSTV:

1. With QSSTV running, click on the Transmit tab.
2. Open the editor by clicking on the painter's pallet icon, **Fig. 5**.
3. Maximise the editor screen by clicking on the maximise square at the top right of the screen.
4. Click on the Image Size button at the top left of the editor screen, **Fig. 6**.
5. Set the image size to 320 wide and 256 high and press OK.
6. You should now see a rectangle in the centre of the screen, which represents the target image size.
7. Next you need to import one of your images so click on the camera image on the left-hand tool bar.
8. Navigate to the image you want to resize (normally in tx-stock) and click open.
9. Left-click the cursor inside the image frame and you will see a small version of your image.
10. You can resize the image to fit the frame using the handles on the corners and sides of the image.

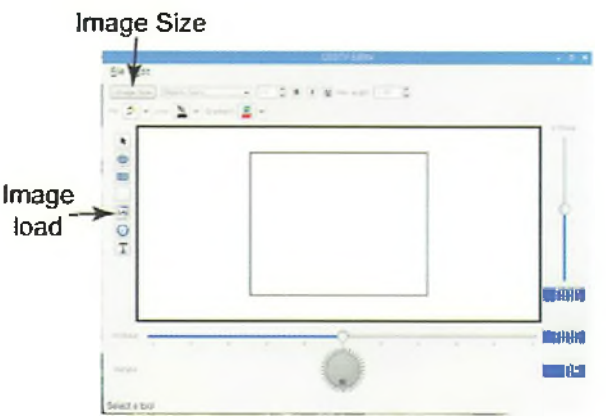

Fig. 6: QSSTV image and template editor.

11. Be careful with the resizing because you can easily distort the aspect ratio.
12. When you're happy with the size, select the File menu and choose Save Image file. I suggest you use the original filename but add 'small' to indicate that it's a resized image. Click OK to finish.

That completes the resize, although you can save space by deleting the original image file because we won't be using that again. When you've resized and retitled your images, we need to look at creating a template. In QSSTV, templates are very similar to the Macros that we use to support other data modes. However, in this case, the template text is overlaid on our image. To create a template, you need to open the editor again from the Transmit tab. Set the image size to 320 x 256. Now you can click on the Text icon and that will pop up the text editor. Here you can type and format your text with different fonts and styles. To make templates more flexible, QSSTV has its own macro language that allows the template to be automatically populated with data from the current QSO. The macro language is very simple and uses a % symbol followed by a lowercase letter to specify the information. I've shown the list of commands in **Table 1**.

When you've finished creating your first template, use the File menu and Save Template File to save it. Make sure you save it in the Template folder so that it can easily be found later. I've shown an example of my CQ template in **Fig. 7**. You also need to create templates to use during the QSO and for the final transmission. One rather nice feature of the templates is the three comments boxes labelled x, y and z. As the name implies, these can be used to add comments to your images during the QSO. I usually add the placeholders for comments in my QSO in-progress template. I've show an example here:

%c DE %m – This prints the distant call DE mycall

%x – This prints comment x

%y – This prints comment y

%z – This prints comment z

This simple template macro lets me add up to three lines on comment very easily, thus making the QSO more interesting.

Table 1 – QSSTV Macro Commands

Command	Action
%m	My callsign
%q	My QTH
%l	QRA locator
%n	My last name
%f	My first name
%c	Remote callsign
%r	RSV signal report or contest report
%o	Remote operator name
%x	Comment box x
%y	Comment box y
%z	Comment box z
%t	Time HH:MM
%d	Date YR/MTH/DAY
%v	QSSTV version number
%s	DRM SNR report

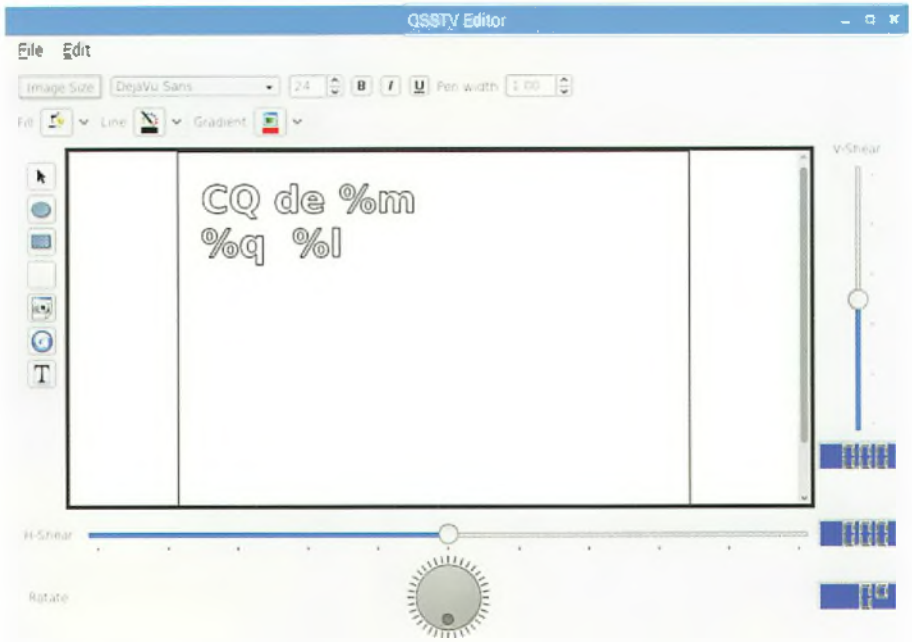

Fig. 7: My CQ template.

Transmitting with QSSTV

With all the images resized and templates created, you're ready to start transmitting. By far the most popular HF frequency for SSTV is 14.230MHz so I suggest you start there because you're almost guaranteed a contact. The first step is to load up your CQ image. To do this, click the Transmit tab and click on the folder icon that will open the file browser so you can select the image you want to use. Once the image is loaded you can select the template that you want to overlay.

For the first call you want your CQ template. On the right of the image display area, you need to click the Use Template box and select the template you want to use. If all is well, your template text should appear on top of your image. If it doesn't, try clicking and unclicking the Use Template check box. You're now ready to go so, if the frequency is clear, hit the Transmit icon (r/h arrow) and transmission should commence. When you get a reply, make sure you put the other operator's details in the log box as these can then be used by your QSO in progress templates. One final but important point to note is that, like many data modes, SSTV is a 100% duty cycle mode so you need to be careful to run your rig within its operating limits.

That's about it for basic SSTV transmission with QSSTV and the Raspberry Pi. I've been running the software on a Pi2 and a Pi3 without any operational problems for a while now. I've just added QSSTV to my Raspberry Pi ready formatted SD cards that you can purchase from my web shop at: www.g4wnc.com/shop

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Kenwood TMV-71 £299.95

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Feature by Don Field G3XTT

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Reflections on ZL7G

Don G3XTT has recently returned from the ZL7G Chatham Islands DXpedition, as reported in last month's Keylines and in Steve Telenius-Lowe PJ4DX's HF Happenings column. Here he reflects on some of the more interesting aspects.

Raising one of the 18m Spiderpoles (Photo G4JKS).

I arrived back in November from the Chatham Islands, a group of islands some 800km from the nearest point of New Zealand. Although part of New Zealand, the islands are far enough away to count separately for the popular DXCC awards programme. Putting on such a DXpedition is very much like putting on a Field Day station but with the added challenges of being on the other side of the world, with no recourse to a local dealer if anything is forgotten. It's also important to be able to cover (in our case) the nine main HF bands and to be able to keep several stations on the air round the clock for, again in our case, 10 days (in order to cover two full weekends).

I won't describe the trip in detail because an article will appear in the RSGB's *RadCom* in due course. However, I though that *PW* readers would be interested in some of the background to, for example, our selection of antennas and station equipment.

Site Selection

The first challenge for such a trip is site selection. Ideally what is wanted is a beachfront location with an unobstructed takeoff to the main amateur radio populations (Europe, Japan and North America). Beachfront because, certainly from Chatham, everywhere is a very long way away and that demands maximising the energy radiated at very low angles from the antenna. These low angles are very quickly attenuated over land but propagate well over saltwater. Previous Chatham expeditions have operated from locations to the south of the island but we managed to find a location on the north coast, albeit a good 45 minutes drive from the main town (to put that in perspective, the population of the Chatham Islands as a whole is just over 600, with around 60 of these on the second largest island, Pitt Island). The good news was that the Ultimate Hideaway (a rental lodge) turned out to be a great choice, with satellite internet and excellent living facilities. However, we would not have beach access and the ground behind it was hilly. This latter was significant because the UK, being almost antipodal to Chatham, actually sits most of the way around a great circle map centred on Chatham. We really needed to be able to radiate in most directions at once if we were to achieve one of our aims, which was to maximise our capability to Western Europe and the UK in particular.

Antenna Design

The choice of the Ultimate Hideaway, therefore, left us to thinking hard about what antennas to use to achieve that low angle takeoff on all bands and in all directions. Not the easiest conundrum to solve! On the Austral Islands (callsign TX6G, see my June 2014 *PW* write-up) we had used vertical dipole arrays on the beach, which had worked well but wasn't going to do the trick this time both because we needed 360° coverage and because we wouldn't be on the beach. Last year's trip to Niue Island E6GG (which I was unable to be part of) had used high dipoles on a cliff top to get low angles of radiation but dipoles in free space have significant directivity. What to do?

The solution we arrived at, largely thanks to **David G3WGN** and **Mike G3WPH**, who modelled both the site and various antenna configurations, was to use elevated ground plane antennas on all bands except 80 and 160m where we would have ground-mounted vertical antennas (actually, a T-configuration on 160m, where a full-size quarter-wave vertical would be an impractical 40m high). We did consider vertical half-wave dipoles but there is a problem of how you route the coaxial feed, which really needs to leave the feedpoint at right angles. In contrast, with a ground plane, the feeder comes straight down the mast while two elevated radials (no more than this are required – two nicely balance each other to cancel out any horizontal component of the antenna current) are sufficient to provide the return path for the antenna current and to isolate the feeder from the antenna itself (to avoid any residual braid current, we used coaxial chokes at every

feedpoint – simply a case of winding the feeder several times through a Type 31 ferrite ring).

To cover the nine bands, we took six 18m Spiderpoles (a German fibreglass mast of proven quality and ruggedness but small and light enough when collapsed to take in a ski bag or similar) and two 12m poles (used for the 12 and 30m bands). It's odd to see, for example, a 15m quarter-wave attached to an 18m pole because the feedpoint is, of course, just a quarter wave from the top of the pole so some 14m or so above ground). What this meant, though, was that provided we could install the masts reasonably close to the hilltop, the actual antenna would have a clear 360° view of the horizon, resulting in the desired all-round coverage with the main radiation lobe at a suitably low angle. Indeed, to prove the point, later in the trip we installed an inverted-vee dipole for the 20m band on a spare pole and made comparisons. Although the dipole and elevated ground plane achieved comparable results into Japan and North America, the elevated ground plane was consistently several S points better on the much longer haul to Europe.

We actually doubled up 20 and 10m on the same pole to save us one pole (mainly because of weight constraints – another antenna would have meant another pole and more coaxial cable, potentially giving us a weight problem). It meant we were unable to use both the 20 and 10m bands simultaneously but we felt this would be a good compromise – we would use 10m when it was open, but 20m would be available for long hours when 10m was closed. In practice, as we had rather anticipated, solar conditions were such that 10m opened only rarely and never to Europe.

Feeders

When organising a fly-in, fly-out expedition, weight is crucial. The heaviest item of inventory is almost invariably coaxial cable. The good news is that recent years have seen the introduction of some lightweight but low loss cables and we investigated these thoroughly before settling on a selection that included Aircell 5, UF-7 and RCF400 cable types. Having seen the site configuration, it was obvious that the most distant antennas were going to be up to 200m from the operating location and if we were to be able to run up to four stations simultaneously (as we hoped, with six operators and several bands open simultaneously at key times of the day, especially sunrise and sunset), we therefore needed something like 900m of cable – four long cable runs to the antenna field and then individual feeds from there to the individual antennas, such that we could patch any cable run from the shack to any antenna. That's a lot of coaxial cable to fly half way across the world!

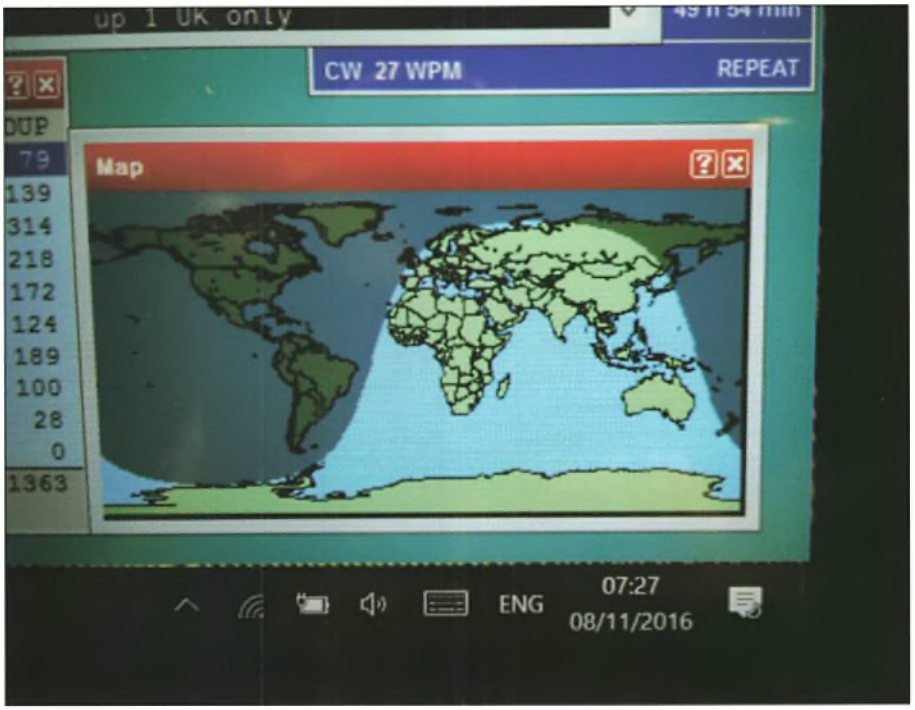
The matching coil and radial field at the base of the 80m band vertical.

Mike G3WPH operates the KX3 and Juma PA1000 combination (see text), with Don G3BJ in background on one of the other stations (Photo G4JKS).

Chris G3SVL operating one of the K3, KPA500 stations (Photo G4JKS).

Station Equipment

Over the past two (TX6G and E6GG) expeditions the team has settled on the Elecraft K3 as transceiver of choice. It is lightweight but its performance is up with the best. The matching KPA500 amplifier



The ZL7G to UK path at UK sunrise – a classic greyline (look out for G3ZVW's Making Waves next month for an explanation).

(see *PW* May 2014 review) integrates seamlessly with the K3 and provides a useful 500W of output – we consider this the minimum acceptable if we are to be heard consistently from distant parts and on the more difficult bands such as 160 and 80m. Our aim, as mentioned above, was to take four identical stations. Having identical stations makes a huge difference – equipment can be taken out and swapped easily if and when problems arise and it is also easier on the operators if they face the same setup, whichever operating position they are scheduled to use at any given time. Incidentally, a major issue in the past with multi-transmitter stations has been interaction due primarily to transmitter phase noise. The K3 is very clean in this respect.

Two of the team members also purchased the new Juma PA1000 before the expedition and we ended up taking these, along with three KPA500 amplifiers and five K3 transceivers, so we effectively had four high power stations plus a complete spare available if needed (**Justin G4TSH** also brought his Elecraft KX3, of which more in a moment). The attraction of the Juma amplifier (launched just this year by a company in Finland) is threefold. It weighs considerably less than the KPA500, has a higher power output (up to 1kW, helpful on those tough LF bands) and requires less drive power. The design was largely unproven in DXpedition conditions at the time of our trip but we felt that it would be useful to have them and might also open the door to a very lightweight solution in the future.

Juma and KX3

At various times during the DXpedition, we tried a combination of the Elecraft KX3 transceiver and Juma amplifier. The KX3 (reviewed in February 2014 *PW* and big brother of the KX2, reviewed in this issue) uses SDR technology (compared with the K3, which is something of a hybrid) and handled the big pileups (lots of people calling simultaneously on or around one frequency) with aplomb, sounding very nice indeed. Although its output is insufficient to drive the KPA500, it can easily drive the Juma amplifier to full output. The combination weighs just 6.2kg, compared with around 16.3kg for the K3 and KPA500, so this is something we and other DXpeditions may need to consider in future as a handy way of reducing payload.

Computers and Software

On a trip like this, it's essential to have the logging software networked. This allows each operating position to see what is happening at each other (what band they are on, who they are working and so on). It also ensures that the log is copied simultaneously to each PC, to avoid loss of any of the log if there is a computer crash. Obviously each PC is connected to the transceiver for frequency logging and other purposes – although I have a K3 I hadn't realised until my fellow operators showed me how, that CW can be sent from the logging program by toggling the DTR line so an external keyer (such as a Winkey) is unnecessary. We used Win-Test for logging but selected MMVARI for RTTY operation. MMVARI is a multichannel decoder, which is helpful when many stations are calling at the same time across a bandwidth of maybe 3kHz. In these pile-up circumstances, it's quite impossible to see the usual two lines on a waterfall display – it's more likely to be a solid wall of colour!

Where we fell down a little is that the various team members brought a variety of external keyboards (it's almost impossible to use the laptop's own keyboard over an extended period in DXpedition conditions). When you are tired after a long operating shift, it helps if the keyboard is the same, whichever operating position you are at. We will fix that in future.

Power

We were fortunate on this expedition that reliable 220V power was available at the Ultimate Hideaway. However, it was still necessary for us to take several multiway socket outlets daisy-chained and terminated in a New Zealand plug. Each station needs mains for transceiver (a lightweight external 12V PSU), amplifier, laptop and invariably one or two other items, perhaps powered by a wall wart style PSU.

Results

As I said at the beginning, I haven't tried here to give a blow-by-blow account of how the expedition ran. In practice, it went pretty much to plan despite poor HF propagation and we ended with over 42,000 contacts (net of duplicates), including 597 with the British Isles. We uploaded to Club Log and Logbook of the World as we went along and QSL cards for those who still like a traditional confirmation are already in the mail. More to the point we all had great fun – it's extremely satisfying to work as a team on trips such as these, solving the inevitable problems that occur and learning from each other's previous experience. For me it was also an opportunity to see and experience radio propagation from yet another corner of the world. We also very much enjoyed the contacts we were able to make back to the UK, especially on the 160 and 80m bands but the 30 and 40m bands were our mainstay on that path as the statistics on the Club Log DXpedition page demonstrate. You can find more on our own website or through Club Log.

www.6gs.org.uk

https://secure.clublog.org/charts/?c=ZL7G

My thanks to fellow team members **Don G3BJ**, **Chris G3SVL**, **Nigel G3TXF**, Mike G3WPH, **Hilary G4JKS** and Justin G4TSH and, of course, to my wife for allowing me to join the team.

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Boot Camp 2016

Roger Cooke G3LDI reports on another successful Boot Camp and other Morse-related topics.

Yet another Boot Camp, Fig. 1, took place at my home this November. We originally had 16 booked for it but a few had to pull out due to circumstances beyond their control. Some attended just for the fun of the two days and, of course, to improve. However, we still divided into three classes, slow, intermediate and advanced. The two days were just about enough, unlike the original Boot Camp we organised, which occupied a whole week!

This year, we were very lucky to have three visitors. **Andy G0IBN** e-mailed me to ask whether he could come to see just how we did it with a view to replication in the Essex CW club. Knowing how keen they are down there and looking at their achievements on the website, we were pleased that they decided to make a trip to rural Norfolk. In the event, Andy brought with him **Oliver M0WAG** and **Dean G4WQI**. They integrated very well into the group and Andy, who is an FOC member anyway and an ex-marine operator, did some instructing. This was very useful, because ideas were bounced around and we gleaned some good ideas from the proceedings too.

Boot Camp is a very good idea. It's not the rigorous theme that the name implies. It's a lot of work, yes, but also a lot of fun and a lot of laughs. It was broken up with tea/coffee breaks, of course, and this year **Karen**, the YL of **Jim G3YLA**, made some sausage rolls for us. **Shirley**, the XYL of **Ray G3XLG**, made some scones with jam and cream. Oh, the calories in those! They were very nice though.

Morse keys littered the table. **Alan G8OO** had a Begali HST, **Malcolm G3PDH**, Ray G3XLG and **Marshall M6DXL** all had the Chevron made by **M0AGA**. There were single paddles, twin paddles and straight keys, also the TE-NE-KEY by **KK5PY**. The adjustment of keys was also discussed and put into action. Marshall M6DXL is very keen on CW and is on the air when he can, using that mode too. It really is good to see a new licensee take to Morse like that.

Andy took a class with the slower guys, giving them some different practice and style by using a key rather than a computer. This proved quite popular, **Fig. 2**. He and Malcolm also sat opposite each other in the main room with the advanced class and had a QSO at 30WPM to see just how much information each person actually received.

I hope this encourages other clubs to follow a similar arrangement. If it does do that, I will personally be very satisfied and the old adage *"imitation is the sincerest form of flattery"* will prove its worth.

Morse Practice On and Off Air

I recently received an e-mail from **Dave M0GGK**. It was in response to a message that I put on the FISTS forum. I was trying to boost the numbers of volunteers that contribute their time and effort to teach Morse over the air using the GB2CW scheme. The scheme was set up to legalise the 'broadcasting' of Morse transmissions to several people all at once. This is similar to the way that GB2RS is set up. It is merely to comply with regulations. It is illegal for any amateur to conduct Morse tuition over the air to more than one person without using the GB2CW scheme. Of course, I would love to see many more volunteers take up the scheme but it seems to be stuck at present and, in fact, we have lost two in the last year or so.

If you are involved in tuition to more than one person over the air, you are required to use GB2CW. It is not complicated, costs nothing and you will be doing amateur radio a major service. We must provide momentum for all newcomers to the hobby to take up (or press down!) the key and learn Morse. As the RSGB Coordinator, I can issue a letter of authorisation to do this; all very easy and simple. There is just one hurdle to overcome and that is that you must be a member of the RSGB.

Now when Dave wrote to me, he told me he was not an RSGB member. However, there is no reason why I should not mention all those who are involved with tutoring at their local radio club, their house, the pub, a museum or anywhere else. It would publicise the fact that tutoring is indeed taking place. Ordinary amateurs will be able to read the details and take advantage of it. This would apply to RSGB members and non-members alike.

You would also then receive the recognition that you deserve. If you let me know your name, callsign, Club, RSGB membership number where appropriate, place and time of the class, I will set up a page especially for those tutors. If you wish to then take advantage of the GB2CW on air tutoring, you can do so once an RSGB member. I would then send the letter of authorisation and your callsign could join those on the other page.

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E-mail address and telephone number.

RSGB membership number.

Frequency used (if on the 2m band, the one in general use is 145.250MHz FM).

Day and time(s) you would like to use.

Lady Operators in Waiting

Some lady operators are just as good as the men. I featured a couple last time in this column and thought I would mention that in Norfolk we do have two at present who are keen on learning so it will be interesting to see how they fare in the future. So, don't be shy about learning if you are a female. You could well outshine your male counterparts!

LBs (Lightning Bugs)

If you are from the old school and are lucky enough to own a Vibroplex Lightning Bug, or LB as they are fondly known, then some pertinent information might be useful to you. This advice came from **Bruce K6ZB**. Vibroplex has some generic instructions at the URL below. I've used this and it's fine.

http://tinyurl.com/znyluwa

What I've found with the LB is that you first need to be sure that the vibrating arm just touches the ring damper when centred. Then you need to set the spacing of the dash contact to your liking. Also adjust the dash tension. For the dot, it's a bit trickier since you have to position the stop on the left to be where it should be (about equal to the stop on the right, which was set for the ring damper). Then move the dot contact to give a reasonable gap. Key for dots and see the arm vibrate. Move the dot contact inward until it touches. From there, it's trial and error to get decent 50/50 dot ratio. I use my keyer

to match the speed and to hear that the ratio is correct. There are several *QST* articles relating to the LB, including in the August 1948, February 1968 and August 1980 issues.

Propagation or Lack Thereof

HF propagation is plummeting now at a rapid rate of knots and the hobby will change in the next seven or eight years before we reach the sunspot peak. Morse will be a very useful mode to use and much more likely to work the DX than SSB *(though see Steve PJ4DX's comments in this month's column! – ed)*. We will also be using the LF bands a lot more and hopefully you will be able to get up a suitable antenna for the 160, 80, 40 and/or 30m bands. These are the bands where you will find the DX.

To amply demonstrate this, I masochistically took part in the CQWW CW contest in November and spent both days trying to work stations in the noise on the 10m band. Needless to say, they were all in Europe – nothing elsewhere at all. I had hoped to work a few African stations because the north-south path is usually fairly reliable. However, despite seeing several ZS stations spotted on the Cluster, not a bean heard here. I finished with 67 contacts and several dupes.

The dupes (duplicate contacts) happened because, despite having problems with copying, the other station still insisted on sending at 30 to 35 WPM. The other station obviously had the same problem, even with me sending at 20 WPM. Seven dupes in 67 QSOs is not good.

Essex CW Club – CW Amateur of the Year

The ethos of Essex CW is to spread the club's enthusiasm for CW around Essex. This enthusiasm for promoting CW has proved successful in many clubs where Essex CW Club members have given talks on helpful ways to learn Morse code.

Having given such a talk at Thames Amateur Radio Club, **Huw 2E0HTL** took up the sword for his club and now teaches Morse to its members. His enthusiasm for CW and his ability to transmit this to fellow club members put Huw at the top of the committee's consideration for Essex CW Operator of the Year.

At a presentation evening at his club, Huw was presented with his 5 WPM certificate along with fellow class members **Nigel M6NBZ** and **Steve G7NBQ** who gained the 10 WPM certificate. Huw was then presented with the G4OAD Memorial Key, which he holds for a year along with a certificate for his achievements, **Fig. 3**.

73 and May the Morse be with you!

Roger G3LDI.

Fig 1: Morse Boot Camp. L/R standing Alan G8OO, Andy G0IBN, Oliver M0WAG, Bruce G6OUM, Ted G4OZG and Paul M1AFQ. Seated L/R Dean G4WQI, Roger G3LDI, Malcolm G3PDH, Jim G3YLA, Marshall M6DXL and Ray G3XLG.

Fig. 2: Andy G0IBN (on right) with some of the trainees.

Fig. 3: L/R G0IBN, 2E0HTL, G7NBQ and M6NBZ.

• E-mail: military1944@aol.com

Valve & Vintage

Ben Nock G4BXD receives an interesting donation to the Museum as well as rediscovering a lifeboat set and yet another wavemeter from the Museum's darkest recesses.

A very warm welcome to my *Valve & Vintage* column coming to you once again from the Military Wireless Museum in Kidderminster and a Happy New Year to you all. Even though, as I write this, the weather has not been conducive to outings, the museum has had a steady stream of visitors so thanks to you all. Some, it turns out, are avid readers of *PW*. A donation to the museum, an emergency set and another wavemeter from the stores are all featured this month.

The Sputnik Special

I was very happy to welcome **Chris Pettitt G0EYO** and three of his friends when they visited the museum and Chris kindly donated a very nice radio to the collection. Mind you, I think he was just glad to get rid of the lump if truth be told.

The lump in question is an R208 receiver, **Fig. 1**, which is a superheterodyne receiver designed for CW, MCW (Modulated CW) and AM reception modes. It was intended to be used for long distance reception or even local broadcast service as well as for mobile use in military vehicles in forward areas. The set was often combined with the Wireless Sender No. 36 and in this configuration was apparently used for local communications in anti-aircraft units.

The set's frequency range is rather unusual because it covers the high end of the HF spectrum and the low end of the VHF spectrum. This meant that it could be used for long distance work by way of the HF ranges and for very local working on the VHF ranges. The frequency ranges are in three bands: 10-20, 20-40 and 40-60MHz.

The set can be run off various AC mains voltages as well as a 6V DC supply, battery and so on. The receiver circuit features an RF stage using an EF39 (ARP34), a 6K8 mixer, followed by two IF stages utilising another EF39 and the pentode of another 6K8. The 6K8 triode functions as a BFO for CW reception and a 6Q7 is used as a triode audio amplifier, with the two diode functions being used for detection and AVC. An additional 6V6 is used for the audio output stage. The internal layout, **Fig. 2**, makes working on the set very easy.

The audio output is 2W to the large front panel mounted loudspeaker. There is provision for two sets of low resistance headphones and a line output at 600Ω. The antenna input impedance is quoted as 80-100Ω with the recommended antenna being a dipole The handbook suggests a coaxial feed but the antenna terminals suit open wire feeders.

The R208's intermediate frequency (IF) is a high 2MHz but with the beat frequency oscillator (BFO) running at 500kHz. The power supply delivers a typical filament voltage of 6.3V, with smoothed HT quoted at 205V DC. The receiver's weight is a hefty 80lbs (36kg) but the outer case, which also holds the spare drawer just above the receiver, is quite solid.

The receivers gained notoriety and were frequently advertised in the late 1950s as 'Sputnik Specials' because the frequency ranges included some of the early satellite frequencies. Sputnik 1, launched in 1957, had transmitters that worked on two frequencies, 20.005 and 40.002MHz. Signals on the first frequency were transmitted in 300ms pulses (under normal temperature and pressure conditions on board), with pauses of the same duration filled by pulses on the second frequency as the Wikipedia entry, below, explains.

https://en.wikipedia.org/wiki/Sputnik_1

I was delighted to find that when I powered up the set it did indeed still work. I have, though, now replaced all the decoupling capacitors. If not faulty now, these are the components that give the most trouble in old radio sets and, given that the spares tray has a full set of vales in it, I'm sure the set will happily carry on working for another 70 years.

Lifeboat Set

Another item found at the back of the storeroom was in a distinct yellow box, which could only mean one thing, a search and rescue or emergency set. In fact, it was a brand new, looking unused, lifeboat radio, Emergency Radio Type 710, **Fig. 3**. I could find little on the web about this set except for a listing on the Imperial

Fig. 1: The R208 receiver.

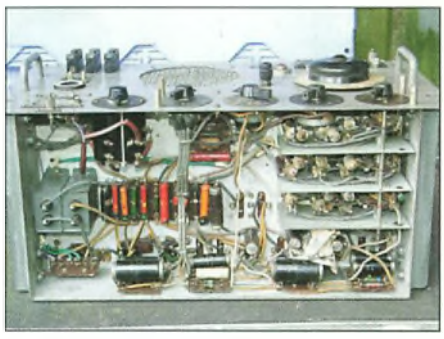

Fig. 2: Underside of the R208.

Fig. 3: Emergency Radio Type 710

Fig. 4: Inside the 710.

Fig. 5: The W1191A meter.

War Museums collection list, item 669: *"Object description: Emergency Radio Type 710. Serial number 613. Made by Clifford and Snell Ltd, Croydon. History note: This emergency radio equipped RN warships. It was to be used by survivors in life-rafts, etc."*

The Type 710, produced around the mid-1970s, allows those in the lifeboat to attempt communication on either 500kHz using CW, 2182kHz using speech or 8364kHz, again using CW. There is an automated two-tone alarm facility but unlike the British wartime T1333 or USA Gibson Girl, it doesn't send out an automated SOS Morse signal.

The lid of this radio set contains poles and whips with which to fabricate an antenna and there is an 'earth' lead attached to the set's base that is thrown overboard into the sea. The radio is powered internally, **Fig. 4**, by a generator. Two handles are provided so some poor soul can use them to wind up the generator or, should such be available in a lifeboat (unlikely?), an external 24V supply can be connected.

Though recently acquired by an American company, Clifford & Snell are still in business, developing and producing optical, acoustic and combined signalling devices. I have not been able to locate any circuit diagrams or such for this set so any thoughts of modifying it for the 160 and 40m bands are on hold. Unless of course, that is, any dear reader out there can help?

RAF Wavemeter

Further rummaging in the stores brought forth yet another wavemeter. The wavemeter, model W1191A, **Fig. 5**, was used not only as a frequency meter but also as a signal generator, **Fig. 6**, for the RF spectrum of approximately 100kHz up to 20MHz, or 3000 through to 15m in wavelength. The unit was powered from internal batteries, a 2V 7Ah cell for the filament voltage and a 60V dry battery for the high tension (HT) supply.

The circuit of the W1191A uses a triode heptode VR82 as a Hartley oscillator running from 100kHz to 20MHz in eight ranges. The heptode section mixes this signal with the incoming signal. The mixed product is then fed to a VT50 triode as a detector and the audio beat is then fed to another VT50 as the audio amplifier.

The audio amplifier can also be used as a 1200Hz audio oscillator to modulate the heptode when using the set as a signal source. A VR19 is used as a crystal oscillator to produce calibration pips from either a standard 1MHz crystal or the set can be crystal controlled using a reference crystal, which can be inserted via a small side door. Again, the crystal signal can be modulated or not as required.

The set's operation is very similar to the BC-221 frequency meter and uses a calibration book as well. The book is particular to each set, having been calibrated to that meter during manufacture. In addition to the RF frequencies, the calibration settings are also given. The dial of the W1191A is not as sophisticated as the BC-221, being the rather dated half-round type.

Widely used by the RAF, the W1191A would have seen action in every radio maintenance unit and, being battery operated, it could be used in the field or on the road. A small rod antenna is carried in the lid and can be removed and inserted into either the input or the attenuated output connectors for local working.

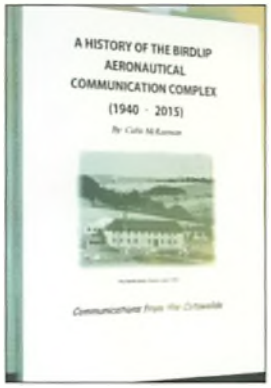

Fig. 7: Colin's book.

On this particular example some previous owner had fitted a 240V AC power unit in the battery space. I therefore tried the set, bringing the mains voltage up slowly using a variable transformer and was again delighted to find that it worked. After 30 minutes or so warm-up time I tuned into its carrier using an R1155 receiver with its BFO on and found the signal to be reasonably stable. No doubt the set could be improved with new capacitors and checking resistor values but I don't think it will become a regularly used item of test gear.

And Finally

Having been approached to provide a small amount of data for it, I was pleased to receive a copy of a very interesting book, one that will interest anyone with a passion for aviation communications. It's entitled *A History of the Birdlip Aeronautical Communication Complex (1940-2015)*. This 329-page softback book, with over 170 black and white illustrations, covers the history of this vital HF communications station, which was situated in the Cotswolds region of the UK. It had very strong and important links with the existing Irish HF radio station at Ballygirreen, probably best known to aeronautical radio enthusiasts as Shanwick Radio.

The book, **Fig. 7**, covers the complete history of this station from its wartime beginning until its closure in 1976 and provides an insight into both the operations and staffing at this facility. It is available from the author, **Colin McKeeman**, e-mail **downrange@eircom.net** at a reasonable 15.00 euros plus P&P.

Well that's about it for this outing in the *V&V* shop. I trust the sets have been of interest and, of course, there are plenty more pictures to view on the museum's website, below. For those interested in visiting, the museum would be happy to see you. Visits are by prior arrangement and contact details are on the website so do get in touch. Cheerio.

www.militarywirelessmuseum.co.uk

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Chapter 27

CHAPTER 27

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Fig. 6: The Official Purpose.

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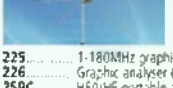

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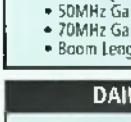

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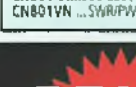

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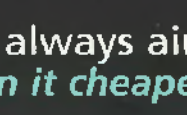

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VHF/UHF Amplifiers

Chris Lorek G4HCL takes a looks at solid-state VHF/UHF linear amplifiers from the UK firm of Microwave Modules.

Many beginners start with a VHF/UHF handheld transceiver or maybe one of the low power all-mode transportable HF/VHF/UHF transceivers on the market, all of which give power levels to suit various licence conditions. UK Foundation licensees (currently M6 and M3 prefixes), for example, may use up to 10W whereas progressing to an Intermediate licence (currently 2x0 and 2x1 prefixes) allows up to 50W. Finally, a Full licence allows higher power levels up to 400W.

Back in the 1970s many amateurs such as myself started out as a G8 (a B Class licensee, limited to VHF/UHF operation) operating primarily on 2m (144-146MHz) and often on AM and SSB. My first transmitter was an AM Pye Vanguard with a valve transmitter amplifier line-up, which I used together with my Trio JR-599 receiver. I later bought a Liner 2 SSB 10W mobile transceiver, which I ran from home and from my father's car (I was just a teenager and too young for a driving licence!). The transceiver's 10W output power was fine for local and semi-local contacts but I envied the users of HF to 2m transverters such as the SSM Europa with its 80W output and others with linear amplifiers such as the valve Dressler D200, **Fig. 1**, which gave up to 400W PEP on SSB. Yes, I eventually acquired a D200, for nostalgic reasons, to accompany an equally nostalgic Liner 2, albeit buying each of these around 20 years later.

Microwave Modules

The UK firm of Microwave Modules was born out of the enthusiasm of two men, both named **Richard**, who worked for the professional Liverpool electronics company of Plessey. Between them they founded Microwave Modules, supplying solid-state VHF/UHF ancillary equipment to amateur and professional users. On the amateur side these eventually included VHF and UHF receive converters, HF to VHF and UHF linear transverters, and VHF and UHF linear amplifiers with output powers of up to 200W, all being solid-state. One of the most popular was their early 100W output linear amplifier for the 2m band, which was subsequently updated with a newer enclosure and circuitry. If you're an old hand and, like me, have in the past attended amateur radio rallies and exhibitions in the 1970s and 1980s, you'll have certainly seen the Microwave Modules stand there, manned by **Mike** and **Julie** who were both licensed amateurs.

Linear Amplifiers

This article is about solid-state Microwave Modules VHF/UHF linear amplifiers available on the second-hand market, although there are many high power valve amplifiers available such as those from Heatherlite (later Linear Amp UK) and Dressler, which I've been pleased to use in my own amateur shack. These amplifier types may indeed be the basis of a future article because I've already covered second-hand HF linear amplifiers in a previous column.

Bands and Powers

As well as for the popular 2m (144MHz) band, **Fig 2**, Microwave Modules produced amplifiers for 6m (50MHz), 4m (70MHz), 70cm (430MHz), **Fig. 3**, 23cm (1296MHz) and, for the US market, the 220MHz band. To the best of my knowledge their best-selling amplifier range was the 2m 100W output range, of which there were a number of models. Naturally these will typically be the type mostly available on the second-hand market unless, of course, their owners like them so much that they are keeping hold of them.

There is a wide range of Microwave Modules amplifier types, all of which operate from an external 13.8V DC supply and you'll see these in the accompanying **Table**, although the list may not be totally comprehensive. You may note a commonality here in the amplifier numbering. MML stands for Microwave Modules Linear, followed by figures denoting the operating band in MHz, then a '/' and further numbers, the first and possibly only number denoting the maximum power output, then sometimes a dash and second number or sequence of numbers denoting the input power. There are sometimes also one or two letters following this, an 'L' denoting a low power level input and 'H' denoting a higher power input. The letter 'S' signifies a built-in receive preamplifier.

Do note that there have been at least three versions of the MML 144/100 100W amplifier. The early model has a red-

Fig. 1: The Dressler D200 amplifier for the 2m band.

Fig. 2: The MML 144/50 amplifier.

Fig. 3: The MML 432/50 amplifier.

brown front panel with a massive heatsink whereas the later model, Fig. 4, follows the usual Microwave Modules black front panel type and exists in two versions, one with a large heatsink and one with a smaller one. An 'odd' type number is the MML 144/100P. Unfortunately, I don't know what variant it denotes, apart from it giving 100W maximum output on 144MHz. The moral is to ensure that you check the full model number rather than just buying one described as, say, 100W output.

An Ideal Accompaniment

In the past, many amateurs, particularly those who gained their licence during or immediately after the CB boom of the late 1970s and early 1980s, came on air with an FT-290R multimode 2.5W 2m transportable transceiver. Any of the MML 100 series with a 1-3W input and a built-in preamplifier made a great addition to these for home or mobile use, transforming the FT-290R into a higher power transceiver, matching many base stations in performance and output power. The FT-290R was also considered a little insensitive on receive, and the preamplifier within the linear helped this. An alternative was to fit an internal preamplifier to the transceiver, a popular type being one from UK company muTek. Thus if you have an FT-290R with one of these fitted, any of the MML series without a preamplifier will, of course, be fine.

Hard Transmit Switching

If you've purchased a second-hand Microwave Modules linear amplifier, connected it up, and you've found it doesn't switch into amplification mode nor draw much current when you key your transmitter into it, there could a simple explanation. The original amplifiers all used an automatic RF detection circuit with subsequent automatic transmit/receive switching. This can be useful for SSB because it doesn't need additional 'TX Key' wiring from your transceiver. An internal variable delay circuit is used similar to a VOX (Voice Operated Transmit) mode where the amplifier waits a short while after your RF power has disappeared before going back to receive. A common modification is that of 'hard switching', where the DC control line out of the rear panel of your transceiver can be used to switch the linear between transmit and receive. The advantage of this is that, firstly, the amplifier doesn't clip the first part of your transmission while it detects the RF power and, secondly, that after you release your PTT (Push To Talk), it instantly goes back to receive rather than waiting a second or two, which could mean that you miss the first second or two of your QSO

Table – Microwave Modules Amplifier Types

Model	Output (Max)	Input	Comments
6m (50MHz)			
MML 50/30-3	30 W	3W	
MML 50/100-3	100W	3W	
MML 50/100-10	100 W	10W	
4m (70MHz)			
MML 70/100-10	100W	10W	
2m (144MHz)			
MML 144/25	25W	1-3W	Built-in preamp
MML 144/30-LS	30 W	1-3W	Built-in preamp
MML 144/40	40 W	1-3W	
MML 144/50-S	50 W	1-3W	Built-in preamp
MML 144/100	100W	1-3W	(Older version)
MML 144/100	100W	25W max	(Newer version)
MML 144/100-HS	100W	25W max	Built-in preamp
MML 144/100-LS	100W	1-3W	Built-in preamp
MML 144/100-P	100W	10W max	
MML 144/100-S	100W	10W max	Built-in preamp
MML 144/100-3	100W	3W	
MML 144/100-10	100W	10W	
MML 144/200	200W	3/10/25W	
MML 144/200-S	200W	3/10/25W	Built-in preamp
220MHz (US band)			
MML 220/80-10	80 W	10W	
70cm (430MHz)			
MML 432/20	20W	1-3W	Built-in preamp
MML 432/30-L	30W	350mW Max	
MML 432/50	50W	10W	
MML 432/50-S	50W	10W	Built-in preamp
MML 432/100	100W	10W	
23cm (1296MHz)			
MML 1296/15	15W	1-3W	

Fig. 4: The newer version on the MML 144/100 amplifier, with black face plate.

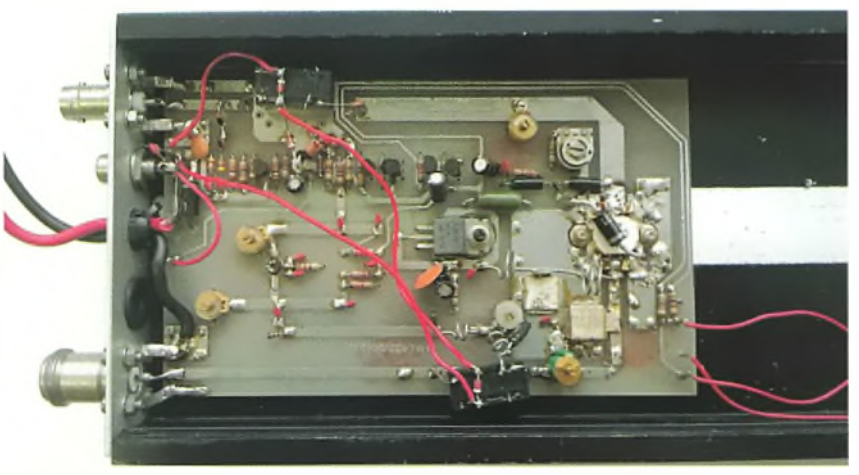

Fig. 5: Spot the internal user modifications in this MML 432/50 amplifier.

partner's reply, including possibly that vital fast contest report and serial number.

If you find this happening on your second-hand amplifier, take a look inside to check for any additions or user alteration to the circuitry, **Fig. 5**, particularly in the region of the transceiver coaxial connector. A common modification for this is the addition of a small RF choke to provide DC switching and this blocks the RF sensing circuitry. You can either choose to remove the modification or to use hard wiring although, unlike most HF high power transceivers, many early VHF/UHF low power transceivers don't have a rear panel output to switch an external amplifier. However, before making changes, do check that the unit does actually amplify. If the amplifier has a PTT or TX phono socket on the rear panel, simply short the inner and outer of this to simulate hard switching and try transmitting again.

If you wish to restore the RF sensing, simply cut one of the leads of this choke. Inside each linear amplifier there is a small variable resistor that adjusts the 'hang time'. If you're just using the amplifier on FM, you can adjust this to its minimum setting for a very short, if any, hang time. If you find any other modifications, do ask whether the seller has the details!

VHF Second Harmonic

Don't be tempted to randomly 'tweak' the capacitor trimmers inside the linear amplifier for more transmit power output, unless you have a spectrum analyser to view the output spectrum, particularly the second harmonic of 144MHz (288MHz) on a 2m linear amplifier. This is because one of the capacitors in the output circuitry is commonly used together with an inductor as a second harmonic notch circuit. You may well get more power output by adjusting this but the additional power may not be on 144MHz! Unless you are able to check the 288MHz directly, it is safest to use a lowpass filter (back in the day, BNOS sold lots of of their lowpass filters for use with MML amplifiers) – one correspondent mentions measuring 500mW out at 288MHz on a 'tweaked' amplifier.

Manuals and Further Information

All the manufacturer's manuals for Microwave Modules equipment were in paper form. Early types were even a combination of duplicated typewritten instructions and hand-drawn circuit diagrams. If you didn't manage to get one of these with your amplifier, there are a number of scanned-in manuals for Microwave Modules equipment available for download from the internet. One good source is **Dave Robinson G4FRE's** website (below). You should be aware, though, that identical looking amplifiers don't necessarily use the same semiconductors because MML sourced them from different manufacturers at different times.

http://g4fre.com/MM.htm

Right now you'll find, as I did, several MML amplifiers for sale on the second-hand market. A couple of months ago I donated several pieces of various Microwave Modules equipment towards funding for my local GB7IV and GB7SH repeater funds and they all sold extremely quickly online. One of these amplifiers could make a perfect addition to a low power VHF or UHF handheld or transportable transceiver, whether this is an FM only type or all-mode. Happy hunting.

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Customers Were Not Always Right

Once again Harry has a selection of anecdotes that are both entertaining and educational.

Dick bought a rather up market AOR scanner, Fig. 1, from us but six months later he was back with it demanding a refund. He said that it was "*extremely insensitive*" and that his friend's cheap scanner could receive more stations such as several local amateurs in the range around 415MHz but his unit couldn't pick up a thing in this range.

His complaint reminded me of a comment I once had when a customer purchased his first communication receiver: *"The reception is very good, but my old broadcast receiver seemed to pick up more stations"*.

Nearly all modern receivers use the superheterodyne (superhet) method of reception. For instance, when a scanner using an intermediate frequency (IF) of 10.7MHz is set at 435MHz, the local oscillator will normally be running at 445.7MHz. Any station at 435 MHz will be received because the local oscillator is 10.7MHz different in frequency and will beat with it to produce the IF. If, however, there is also a station transmitting at 456.4MHz at the same time, this will also be 10.7MHz away from the local oscillator frequency and therefore produce a mixer product at 10.7MHz, potentially interfering with the wanted signal. All superhet receivers have a tendency to pick up stations as an 'image' signal at twice the IF from the correct frequency as well as at the correct point on the dial. The strength of these image responses depends on the selectivity of the stages prior to the receiver's first mixer and with some receivers this selectivity, and hence the image rejection, is inadequate.

Fig. 1: Dick thought his AOR scanner was insensitive but the truth was that it was his friend's receiver that was also receiving image signals.

The first communications receiver I had in the mid 1950s was an ex-WD Eddystone 358X, **Fig. 2**. This did not have a band change switch but it came with a set of plug-in coils, which were aligned so that the local oscillator was always 455kHz higher in frequency than the reading on the dial. When I tuned to, say, 14.2MHz, the oscillator ran at 14.655MHz to produce the required IF of 455kHz. Unfortunately, 14.655MHz was also 455kHz different in frequency to 15.12MHz so when tuning the 20m amateur band, I was also tuning the 15MHz broadcast band on the 'image'. The 358X had two stages of RF selectivity before the first mixer, intended to attenuate images, but this was insufficient to separate megawatt broadcast stations from low powered amateurs. Fortunately, I managed to obtain a spare plug-in coil and aligned this so that the oscillator ran lower in frequency than the signal. The image when I was tuning the 20m band then fell to around 13MHz where there were no powerful broadcast stations.

A similar problem used to occur when I first got my licence, long before 2m FM became popular, and radio amateurs used the160m band regularly for local chat. In some areas of the country the BBC Home Service operated just below 1MHz and with most AM broadcast receivers then having an IF of around 465kHz, the image of this fell in the centre of the 160m allocation. Depending on the area of the country, certain frequencies in the 1.8 to 2MHz allocation were just not useable without upsetting the neighbours.

In Dick's case his friend's cheap scanner had hardly any image rejection at all so nearly every station was received twice, once at the correct frequency and again at the image response, giving the impression that it was picking up twice as many stations. There are no amateurs on 415MHz. It was just an image. The AOR scanner I had sold him had a much higher IF and more RF selectivity, hence better image rejection. While I was always willing to respond to genuine complaints, Dick did not get his money back, especially because one of his workmates told me, *"Dick soon tires of new toys and from then on is always looking for something to complain about so that he can demand a refund"*.

Fig. 2: The Eddystone 358X receiver.

I will always remember **Bill Lowe** of Lowe Electronics whose advertisements I loved to read. He once made the position perfectly clear when he advertised, *"Money returned if not fully satisfied but please note that I am usually fully satisfied with your money"*.

Static Electricity and the Workshop Mains Supply

When servicing transistorised equipment we are always warned about the danger of 'static', particularly in the case of FETs, but as time goes on you tend to relax and become careless.

In my case I was used to servicing valve equipment but after moving over to transistorised rigs, I blew a few devices during the learning curve. I had thought that having an earthed soldering iron and touching the equipment was sufficient but after some investigation I found that it was not static that was causing the trouble but leakage from the mains supply.

In an electronics workshop, to minimise the danger of electric shock, it is recommended that the whole mains supply is isolated with a one-to-one transformer as per **Fig. 3**. This means that even if the equipment you are working on has a live chassis, or you accidently touch a mains connection, you will not get a shock to earth. Such an arrangement is highly recommended in the amateur shack because then the mains earth can safely be removed and all the equipment can be connected to the RF earth. Like all safety measures, fitting an isolation transformer should not be used as an excuse to be careless and if equipment is not earthed, it can still become slightly live with respect to earth.

In my case, all the equipment I was working on and my test equipment 'floated' above earth as a consequence of the capacity between the primary and secondary of their own and that of the mains isolation transformer. This slight voltage was not enough even to be measured with anything except the most sensitive meters but was enough to blow sensitive solid-state devices.

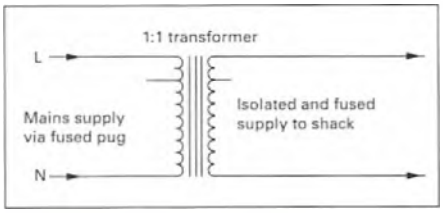

Fig. 3: Isolating the mains supply.

Fig. 4: Should your FETs be wrapped in cotton wool?

Even when you are working on a normal mains supply, it is as well to be aware of the possibility of leakage from the mains when replacing any solid-state devices. It goes without saying that you should switch off but also make it a rule to connect your soldering iron to the chassis of the rig you are working on and to disconnect the rig from the mains, antenna and any other equipment that is plugged into the supply before trying to replace parts.

When assembling printed circuit boards for my RF clipper and FM units, I still managed to blow a few dual-gate FETs, some of which were extremely sensitive to heat as well as to the slightest leak of voltage. In the end I started to use 'belt and braces' protection and before fitting the devices, I wedged a very small piece of wet cotton wool between their four leads and soldered them up with this in place, **Fig. 4**. This shorted out any stray voltage and also absorbed the heat from soldering. Of course, after the boards were fully assembled I then removed the cotton wool and left the boards to dry for a day or so before applying power. This method might be a little 'over the top' for normal servicing but is worth using if you are fitting a sensitive, hard to obtain or expensive device.

Input Impedance

It sometimes happens that you need to know the input impedance of the microphone, aux, tape or other audio input socket on an SSB rig or hi-fi equipment. You can't simply check it with an AVO so how do you measure it? First, you need a steady tone in the centre of the audio range and ideally this should come from an audio generator set at about 1kHz. However, if you don't have one, you can produce a suitable tone using a receiver and its beat frequency oscillator (BFO). Once you have a steady signal, apply it to the socket in question and adjust the level or the gain control until you have a small steady output from the amplifier or transmitter being tested. Measure the output voltage, not the power, and then try various resistors in series with the audio input lead. When you find a resistor that reduces the measured output voltage by 50%, its value is approximately the same as the input impedance of the socket you are checking.

An Earth Lead

Joe's xyl (wife) wondered why, being a 'townie', he was so enthusiastic about the house that they decided to buy in a village but because it seemed to offer everything that they wanted, she agreed to the purchase. Joe had, however, spotted something that he had not mentioned.

At the rear was a field containing a herd of cows and also a large tree about 50m from the house. It soon became clear as to what was in Joe's mind. The tree was almost due west of the house and Joe reasoned that a longwire antenna attached to it would fire a good signal north and south on 160 and 80m and have some gain east and west on the higher frequencies. *"Why struggle with carrying milk"*, he said to his wife, *"when we can have it delivered to the door farm fresh?"* She agreed. This was too good an opportunity to miss so he nipped round to the farm, placed an order for two pints a day and gained permission to attach a length of wire to the tree. All he then had to do was to fit a bracket on his chimney and, using a homemade bow and arrow

Fig. 5: The once very popular FT-101B.

(when the cows had gone in for milking!), he soon had a wire attached with the end coming into his upstairs shack.

As expected, the signal reports for his FT-101B, **Fig. 5**, were terrific on the lower frequency bands but often when he tried to operate on the higher frequencies he got reports of distortion and, once, he managed to burn his lip on the metal case of the microphone. He was told by his friends that he needed a better earth connection so he ran a thick wire straight down to an earth rod but it didn't seem to help and on the 10, 15 and 20m bands the shack was live with RF. At this point he called in to the shop for some advice.

A little basic theory shows that it is almost impossible to attach an earth rod to a shack in an upstairs bedroom that will be effective on the higher frequencies. If, for instance, the lead is a quarter of wavelength long, the impedance to earth at one end will be exactly the opposite to that at the other and, hence, if one end has a low impedance to ground, the other will be effectively insulated from earth. What Joe needed was some kind of counterpoise arrangement.

Now he could have fitted a collection of lengths of wire, each about a quarter of a wavelength long on the bands he wished to operate on, but as these would have still tended to radiate, Jack followed my more radical suggestion. He removed the carpet from his shack, covered the floor with chicken netting and replaced the carpet. For the sake of safety, it is not a good idea to stand on something that is earthed when operating electronic equipment. He then connected the netting via a 1500VW 0.01μF disc ceramic capacitor to the earth terminal of his ATU and, to his delight, the feedback was much reduced. As always with a longwire, there was still the problem that the single wire feed was itself radiating so he added a ferrite ring core to the microphone lead and this completely cured the problem. For safety, and possibly to improve results on the lower frequencies, he left the earth rod connected.

I have often been surprised at the good signals that many mobile whips can push out and am convinced that this has much to do with effectiveness of the car body as a counterpoise earth. Large end-fed or vertical antennas may look impressive but while earth connections may not look so important, with any system that is fed against ground the nature of the earth connection can make a huge difference to the results.

Years ago I read of some tests carried out by an American amateur who was trying to find out how many buried earth wires were needed to get the best results from his 160m band vertical. He kept adding more but when it got to 80 wires the signal still improving – at that he gave up.

End-fed wires were very popular when I first got my ticket in 1956 and I had one for 160m, which ended up on a hen cabin in a farmer's field. All the valves in the home built rig were ex-government surplus and TV types but with two watts of AM I still managed to put out a respectable signal throughout the UK and had lots of fun.

The PA valve I was using was an EF50 RF pentode but the very encouraging radio and TV servicing course instructor at Blackburn tech, **Mr Wallinger**, gave me an EF55, which was larger and intended as a video amplifier yet had identical pin connections. It simply plugged in, tripled my power and gave me even better results.

Memories! 73 Harry.

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Don't forget – all reports to Steve now by the 1st of each month please!

CW vs SSB

Steve Telenius-Lowe PJ4DX has another packed column starting with some sad news of the passing of a long-time supporter of PW and SWM.

We start this month with the sad news that top contester and DXer Steve Cole GW4BLE, Fig. 1, passed away on December 2nd after a brave battle with cancer. Steve and I go back a long way: as teenage SWLs in the late 1960s or early '70s we were sending DX reports to *Short Wave Magazine* at the same time. He recently took out a subscription to *PW* and contributed to *HF Highlights*, most recently to last month's column.

Fig. 1: Steve Cole GW4BLE (SK) with son Adam and grandchild William.
(Photo: GW4BLE qrz.com page)

Steve was one of the UK's top contesters, setting many records over a period of 40-plus years. He was also one of the driving forces behind the UK·EI Contest Club: www.ukeicc.com

Despite having had major surgery only a few weeks earlier, Steve was determined to take part in the CQ World Wide DX Phone contest in October, typically setting himself the target of a new GW record in the 'Classic' (24-hour) Low Power section. Afterwards he posted: *"wouldn't miss THE contest for anything. CU next year."* Sadly that will never be the case. Steve was a husband, father and, since Christmas day 2015, a grandfather. Our sincere condolences to his wife, Mandy, and their family.

CW vs SSB

It has long been asserted that CW has a great advantage over SSB, especially when using low power (QRP) or for otherwise 'difficult' contacts. There is a scientific explanation for this, as American technical author **Phil Salas AD5X**, writing on the *eHam forum* (website below), explained. *"It is mostly the signal-to-noise (S/N) improvement on the receive side that gives you the advantage on CW. Assume a 2.5kHz receive filter needed for SSB, and a 250Hz receive filter used for CW. Now you have a 10log$_{10}$(2500/250) = 10dB advantage. However, it is also easier to hear a CW tone than it is to understand SSB in a noisy environment. In other words, the required S/N for CW copy is lower than for SSB copy. So, add a few more dB advantage to CW. A rule of thumb is that CW has about a 12dB advantage over SSB so a 100W CW signal is equivalent to a full legal limit* [US legal limit, 1500W] *SSB signal."* Since many SSB operators use a somewhat wider filter than 2.5kHz, and CW operators often use a filter narrower than 250Hz, the theoretical difference can be even greater and I have seen a figure of 18dB difference quoted in the past.
www.eham.net/ehamforum/smf/index.php

It should therefore – theoretically – be easier to 'get through' to wanted stations on CW than on SSB but my recent experience suggests the opposite is the case: the 12 to 18dB advantage of CW is now often negated by modern technology. In November **Kenneth Opskar LA7GIA** was on a one-man DXpedition to the Central African Republic, operating as TL8AO. Ken prefers CW and is an excellent CW operator. I heard him on 20m CW with a fantastic S9+15dB signal but, despite calling him using 1000W output on and off over a period of several hours, I was unable to get through the numerous other callers and make a contact myself.

The following day Ken was on 20m SSB and I worked him after a single call using less than 100W. Ken even commented, *"great signal"*. Pure luck? No, I don't think so. The next day I tried to contact TL8AO at different times on both 20 and 15m CW, again using 1kW but without success. Then, two days after my 20m SSB QSO, I worked him on 15m SSB, again 'barefoot'. Both the SSB contacts were really easy, despite using relatively low power, while hours of calling on CW on the same bands – and using more than ten times the power – resulted in no contact on either band.

Why should this be? **Don Field G3XTT**, just back from the ZL7G DXpedition (see the January column), explained the reason in one word: *"RBN!"* (the Reverse Beacon Network), adding on the CDXC members' e-mail reflector, *"An expedition calls CQ on CW and gets a pile-up. Calls CQ on SSB and nothing happens!"* **David Wicks G3YYD**, himself an enthusiastic CW and datamodes operator, responded: *"I often tune around, find a lonely SSB DX station calling CQ and work him. After I have finished and no one calls I then spot him. It takes about 30 seconds from hitting the return key to a pile-up starting. The moral is obvious: if you are not a top-flight signal, tune the SSB portion of the bands to find the DX before anyone else. Just like we all did decades ago, except today on CW, PSK or RTTY, Skimmers get them on the Cluster before I get to hear them. SSB is the last bastion for DX hunting."*

Certainly the pile-ups on TL8AO were much bigger on CW than they were on SSB, suggesting Don and David are absolutely right. My suggestion to those finding it difficult to fight through the pile-ups on CW is to plug in a microphone and tune the bands to find the DX – don't just rely on the Cluster.

Readers' News

Owen Williams G0PHY said, *"The month started well with a contact with a Belgian team on Bonaire, PJ4L, on 14MHz and finished with a contact with V26BH on 14MHz. This was well-known DXer **Martti Laine OH2BH** celebrating his 70th birthday on Antigua."* PJ4L, operated by **Roger ON7TQ, Fig. 2**, and **Ief ON6KX**, with assistance from SWL Kevin ('in charge of

IT and catering'), made over 8000 QSOs on all bands from 160 to 10m in early November. Most contacts were on SSB but they also made several hundred on CW and RTTY.

Owen and his wife recently went on a Danube river cruise. *"One of the stops was near the United Nations Vienna International Centre. Although it doesn't count as a separate DX entity, it has its own callsign, 4U1VIC. For 10 euros you can go on a short guided tour; it's worth it because you can see the Nobel Peace medal that was awarded to the UN and samples of moon rock. Needless to say the guide had no knowledge of any amateur radio station in the building!"*

Martin Juhe M0XJP reported that he had *"just returned from La Romana, near Alicante, Costa Blanca, after three and a half weeks there. Conditions were very changeable and not as good as last year* [see *HFH* February 2016 - *Ed*] *but nevertheless quite enjoyable. I'm still using an Alinco DX-70TH at 80W with a G5RV up 25ft,* **Fig. 3**." Martin worked 57 DXCC entities on SSB and the best of his logs feature in the band reports.

Fig. 2: Roger ON7TQ operating as PJ4L from Bonaire.

Fig. 3: The G5RV antenna used by Martin EA5/M0XJP from near Alicante, Spain.

Carl Gorse 2E0HPI wrote, *"we travelled to Blackpool for my birthday and for a few days out on the radio. Conditions were not so good but we still managed 138 contacts over the few days of operating on the sea front,* **Fig. 4**, *and also at the Ribble Estuary (GFF-0145) near Lytham."* Starting at 6.00am Carl worked **Jonathan VK7JON/M** via the long path on 20m SSB, plus a number of European stations. *"Later in the day I headed to the Ribble Estuary. The weather was really nice with little wind and this proved to be a good location."* Carl worked all around Europe on both 40 and 20m SSB. Back home in the north-east, Carl used his Elecraft KX2 and Alex Loop antenna from Tynemouth, 10 miles east of Newcastle, to operate on 40 and 17m. He continued, *"I recently purchased the M0AQC interface box, which is available on eBay for under £30. It is made to fit most radios and Alan kindly made me one for the KX2."* Using it, Carl plans to be more active on digital modes in the future. *"I have also purchased the SOTAbeams Endfed tuners for portable operations but have yet to get out and use them."*

Fig. 4: Carl 2E0HPI/P operated portable from Blackpool Promenade (there's a 518ft tower going begging in the background!).

Our Belgian correspondent **Etienne Vrebos OS8D** said that he had not been very active of late because he has been riding his Triumph motorbike *"to all corners of France, Holland, the UK and Germany"*. He still found time to make some good contacts, as can be seen in the band reports. Etienne continued, *"After reading in* PW *about amplifiers* [November 2016 – *Ed*], *I am thinking about buying an amplifier of 500 – 600W, because it seems I have reached the final possibilities with the Icom IC-7851 and its 200W. I'll never get a tower allowed here, near to the control tower of Brussels Airport, and will be doomed to transmit through my six end-fed long wires (one for each band). It seems I went the wrong way, as described by Don and by* **Steve Ireland**: *I started with an expensive rig, no amplifier and only end-fed wires. Don wrote the opposite: start with a good antenna, then an expensive amplifier and just a cheap rig. The* PW *article came years too late for me!"*

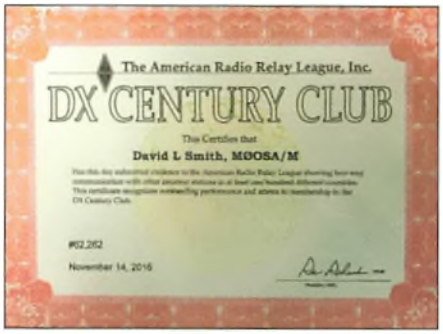

Fig. 5: DXCC certificate awarded to David M0OSA for contacts made when mobile.

Congratulations to **David Smith M0OSA/M** who qualified for the ARRL DXCC certificate, **Fig. 5**, for contacts made mobile with 50W from a Yaesu FT-857D and Outback 2000 antenna. David wrote,

"With 98 DXCC confirmed on Logbook of The World, I started in November trying to make those last two confirmed contacts that would allow me to 'join the club'. I tried to arrange a 'sked' with a couple of GI stations via Facebook but that didn't come off. However, confirmation of a 2014 QSO with OH3OJ/P gave me DXCC number 99. On November 13th I heard C31FR on 40m and managed to get through. I didn't have C3 confirmed, so was very pleased when I checked LoTW the following morning to see the confirmation there."

Once again **Terry Martin M0CLH** has been very active and sent in a log of over 240 stations worked, the best of which are featured in the band reports. He wrote, *"A reasonable month with conditions lifting a bit at times to allow some reasonable DX. As can be seen in the log, an eclectic mixture of modes were employed to get the best out of my R8 vertical. Dabblings included an RTTY contest and the CQWW CW contest where, again, the filtering on the Icom IC-7300 performed admirably. I have to say that the CW sending speed of some of the operators was sometimes self-defeating because they often had to repeat the received callsigns for us mortals to ensure they got it right!"*

As usual **Victor Brand G3JNB** reports some great DX contacts made with low power on CW. On November 5th he worked ZL7G (Chatham Islands) on 30m. *"Back came 'G3?' repeated over and over again until the operator copied and sent 'G3JNB 599 tnx Victor'. Great ears!"* With the declining propagation, almost 12,000 miles and running just 60-odd watts to a small vertical at 9ft, that really is decent DX! XU7MDC, the Italian team in Cambodia, proved to be a 'gotaway' whereas S01WS in Western Sahara was the only signal audible on 30m just after sunset one afternoon and Victor joined the queue for a QSO. Another evening, **Tom 5Z4/DJ6TF** in Kenya was calling CQ. *"Working at marginal levels, it took ages to complete the QSO but persistence prevailed. By contrast, YB16T was booming in from Indonesia."* One evening Victor called CQ on an apparently empty band, bringing a strong response from **Gus VO1MP** in Newfoundland. *"Although we had worked several times over the years, I had never checked his qrz.com pages,"* said Victor, *"I recommend readers take a look and be prepared to be blown away by the photos of his megastation antennas. No wonder Gus is strong in the UK!"* Over the last three days of November, Victor ran through the bands and worked A44A in Muscat on 15m, VP2EHC and 5Z4/DL7KL on 17m, PJ2T on 20m and 8Q7SP and 5T9VD (Mauritania) on 30m.

Fig. 6: HM King Bhumibol Adulyadej HS1A (SK October 13th, 2016)
(Photo: HS1A qrz.com page)

Kevin Jackson M0XLT said, *"The month has been interesting with DX worked at the beginning and end of November. The following bands produced the DX: 10, 12, 15, 17 and 20m. Quite a lot of special event stations from across Europe as usual keeping things lively, so although there was a downturn in propagation through the middle of the month it's not all doom and gloom."*

HFH's 10m man, **Tony Usher G4HZW**, in Mobberley, Cheshire, wrote, *"10m 'almost' opened up with WSPR signals from VKs 2, 3, 6, 8, W1, W2, HS2 and FR5. My only contact of note came on November 11th when I worked XT2AGI."* It is true that 10m has been 'disappointing' from Europe, although in the CQ WW CW contest at the end of November, PJ4Q on Bonaire made 730 contacts on 10m, albeit mainly with North America, using a Spiderbeam 35ft high.

Kevin Hewitt M0GTD in Chatham, Kent, had been off the air for a few months but, using a Kenwood TS-440 with 5m of wire through a 9:1 balun, he made contacts with EA7JNC and ZB2JK on 20m SSB. Kevin said, *"It was good to finally get back on the radio, although band conditions could have been more accommodating."* Kevin is planning to return to Gibraltar soon, where he is licensed as ZB2GI.

Band Reports

Martin EA5/M0XJP worked: 40m SSB: VK7AC. 20m SSB: 6W1RY, A71A, DK8OL (IOTA EU-042 Sylt I), HS70A (in memoriam HM King Bhumibol Adulyadej of Thailand, **Fig. 6**), OJ0B, S01WS, V85TL, VI50CC, ZL1BD. 17m SSB: NP4DR, VP8LP. 15m SSB: 4X6TT, 9J2BO, PJ4/K5LP, ZD7FT. 10m SSB: OD5ZZ.

Carl 2E0HPI/P operated portable from various locations to work, on 40m SSB: GN4LAB/A, GU6EFB, OP4VT, MU0GSY, MX0WFF, UA4TAN. 20m SSB: EU2MM, VK7JON/M. 20m RTTY: DH2PL, UR5UCJ, YQ0U. 17m SSB: 9A1AA, HA7NB, M6RGS.

Etienne OS8D worked his first US station on 80m SSB: KK6ZM/1. 40m SSB: ZL4AV (his first ZL on 40m). 20m SSB: 4U1WB (World Bank, Washington DC), 5N/PA3TG, 5T0JL, 5T9VB, 9G5AM, CY0/VA1AXC (Sable I), FM1HN, HI8JSG, PJ4/NT5V, TS16WTSA (Tunisia), VK6WC, VY2ZM. 17m SSB: 5H3MB. FG4NN, FJ/KO8SCA, HZ1BL, J68GD, KP4FL, KW7Y, NP4DR, PJ4L, PJ4/K5JP, PZ5V, TI2CC, VP5/W5CW, XE2G, YS1/HB9KNA. 15m SSB: 9N7WE, CO6HLP, D4C, LU1FAM, PJ2T, TL0A, TL8AO. 10m SSB: D4Z, ZD8W.

David M0OSA/M worked the following from his car. 40m SSB: C31FR. 20m SSB: 7U62AR (62nd anniversary of Algerian Revolution). 17m SSB: 7Y9OU (Algerian lighthouse). 15m SSB: 6V1IS/P, A60A, CO6HLP, CX8TC.

These are the best from the log of Terry M0CLH. 40m CW: ED9U, HB0A, HS0ZIA. 40m PSK31: C31MF. 40m PSK63: R9CQ. 40m RTTY: C31KC. 20m SSB: PJ4/NT5V, TK2A. 20m CW: 8P9JH, 9K2NO, HV0A, PJ2/DK3DM, PJ2/K2PLF, SW9AA, TK0C. 20m RTTY: 5C5W, A61DA, PJ4/N5JR, SX25LSV, VP2EGR, VP5/W0BM. 20m PSK31: 3DA0AY, YV4DHS. 20m PSK63: A92AA, SV9FBP, TA2DX. 17m SSB: A71AM, PJ2/DL8OBQ, PJ4L, VI50DC. 17m CW: 5H1WW, 5R8IC, 8P9JH, HI3TEJ, J68GD, PJ4/N5JR, VP2ESM. 17m RTTY: HP3SS, J6/NX8G. 17m PSK63: HB0/IZ3GNG. 15m SSB: J68GD, PJ4/K5JP, PJ4L. 15m CW: TL8AO, VE3DZ/KP4, VU2XE. 15m RTTY: 5R8IC, J62DX, PY2UD, WP3E, YV5AAX. 15m PSK31: 3DA0AY, CM2FRB, HS0ZHK, PY4NY. 15m PSK63: 5R8IC, HI8CSS, LU6VEK. 12m CW: TL8AO.

Kevin M0XLT worked these stations using 100W and a wire antenna. 20m SSB: K1QS (ME), TS16WTSA, VA2PW. 17m SSB: 4X6TT, 7U62AR, UA9MA, ZS5TU. 15m SSB: 9K2MB/M, A71AM, EA9UV, N8II (WV), PJ4L, RW9AS, VU2SMN, ZS6AI. 10m SSB: CN2JF, FR8QN.

Signing Off

A big thank you to all our contributors. Please send input for this column to **teleniuslowe@gmail.com** by the first of the month (February 1st for the April issue, March 1st for the May magazine). 73, Steve PJ4DX.

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Moonbounce with a Two-Element Yagi

Tim Kirby G4VXE has another full column of VHF news, including details of some successful EME QSOs using a small Yagi.

If you talk with most amateurs about what is required to make successful moonbounce contacts, the usual opinion is that you need vast arrays and high power – certainly a level of equipment that is beyond the realm of most 'ordinary' amateurs. With the advent of digital communications and, conveniently, some very large moonbounce equipped stations around the world, this has all changed.

Regular readers of *PW* may well have enjoyed the article (September 2016) describing the activities of the **Essex DX Group MX0CNS** in making experiments with single Yagis and low power on 70cm EME. Back in April, **Tom Hackett M0ABA** started testing with an optimised 2-element Yagi, **Fig. 1**, designed by **Hartmut DG7YBN**. Tom and **Dan HB9Q** decided to do some tests on the weekend of the 'supermoon' (more correctly known as the perigee moon). The night of November 12th was a rainy one in Essex so Tom had to use a program to calculate where to aim the antenna at the moon. This seemed to work fine because Tom was able to copy HB9Q at −28 (dB relative to the noise level) but after decoding a few CQs, Dan's signals jumped up to −19, **Fig. 2**. Tom called Dan and was delighted to complete a contact using the 2-element Yagi and a barefoot FT-857. I think it's fair to say that both Tom and Dan were delighted and a little surprised!

That's not the end of the story, though. The following day, Tom worked **Bernd DL7APV**, also with the 2-element Yagi. Tom was particularly pleased with this QSO because Bernd has been very supportive of all the low power tests over many months.

Congratulations to Tom, Dan and Bernd for such an inspiring story, a story that is ongoing. Hartmut DG7YBN is designing the next antenna, a narrowband 8-element Yagi, so Tom hopes to be building one of those after the Christmas period. I look forward eagerly to reporting more low power moonbounce contacts in due course.

Fig. 1: The 2-element Yagi used at MX0CNS for the 70cm moonbounce contacts with HB9Q and DL7APV.

Handheld Radios and SMA Connectors

Andy Webster G7UHN asked how people tended to connect high value handhelds such as the Kenwood TH-D72 to an external antenna. Although you can get SMA adapters that fit the antenna connector on the handheld, this can put quite a strain on the connector. With an expensive rig, the last thing you want is for the connector to snap off. In my case, I have a lead terminated with an SMA at one end and a socket at the other, which can receive the antenna connection from the Elk portable Yagi or whatever antenna I am using. This means that the weight of the

Fig. 2: A screenshot of the contact between MX0CNS and HB9Q.

cable and the antenna can be supported elsewhere without putting too much strain on the rig. A good point to mention, Andy – thank you.

The 6m Band

Jim Edgar GM4FVM (Eyemouth, Berwickshire) says that he started using the MSK144 mode on November 22nd. MSK144 is a new mode, available within the WSJT suite and also LZ2HV's MSHV program, along with 'legacy' modes such as JT6M. On 6m (50MHz) MSK144, Jim has worked DM2ECM, DF0OX, SM4GGC, SP8SN, OE5MPL, EA2ARD, GU8FBO, SM5KWU, SM5EPO, SP3UR, SK0TM, SP2GUB and EI7BMB. He hopes that activity will continue on this new and rather more efficient mode rather than falling back to the less effective FSK441and JT6M.

Mark Marment CT1FJC (Algarve) caught an Es opening on November 11th, working EI6EG (IO63) and G0GGG (IO81) on SSB and G4NRT (JO01), ON3CQ (JO21) and ON4KCD (JO20) on JT65.

The 4m Band

Roger Daniel G4RUW (Newbury) has a new radio, the Icom IC-7300, and is looking forward to using it on the 4m (70MHz) band. These radios seem to have become popular and I've always been impressed with the spectrum display, which can be quite useful during Es openings to keep an eye on band activity.

Jim GM4FVM worked OZ1JXY, SP9HWY, GI4OWA, GW4HBK and S52OR all on MSK144 via meteor scatter.

The 2m Band

During November **Jef VanRaepenbusch ON8NT** operated as OP8NT. The special OP prefix is in remembrance of the centenary of WW1. A special award is being issued by the UBA. You need to collect 1418 points. OP0PPY counts for 500 points and special event stations with an OP14, OP15, OP16, OP17 and OP18 prefix count for 250 points. During the month of November, all other Belgian stations count for 30 points. The award is only available in digital form, is free of charge and you can send your entries in text format, to on4cas@uba.be

Jef participated in the RSGB 144MHz UK Activity Contest on November 1st and worked G3YDY (JO01), G0QQT (JO01), G8CUL (IO91), G3MEH (IO91) and G4ODA (IO92).

Simon Evans G6AHX (Twyning, Gloucestershire) found that his 8-element OWL antenna had a high SWR following a very heavy rainstorm, so has temporarily replaced it with his standby antenna, an 8-element ZL-Special Yagi that Simon made years ago. He says it's performing well and he has taken part in a couple of contests since making the change. On December 4th, Simon took part in the RSGB 144MHz AFS contest with the best DX being F1BHL/P (IN98) at a distance of 441km. On December 6th, Simon took part in the UK Activity Contest, making 37 contacts with the best DX being F8BRK who, Simon says, is always a very strong signal. For both contests, Simon used his Yaesu FT-897 with the output set to 50W. Simon plans to put the original antenna up again after Christmas once it's dried out and having had the chance to make a few adjustments to avoid water ingress in future.

Jon Joyce GM4JTJ (Arbroath) also took part in the RSGB 144MHz AFS contest and said that it was as though all the south of England was at the bottom of his garden. Signals were extremely strong but there seemed to be very little activity from the middle of the country until a few hours into the contest. Jon lists his contacts and there are some very nice distances, particular F1BHL/P (IN98) at 863km with the majority of contacts being in the south of England. Jon's average distance per contact was an excellent 537km.

Lyn Leach GW8JLY (Cardiff) wonders if propagation is as good as it used to be. Is this a case of us remembering better summers when we were young? Here's what Lyn has to say:

"I have noticed over recent years that all the forms of propagation available to keen 2m DX hunters have been in slow decline. By far the biggest decline I have seen is in the number and quality of tropo openings. I just don't see the very intense openings that were often experienced here in previous years. The ones that do occur seem to favour those living on high ground and those living close to the sea. Of course, a high QTH and a sea takeoff has always helped but even those living at QTHs such as mine (about 90ft ASL and with no sea nearby) used to see very good openings several times each year, particularly in the autumn. In those openings, I could work many stations at very good signal strengths. In the openings we see now, each one is nearly always very patchy and although I am sure many stations are active, I don't work too many and signal strengths are usually weak.

"Auroras are certainly not as good at my latitude either. It's now rare for me to work stations outside the UK. As far as Es events at 2m are concerned, again these seem less intense and fewer in number compared with those of a few years ago. Most recent events have been comparatively short and very selective. I can remember 2m Es events a few years or more ago lasting for over three hours with end-stopping signals for hour after hour. What has happened, though, is that the 'summer' Es season at all frequencies has 'stretched' and begins earlier each year and ends very much later. This year (2016) the 'summer' season went on and on and on, right through October, into and up to the end of November and I even saw a report of someone seeing 6m Es as late as the December 1st. The December 1st opening does seem to be the final event, though, and no more Es has been noticed here since.

"Some of this decline could be due to global warming or maybe the lack of solar activity but what I find strangest of all and can't be put down to either of those factors, is the decline in the quantity of random meteors entering the earth's atmosphere and thereby creating the short trails of intense ionisation that we need to complete meteor scatter (MS) QSOs. MS QSOs, outside major showers, usually take much longer now and are more difficult to complete. Additionally, even the major meteor showers are not as good as in previous years.

"I would certainly like to see what your readers think about this – maybe they agree with my view or maybe they disagree."

It's an interesting question and I wonder what you think? What's curious is that Lyn feels that this has happened across a variety of propagation modes that have very different triggers (for example, terrestrial weather versus space weather). My inclination is to think that this is an effect of reduced activity and the openings being less obvious. Lyn and I will both be interested in your views.

Lyn worked GM6VXB/P (JO08) via MS on December 1st. **Martin GM6VXB** works on oil rigs and had recently also operated from JO07, JO17 and IO98 – all new locators for Lyn. Lyn noted tropo between November 25th and December 1st but found that very little could be heard at his QTH. He managed three QSOs, one with DL6YBF (JO31) and two with DK1FG (JN59), the first on November 27th and then on December 1st.

The 70cm Band

Jef OP8NT operated during the RSGB 70cm UK Activity Contest on November 8th and worked G0XDI/P (JO01), G3XDY (JO02) and G4CLA (IO92).

Satellites

Jef OP8NT worked CT1FJC (IM57), G0ABI (IO80) and UX0DA (KN18) through SO-50 while working, through AO-85, CT1FJC (IM57), F6GLJ (IN94), EA7AFM (IM66), HA1SE (JN87), EA1JM (IN70), EA5TT (IM99), F4DXV/P (JN05), EA4SG (IN80) and DG1JC (JO31). A very nice haul through AO-85 in particular.

Kevin Hewitt M0GTD (Chatham) received the International Space Station (ISS), digipeating on UHF on December 6th while using a Baofeng UV-5RE and a 4-element Yagi made from four Poundstore 'rabbit ears' antennas, **Fig. 3**. On December 9th, Kev monitored the ARISS school contact with Jean Charcot College, St Malo from a local hill using the same UHF setup. The signal was S2 during the 18° pass. Kev also received an SSTV picture from the ISS using an Icom IC-271 and a crossed dipole for the 137MHz weather band.

Bob Houlston G4PVB also heard the ISS digipeater on UHF, using the frequencies I mentioned in the January 2017 column. Bob has kindly put together a satellite information page on his website (below). Although not in the amateur bands, I suggested to Bob that he might find it interesting to listen to the 143.625MHz downlink from the ISS to ground stations, which is often active as the ISS crosses Europe.

http://g4pvb.eu.pn/sats.htm

Patrick Stoddard WD9EWK (Arizona) has been busy out on the road again. I've had to edit Patrick's fascinating report for space reasons but hopefully have retained the flavour and enthusiasm of what he has to say. Patrick takes up the story:

"November was a busy month here. With the start of hamfests here in Arizona, another quick road trip for a National Parks on the Air (NPOTA) activation via satellite and more experimentation with the ISS packet digipeater on 437.550MHz, it has been fun.

"During the long Thanksgiving holiday weekend at the end of November, I made a day trip to the Walnut Canyon National Monument east of the northern Arizona city of Flagstaff. On my way to Walnut Canyon, I stopped to work an SO-50 pass from the DM34/DM44 grid boundary. Those grids are rarely heard on the satellites and I logged 13 QSOs with stations across the continental USA and Canada. There was snow on the highest mountaintops, with the morning temperature dropping below freezing, where it stayed until late morning.

"With SO-50 and AO-85 passes for FM satellite operators, along with a couple of passes on SSB (FO-29) and packet (NO-84) satellites, I was more than able to work the ten different stations required for an official NPOTA activation.

*"When available, I will work the ISS or NO-84 packet digipeaters as I will any other FM or SSB/CW satellite. For some, this may be their only way to work me in a rare grid locator or interesting location. The second NO-84 pass I worked from Walnut Canyon had just three stations on the pass – **Mark KK6OTJ, Endaf KG6FIY** and me. In the span of a few minutes, we all worked each other using APRS messages through NO-84's 145.825MHz digipeater.*

*"Starting on November 18th, I began to try working the ISS packet digipeater on 437.550MHz with a different antenna. Instead of the Elk handheld 2m/70cm log periodic I normally use for satellites, I used a Diamond RH77CA 2m/70cm duckie antenna. This antenna, at 15in/38cm in length, offers some gain over the normal (and shorter) antennas typically used with HTs. When moved around with the HT during an ISS pass, it was capable of both hearing the ISS digipeater and having my TH-D74A's signals heard at the ISS. I worked one nearby station on a morning pass – **Jack KC7MG**, about 50 miles south of me. I tried again a few days later, this time on an evening pass. I worked **Mark KK6OTJ** in southern California. When Mark learned that I was using this HT/duckie combination, he wanted to see if we could make an ISS packet QSO where both of us used an HT and the same Diamond long duckie.*

"The pass we decided to try was a high pass for both of us. We were ready when the ISS rose from the southwest. It took us several minutes to do the exchange of APRS messages to make the QSO but we did. We finished the exchange about six minutes into the pass, later than we thought this would take. We were successful, though, showing that moving the ISS packet digipeater to UHF offered new challenges".

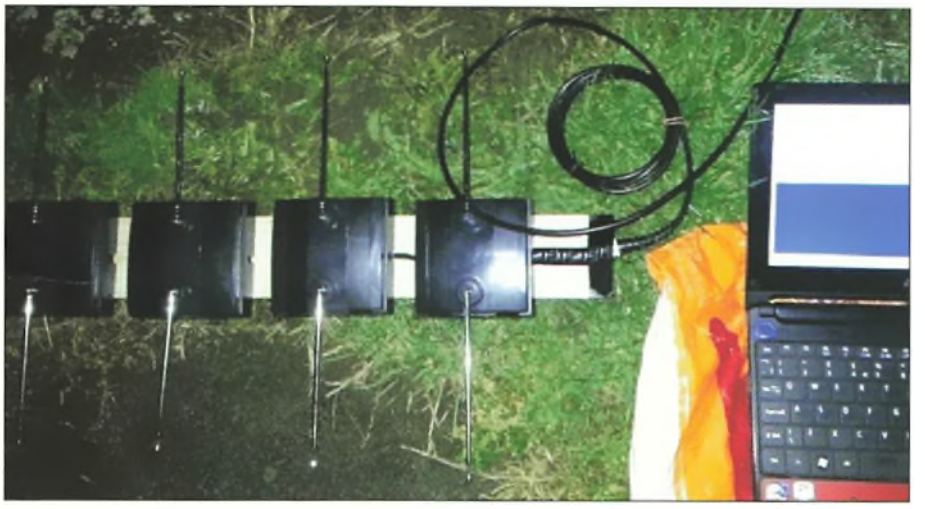

Fig. 3: The homebrew antenna made by Kevin M0GTD to receive the 70cm signals from the ISS digipeater.

Mark CT1FJC sent a log of over 100 satellite QSOs made during the month with some very nice contacts. Mark says that he is looking forward to getting the antennas up on the roof because at the moment he is only able to use approximately half of the orbits. Mark lists some very nice contacts made through FO-29, both to the west, K3SZH (FN10), KB1RVT (FN34) and K8YSE (EN91) plus R3THA (LO15) and UA9FFF (LO88) to the east.

A quick note from **Graham Jones G3VKV** (Cheltenham) says that he has reached working 30 states through the FO-29 satellite by way of a contact with AB4AN (EM64) in Alabama.

Microwaves

Jon GM4JTJ writes. *"I have just taken delivery of a PLL local oscillator from **Dieter DF9NP**. He supplies a range of oscillators for microwave work and at a very reasonable price. He only supplies people in Europe so I thought it best to order my 3256MHz version before Brexit!*

"I also asked him to program a second frequency of 3408MHz for future experimentation as a stable local oscillator for 10GHz. The unit arrived this week, was beautifully made by Dieter and measured only 2 x 2 x 1in with a 13dBm output level. Needless to say, I will soon be operational on 9cm in 2017".

You can see DF9NP's offerings at: www.df9np.de/page1.html

Thank You

Thank you to everyone who's written. There seems to have been plenty of news, which is great for what is often quite a quiet time of year at VHF/UHF. Please keep your news coming – see you next month!

Rallies

Send your rally info to:
PW Publishing Ltd, Tayfield House, 38 Poole Road,
Westbourne, Bournemouth BH4 9DW.
E-mail: newsdesk@pwpublishing.ltd.uk

Plan your rally visits with our comprehensive list of forthcoming events.
PW Publishing Ltd. will be at shows marked* – come along to our stand for great deals on subscriptions to *Practical Wireless* and *RadioUser*.
Club Secretaries and Event Organisers – please send us details of your event if you would like it to be mentioned here.

JANUARY

January 15th

The Red Rose Winter Rally

The Red Rose Winter Rally (organised by the West Manchester Radio Club) will be held at Lowton Civic Centre, 23 Hesketh Meadow Lane, Warrington, Cheshire WA3 2AH (just off the A580 East Lancs Road). The doors will open at 11.00am and there will be free car parking, trade stands, a low-cost Bring & Buy, special interest groups, an RSGB bookstall and a café area. The venue is all on one level, with facilities for the disabled.

John (Rally Manager)
Tel: 07870 161953
http://wmrc.org.uk/lowton_winter.htm

January 29th

The Horncastle Winter Rally

The Horncastle Winter Amateur Radio Rally will be held at Horncastle Youth Centre, Cagthorpe Buildings, Willow Road, Horncastle, Lincolnshire LN9 6DZ. The doors will open at 10.00am and admission will cost £2.00. There will be free parking, trade stands, a prize draw and refreshments will be available (including hot drinks and the now famous Horncastle bacon butties). The event will be all on one level and the venue has toilets for the disabled, wheelchair access and is suitable for both wheel and electric motor chairs. For more information, call the number below – if no answer, please leave a message and you will be called back.

Tony G3ZPU
Tel: 01507 527835
E-mail: tony.nightingale@yahoo.co.uk

FEBRUARY

February 5th

The Canvey Radio and Electronics Rally

The South Essex Amateur Radio Society will be hosting the 32nd Canvey Radio and Electronics Rally at The Paddocks Community Centre, Long Road, Canvey Island, Essex SS8 0JA (the southern end of A130). The doors will open at 10.30am and there will be free parking, trade stands, freshly made refreshments (**Mark's** famous bacon baguettes) and facilities for the disabled. Traders will have access to the venue from 8.30am.

Vic Rogers G6BHE
Tel: 07957 461694
E-mail: nvr1945@btinternet.com
www.southessex-ars.co.uk

February 10th, 11th and 12th (Friday/Sunday)

The Orlando HamCation

The 71st Orlando HamCation will be held at the Central Florida Fairgrounds and Expo Park, 4603 West Colonial Drive, Orlando, Florida 32808. The doors will be open from 9.00am to 6.00pm on Friday, 9.00am to 5.00pm on Saturday and 9.00am to 2.00pm on Sunday. Admission for all three days will cost US$15.00 (for tickets purchased at the gate) or US$13.00 (if purchased in advance). There will be talk-in, free car parking, trade stands, a flea market, a car boot sale, forums, special interest groups, family attractions and a prize draw.

www.hamcation.com

February 11th (Saturday)

The Ballymena ARC Rally

The Ballymena Amateur Radio Club Rally will be held at Ahoghill Community Centre, 80 Cullybackey Road, Ahoghill, Ballymena, Co. Antrim BT42 1LA.

Hugh Kernohan GI0JEV (Secretary)
Tel: 02825 871481
E-mail: hkernohan@aol.com
http://gi3fff.synthasite.com

February 12th

The Harwell Radio & Electronics Rally

The Harwell Amateur Radio Society will be holding a Radio and Electronics Rally at Didcot Leisure Centre, Mereland Road, Didcot, Oxfordshire OX11 8AY. The doors will open at 10.00am and admission will cost £3.00 (children under 12 free). There will be talk-in on **145.550MHz** using **G3PIA**, free parking nearby (disabled parking next to the Leisure Centre), trade stands, special interest groups and an RSGB bookstall. Refreshments will be available all day.

Ann G8NVI
E-mail: ann.stevens@btinternet.com
http://g3pia.org.uk

February 19th

Audiojumble

Audiojumble – "*The UK's largest second-hand and vintage hi-fi event*" – will be held at The Angel Leisure Centre, Angel Lane, Tonbridge, Kent TN9 1SF. Standard Entry (10.30am) will cost £6.00 and Early Entry (9.30am) will cost £12.00. Items on sale will include vintage and modern hi-fi, valve amplifiers, transistor amplifiers, speakers, turntables, tuners, tape recorders, CD players, records, components, books and vintage radios.

www.audiojumble.co.uk

February 19th

The RadioActive Fair

The RadioActive Fair, promoted by the Mid Cheshire Amateur Radio Society, will be held at Nantwich Civic Hall, 4 Market Street, Nantwich, Cheshire CW5 5DG. The doors will open at 10.30am. There will be free parking, trade stands, a Bring & Buy, an RSGB bookstall, catering and facilities for the disabled.

Stuart M0WTX (Fair Manager)
Tel: 07880 732534
www.radioactivefair.co.uk

February 26th

The BRATS Rainham Radio Rally

The Bredhurst Receiving and Transmitting Society Rainham Radio Rally will be held at Rainham School for Girls, Derwent Way, Rainham, Kent ME8 0BX. The doors will open at 10.00am and admission will cost £2.50. There will be talk-in on 145.550MHz using **GB4RRR**, free parking, trade stands and light refreshments will be available.

E-mail: Trev@wig1.co.uk
www.brats-qth.org

February 26th

The Pencoed ARC Table Top Sale

The Pencoed Amateur Radio Club Table Top Sale will be held at Pencoed Rugby Football Club, The Verlands, Felindre Road, Pencoed CF35 5PB. The doors will open at 9.30am and admission will cost £2.00. In addition to the trade stands, there will be hot food (morning and lunch time). Hot and cold drinks (non-alcoholic until lunch time) will be available from the bar. Sellers will have access to the venue from 8.00am and tables (which will be available on a first come, first served basis) will cost £10.00 each.

Madeline Roberts (Table Booking)
Tel: 01639 767056 or 07738 375775

February 26th

The Wyong Field Day

The Central Coast Amateur Radio Club will be celebrating its 60th anniversary with a Field Day at Wyong Racecourse, Howarth Street, Wyong NSW 2259, Australia. The gates will open at 8.30am and admission will cost AU$10.00. There will be ample car parking, ATMs on-site, trade stands, a large flea market, lecture programme, licence assessments and an air-conditioned licensed area.

www.ccarc.org.au/wp/ccarc-field-day

MARCH

March 4th (Saturday)

The Lagan Valley ARS Annual Rally and Hamfest

The doors to the Lagan Valley Amateur Radio Society Annual Rally and Hamfest will open at 11.00am and all the usual traders are expected to attend. For more information, contact **Victor GI4LKG**, **Andrew MI0BPB** or **Jim GI0DVU** all of whom are QTHR.

March 5th

The Exeter Radio & Electronics Rally

The Exeter Radio & Electronics Rally will be held at America Hall, De La Rue Way, Pinhoe, Exeter EX4 8PW. The doors will open at 10.30am (10.15am for disabled visitors) and admission will cost £2.00. There will be trade stands, a Bring & Buy (items can be booked in from 10.15am) and catering will be available.

Pete G3ZVI
Tel: 07714 198374
E-mail: g3zvi@yahoo.co.uk

March 11th (Saturday)

The National Radio Flea Market

The Foundation Bossche Radio Amateur Club (BRAC) will be hosting the 42nd Dutch National Radio Flea Market at the Autotron Rosmalen, Graafsebaan 133, Rosmalen 5248, the Netherlands. The Autotron Rosmalen is wheelchair user accessible and equipped with a toilet for the disabled.

www.radiovlooienmarkt.nl
www.autotron.nl

March 12th

The Dover Radio Rally

The Dover Radio Rally will be held at Whitfield Village Hall, Sandwich Road, Whitfield, Dover CT16 3LY. The doors will open at 10.00am and admission will cost £2.00. There will be talk-in using **GB3KS**, good parking facilities, trade stands, a Bring & Buy (with 10% of the sale price going to Dover Radio Club funds) and hot and cold refreshments. The auction will start at 12.30pm and the Rally will end at 1.00pm. Full details can be found on the Dover Radio Club website.

Aaron Coote 2E0FQR
Tel: 07714 654267
E-mail: aaroncoote@hotmail.co.uk
www.darc.org.uk

March 19th

The Wythall Radio Club Rally

The 32nd Wythall Radio Club Rally will be held at Wythall House, Wythall Park, Silver Street, Wythall, Birmingham B47 6LZ. The doors will open at 10.00am (9.30am for disabled visitors) and admission will cost £4.00. There will be on-site and on-street parking, trade stands, lectures, refreshments, a licensed bar (from midday) and facilities for the disabled.

Mike
Tel: 07976 744479
E-mail: mike@g4vpd.com
www.wythallradioclub.co.uk

March 26th

The Callington Radio Rally

The Callington Radio Rally organised by the Devon and Cornwall Repeater Group and the Callington Amateur Radio Society will be held at Callington Town Hall, Callington, Cornwall PL17 7BD. The doors will open at 10.00am and admission will cost £2.00. There will be ample free car parking adjacent to the venue, trade stands, a Bring and Buy (10% commission) and on-site catering.

Roger 2E0YPH
Tel: 07854 068882
E-mail: 2e0rph@gmail.com
www.gb3pl.co.uk
www.callingtonradiosociety.org.uk

• E-Mail: contest@pwpublishing.ltd.uk

The Eighth Practical Wireless 70MHz Contest Results

Colin Redwood G6MXL has, once again, been busy adjudicating a PW contest. Here he brings readers the results of last September's 70MHz event.

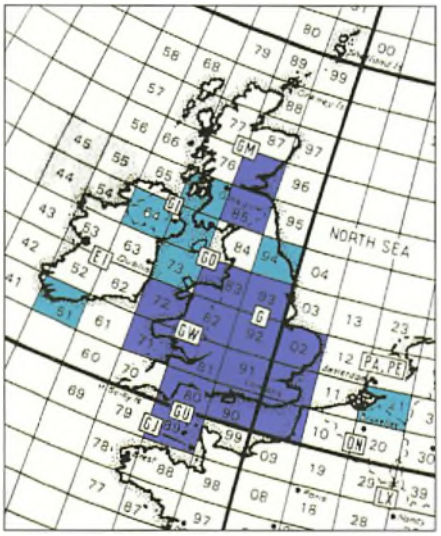

Fig. 1: Map showing locator squares of stations that entered (in dark blue) and other stations worked (light blue).

Very mixed weather greeted those who ventured out portable for the 8th *PW* 70MHz Contest on Sunday September 25th 2016. The 32 entrants made a total of 1007 contacts (a 50% increase over 2015) with 172 different stations in 23 different locator squares, Fig. 1.

Low Power Section Winner

Rob Cridland G7LAS/P operating from the summit of Bardon Hill in IO92IR is the winner of the Low Power section. He used an Icom IC-703 and a UT5JCW transverter running 10W into a damaged single element Quad antenna, **Fig. 2.**

Open Section Winner

The winner of the Open section is **Fred Handscombe G4BWP**, operating from JO02FH. Fred used an Elecraft K3 transceiver + OZ2M transverter + Gemini amplifier, feeding a 7-element Powabeam antenna.

Full details of the results can be found in the accompanying tables. As usual, certificates will be sent to all the leading stations and leaders in each square.

Weather

Those stations who ventured out onto the hills and mountains encountered a mixture of weather. In Powys, Wales, **Simon Pryce GW0EIY/P** was *"disrupted several times by squally showers"*. As a result of high winds he had to keep the mast low, **Fig. 3.**

Rob G7LAS/P, says that he had *"Everything! Sunshine and rain – even a rainbow – and also quite strong wind at times"*.

Even within the same county, the weather was quite variable. The **SADGITS** operating as **G4RLF/P** from Win Green, near Shaftesbury in Dorset, encountered showers among sunny intervals. Yet on the Purbeck Hills a few miles south, I managed to avoid the rain altogether.

Fig. 2: Leading low-power station G7LAS/P.

RF Conditions

Several entrants commented on the rather poor RF conditions. **Steve Appleyard G3PND** submitted the Norfolk Coast Amateur Radio Society (NCARS) MX0NCA/P entry, and said that, *"Only 12 QSOs were made in the four hours, with most being slow exchanges due to the deep QSB. Nonetheless an enjoyable afternoon was had by all and it was very satisfying to have made contact with Wales and the southwest on 70MHz"*.

Ron Price GW4EVX/P operated from near Halkyn, a village in north east Wales. He was, *"pleased with the level of activity from north of the border, with five GMs in the log"* but says he heard nothing from GD/GI/EI or from IO84 square.

Equipment

The trend of using transceivers with 70MHz capabilities rather than transverters appears to be continuing. Simon GW0EIY/P felt that, *"The IC-7100 is a refreshing change after using transverters."*

First Time

The NCARS team, MX0NCA/P, had their first attempt at this contest, **Fig. 4**. They operated from the highest point in Norfolk, at 100m ASL on the Cromer Ridge, 3km south of Sheringham. Steve G3PND says that, *"No one in the club had any experience of this band and it was only through member **Ken Holloway M0SHK** acquiring a new IC-7300 that NCARS were able to join in the contest. The five-*

Fig. 3: The antenna at GW0EIY/P had to be kept low because of the squally winds.

Table 1: Leading Stations.

Description	Name/Team	Callsign
Low-Power Winner	Robert Cridland	G7LAS/P
Open Winner	Fred Handscombe	G4BWP
Leading Single Operator	Fred Handscombe	G4BWP
Leading Multi-Operator	Guildford & District Radio Society	G5RS/P
Leading English Station	Fred Handscombe	G4BWP
Leading Welsh Station	Ron Price	GW4EVX/P
Leading Scotish Station	Andy Anderson	GM4JR
Leading GU/GJ Station	Keith Le Boutillier	GU6EFB

element beam was mounted on the club's telescopic mast, giving an additional 9m of height. NCARS will certainly be back next year as well as also trying this location for the PW 2m contest although probably with a contest callsign because the club callsign MX0NCA/P needed a lot of repetition".

Fig. 4: Members of the Norfolk Coast Amateur Radio Society MX0NCA/P gather around the Icom IC-7300 transceiver.

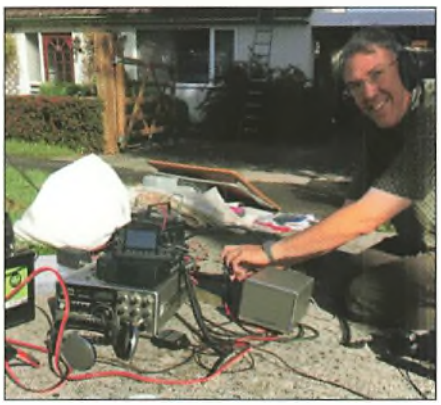

Fig. 5: Martyn Wright G4RLF of SADGITS checks the station on the front drive on the morning of the contest before heading out to Win Green.

Table 2: PW 70MHz Low Power Results Table.

Pos	Call	Name
1	G7LAS/P	Rob Cridland
2	M0ICK/P	Michael Heywood (Bolton Wireless
3	M0VCT/P	Vecta Contest Group
4	G4RLF/P	SADGITS
5	G3YDO	Hereford Amateur Radio Society
6	GW0EIY/P	Simon Pryce
7	G7FAR	Donald Hadden
8	G4DBN	Neil Smith

Equipment Problems

Ron Price GW4EVX says, *"I set up with time to spare but found that the rotator refused to work so I had to manually turn the whole mast. On returning home the rotator worked fine so I think Murphy was at play somewhere!"*

The delta match on their antenna came away at one point, so Rob G7LAS/P and **Mike Hunter 2E0YYY** 'walked-down' the antenna. This resulted in the pole snapping and they finished the rest of the contest with it 2m shorter at 6.5m instead of 8.5m.

Equipment problems weren't confined to rotators and antennas. One group suffered a computer glitch, resulting in the loss of their electronic log. Fortunately they had also kept a paper log, which they were able to fall back on.

The SADGITS, G4RLF/P, made sure that they didn't forget anything and checked

Table 3: PW 70MHz Open Section Results Table.

Pos	Call	Name	QSOs	Squares	Score	Locator	Transceiver
1	G4BWP	Fred Handscombe	70	21	1470	JO02FH	K3- OZ2M-Gemini
2	G4ASR	David Butler	69	20	1380	IO81MX	FT-2000 + DB6NT TR7DH + TE SYS
3	M1DDD/P	Nick Garbett	69	19	1311	IO93CH	Yaesu FT-847 + SSPAANT Amplifier
4	G5RS/P	Guildford & District Radio Society	68	19	1292	JO00EW	Icom IC-735 + MM TVTR + 4CX250
5	G3NPI	Geoff Suggate	54	16	864	IO92MA	ANAN10-OZ2M TVTR-H/B MOSFET P
6	M0ORO/P	Ossett Amateur Radio Operators	48	17	816	IO93EQ	Yaesu FT-847 + Gemini
7	G2HX/P	Gloucester Amateur Radio & Electronics Society	53	15	795	IO81WU	Yaesu FT-817 + Spectrum TVTR + G
8	M0SAT	Dave Remnant	49	15	735	IO91TP	IC-9100 & ME4T-PRO TVTR, homebr
8	GW4EVX/P	Ron Price	49	15	735	IO83JF	IC-7000 + Spectrum TVTR + Amplif
10	G2AS	Sheffield HF DX Group	35	14	490	IO93GG	Yaesu FT-847
11	G5TO/P	Sheffield & District Wireless Society	31	15	465	IO93FL	Icom IC-7100
12	G4IDF	Malvern Hills	25	12	300	IO82VE	K3 + Nacton Transverter + Dressler
13	GM4JR	Andy Anderson	23	12	276	IO85FB	Noble NR-4SCA + Gemini amplifier
14	GC0VPR/P	St Tybie ARS	18	13	234	IO71XW	Yaesu FT-847
15	GW4RWR	Rhys Thomas	17	11	187	IO83HE	All Homebrew. Monoband TRX 10.7IF
16	GM4JTJ	Jon Joyce	16	9	144	IO86RP	Icom IC-7100 +PA
17	GU6EFB	Keith Le Boutillier	11	10	110	IN89RK	IC756 Pro2 Home built TVTR, noasthe
18	G6DOF	Clive Wankling	12	9	108	JO01HN	Icom IC-7300
19	G3UVR	Denis Jones	12	7	84	IO83KH	Kenwood TS-870 + HB TVTR + 4XC
20	M1CJE	Andrew Eastland	9	7	63	IO91CJ	Icom IC-7300
21	GM4JJJ	David Anderson	10	6	60	IO86GB	Icom IC-7300
22	MX0NCA/P	Norfolk Coast ARS	8	7	56	JO02OW	Yaesu FT-7000
23	GC4LZP/P	Meirion Amateur Radio Society	8	5	40	IO72XU	Icom IC-7100
24	G0OIW/P	Mark Palmer	9	2	18	IO91MP	Ascom SE550

	QSOs	Squares	Score	Locator	Transceiver	Antenna	Ht. m asl
	64	16	1024	IO92IR	Yaesu FT-817nd + UT5JCW TVTR	Single-ele quadruple quad antenna	278
lub)	52	16	832	IO83RO	Icom IC-7100	5-ele LFA HB	250
	46	15	690	IO90JO	Yaesu FT-757GX + TVTR	3-ele Yagi	225
	30	11	330	IO80WX	Icom IC-7100	5-ele Yagi	277
	19	11	209	IO82PE			0
	11	6	66	IO82LQ	Icom IC-7100	3 element 'OWL' yagi further optimised w	370
	7	6	42	IO93RE	Icom IC-7100	3-ele Innov beam	9
	5	2	10	IO93NR	Elad FDM DUO+ Ukrainian TVTR	Wire dipole	20

everything out on the front drive on the morning of the contest, **Fig. 5**.

Operating Techniques

Regular entrant **Andy Anderson GM4JR** said that he, *"Twice had problems with stations who worked me then literally sat on me until other stations asked them to move. Quite annoying and not newbies either! I really wish people would listen before they transmit when they decide to find a nice, clear spot to CQ."*

Andy also found, *"One station had dreadful audio and the operator appeared to breathe through his ears because he could call CQ with no breaks in the transmission! When I finally did get through, after nearly ten minutes of their CQs, they could not grasp that they were almost inaudible and needed to slow down and send long slow repeats. A club station, fair enough, with maybe an inexperienced operator, but clubs fielding new operators should ensure they are monitored and mentored to ensure the club gets the best out of them and they learn from the experience. I wasn't alone in my observations with regard to this station either."*

Table 4: Leading Stations in Each Square.

Square	Name	Call	No. entries
IN89	Keith Le Boutillier	GU6EFB	1
IO71	St Tybie ARS	GC0VPR/P	1
IO72	Meirion Amateur Radio Society	GC4LZP/P	1
IO80	SADGITS	G4RLF/P	1
IO81	David Butler	G4ASR	2
IO82	Malvern Hills	G4IDF	3
IO83	Michael Heywood (Bolton Wireless Club)	M0ICK/P	4
IO85	Andy Anderson	GM4JR	1
IO86	Jon Joyce	GM4JTJ	2
IO90	Vecta Contest Group	M0VCT/P	1
IO91	Dave Remnant	M0SAT	3
IO92	Rob Cridland	G7LAS/P	2
IO93	Nick Garbett	M1DDD/P	6
JO00	Guildford and District Radio Society	G5RS/P	1
JO01	Clive Wankling	G6DOF	1
JO02	Fred Handscombe	G4BWP	2

	Antenna	Ht. m asl
	7-elee POWABEAM	36
'EMS SSPA	2 x 7-ele DK7ZB Yagis	233
	6-ele PowAbeam	455
B	9ele DK7ZB @15m/8ele Jaybeam @10m	170
A	6 over 6 LFA Yagi	110
	Vine 5-ele Yagi	110
emini amplifier	4-ele LFA Yagi.	323
w solid state linear	Dual 6 and 4m innovantenna beam	69
er	5-ele OWL	270
	4-ele InnovAntenna dual band Yagi	100
	Homebrew 4-ele Yagi at 3.5m agl	320
linear	5-ele Yagi	68
	6-ele Yagi	0
	HB9CV	325
& VXO.	7-ele DK7ZB	70
	5-ele HB Yagi	90
ad pre amp and liner ampilfier	6-ele beam	26
	3-ele Yagi	120
250FG amplifier	4-ele Yagi	100
	Inov 3+3	160
	HB 5-ele Yagi dual band 4m 6m at 12m AGL	60
	4-ele beam	108
	SRC 3-ele Yagi	150
	Slim Jim	254

FM

In addition to SSB, a number of stations made contacts using FM. Rob G7LAS/P, for example, made eight FM contacts. He used a homebrew 450Ω ladder line Slim Jim antenna for these.

For Andy GM4JR, the highlight of the contest was his contact with **Dave Butler G4ASR** on 70.450MHz FM, the farthest non-Es contact he'd ever made on 4m FM.

Contest Length

I've again received requests to reduce the length of the contest by an hour. I am, therefore, planning to do so in 2017, starting one hour later than at present.

2017

The 2017 *PW* 70MHz Contest is provisionally booked for Sunday September 24th. I expect the rules to appear in the September issue, due in the shops mid-August.

Congratulations & Thanks

Congratulations to the 2016 winners and on behalf of all entrants, a big *"Thank You"* to all stations that participated.

Letters

Send your letters to:
Don Field G3XTT, PW Publishing Ltd, Tayfield House,
38 Poole Road, Westbourne, Bournemouth BH4 9DW.
E-mail: don@pwpublishing.ltd.uk

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

Friends Across the World

Dear Don,
It's strange how two children who grew up together and whose lives went in very different directions were put in touch again through amateur radio and without ever having had an 'on air' contact!

Jennifer and I grew up living in the same road. She moved to Australia many years ago but kept in touch with my mother and as time passed, I found out that she had become an amateur, VK3WQ. She was at one time president of ALARA and was this year given an award for 'Services to Amateur Radio and ALARA over five decades'. Her partner **Peter VK3RV** was given two awards, one for writing articles on amateurs who served in the war to coincide with the Centenary of the ANZAC landings at Gallipoli and the other for services to the Wireless Institute of Australia over 40+ years.

We had a very rare meeting in October when they were in England for the YL International and RSGB conferences at Milton Keynes and it was so interesting to hear about the activities that they are involved in. We keep in touch and we will have that direct QSO one day!
John Sones M0AAO
Ipswich

A Request from RAIBC

Dear Don,
My name's **Ian Spencer** and I'm the Audio Manger for the RAIBC, the charity working for radio amateurs with disabilities.

We record (in MP3 format) licence manuals, user manuals and monthly magazines for those with a sight impairment and make them available for download or on CD sent free of charge to members. As I'm sure you know, *PW* is one of the magazines that are read each month by a dedicated team of volunteers.

However, we really need some extra volunteers prepared to read manuals or to step into the breach with reading one of the magazines when necessary. The volunteers don't have be super computer or audio literate because we offer as much help as is necessary in the form of video tutorials, free software, online and personal help to get any volunteer up to speed. We just need enthusiasm so I am hoping that you can perhaps find a few inches in your magazine to ask anyone interested in volunteering to contact me either via my e-mail address – **audioman@raibc.org.uk** – or by telephone for a chat on 004922451657.

Thank you as always for a magazine enjoyed by so many of our sight impaired members.
Ian Spencer DJ0HF/G3ULO,
RAIBC Audio Manager
Germany

Thanks Tony

Dear Don,
I write regarding **Tony Nailer's** excellent article on trap dipoles. When W3DZZ (known as **Roy**) created his trapped dipole design, I don't think amateurs had the 15m band. What I wanted to say is how simply and succinctly Tony's examples explained what had been a mystery to many amateurs.

His *Terrified of Toroids* articles helped me understand another mystery that was not covered when I took my Radio Amateurs Examination. I was able to make a bandpass filter for the WARC bands. Because I was not a *PW* reader when he wrote the first article of the two, Tony kindly sent me a copy.

These are not the only ideas that I have used to improve my knowledge and station. I used **Steve PJ4DX's** 40m vertical array article as the basis of mine. It worked first time and I am now a good signal to Europe and the Americas.

Thank you guys.
Tom Morgan ZS1AFS ZT1T
G0CAJ
Robertson, South Africa

Old IRCs Wanted

Dear Don,
As QSL Manager at United Radio QSL Bureau, I am on the search for old out of date International Reply Coupons of any age. These are used to support our costs of the outgoing bureau cards from our QSL service. In 2016 we sent out 58,000 bureau cards. Any old IRCs that you find would be most welcome. They can be sent to us at:

United Radio QSL Bureau, PO Box 17, Kenilworth, Warwickshire CV8 1SF.

Thank you!
Tim Beaumont M0URX
Kenilworth

Home Construction

Dear Don,
I just have to respond to your *Keylines* comments and recent letters regarding home construction. I need to nail my colours to the mast. I am a constructor. I design and build my own radio equipment or modify PMR or older kit. In the past I have bought good second-hand test equipment to help with construction. However, most of this is now being replaced with home built.

With regard to *PW* content, I prefer technical articles related to design and construction. **Tony Nailer's** *Technical for the Terrified/Doing it by Design* is excellent, as is *Carrying on the Practical Way* by either **George Dobbs** or **Tony Jones** and also **Harry Leeming's** *In the Shop*. All of these provide hints and tips or explain some aspect of radio function or design. In the case of Harry Leeming, the fault-finding processes are illuminating because I sometimes get equipment brought to me for repair. Similarly **Chris Lorek's** articles provide fascinating background knowledge on older equipment. *Valve and Vintage* I find not only purely fascinating but also very informative because I do some voluntary radio work at a local museum (Internal Fire, Museum of Power at Tan-y Groes, West Wales, website below). **www.internalfire.com**

I enjoy reading constructional projects but don't often build them unless they are exactly what I require. I am more likely to read them to understand how they work and will often incorporate features into my own projects. The problems readers encounter with their projects and how they are overcome is both interesting and of practical benefit. So keep up the constructional projects but don't necessarily expect them to result in exact clones of the original concept (having said this, I did build, in the early 1960s, a six-valve TRF set from a 1949 issue of *PW* and won first prize at the Chester Amateur Radio Club Homebrew Competition!)

Readers may not embark on a published project unless it is exactly what they want and may lack the confidence, desire or expertise to adapt it to their needs. Such articles still provide something to aim for, something for the future rather than for immediate use. I hope that people will not see 'advanced' construction projects as discouraging.

So how do I use *PW*? *PW* is a resource for technical information. I store them for a while. When the pile gets too big, I photocopy the pages I want to

keep and pass on the magazines to the museum.

I think *PW* does have about the right balance, I usually find something of sufficient interest to justify the cover price. Occasionally I pick up an issue and finding little or no content to interest me, I feel disappointed. It's not often and, having edited a magazine myself, I know how difficult it its to get articles and produce a dynamic, punchy magazine that will please everybody, all of the time.

Home construction seems to be viewed as a cheap solution and/or not as good as commercial equipment. While this is often the case, it need not be. My 100W multiband HF transceiver built in 1983 cost easily as much as a Japanese box and it doesn't have memories or dual VFOs but its RF performance is superb. If I were to start the project again today, then it could have all the bells and whistles because the microprocessor hardware to make it possible is so much more accessible. While not wishing to make rash promises, I have a current project which should go some way to proving this point!

So why build your own? In order to learn and for the immense satisfaction of building/modifying/repairing something that works. Nothing beats making a contact on a homemade piece of kit or using some test gear you've put together yourself. In some ways, home construction is easier than ever now; it has just moved to a different level. We can see that leaded components are used less and less in commercial equipment and surface mount is prevalent. We will still be able to get leaded components for a good many years but the writing is on the wall. It's not impossible but serious surface mount is still a long way off for most of us. By using online searches – eBay in particular – you can build sophisticated equipment from surface mount modules. The critical local oscillator (AD9850 and similar) can be bought for less than £10.00, as can an Arduino processor to control it, while the software is free. Mixers, PA stages, filters, display modules and expansion chips are all available. You can get a complete receiver or transmitter module needing only a power supply and a few components to complete. There are frequency counters, IC testers and component testers crying out to be built into useful test gear.

I'm not against appliance operators but I'll champion the home-constructor because that's my passion although I'll respect other amateurs' wishes to pursue the hobby in their own way. After all, radio is a huge hobby, big enough for us all to indulge our particular interests and talents.

Truly the sky is the limit, don't restrict yourself!

Michael Jones G7BBY
Llandysul, Carmarthenshire

CM500 Headset Article

Dear Don,
With respect to the review of the Yamaha CM500 headset in the July issue, there is an error in the circuit diagram concerning the modification. I would assume that the 680Ω attenuator resistor should be connected to the junction of the 1µF capacitor and the 2.2kΩ bias resistor. As drawn, the attenuator chain has both ends connected to the same point and will achieve nothing.

The second issue relates to the HK858D hot air generator reviewed by **Mike Richards G4WNC** in the June issue. I purchased one of these and I am impressed with it. However, I have had to rewire the mains primary side because the switch and fuse were originally in the neutral! My son **Joe 2E0EVB** found a comment on the web suggesting that in some examples the mains wiring may be incorrect and that prompted me to check. I was alarmed to discover that the main on/off switch and the panel mounted fuse are both wired in the neutral return path leaving the whole device at mains potential even when switched off. Further, although the panel mounted fuse is rated at 5A, the fuse in the mains plug is 13A!

Mine was sourced from within the UK and appears identical to the photograph in *PW*. It even carries CE marking! I cannot understand why the Chinese seem incapable of understanding the principles of safe mains wiring or how such potentially dangerous equipment can find its way onto the UK market. There would be no cost involved in wiring it properly at manufacture.

I wonder whether Trading Standards should be informed and I think your readership need to be warned also.

Nick Barnes G4KQK
Stafford

Steve PJ4DX responds: *I regret to say G4KQK is correct regarding the CM500. I copied and redrew the circuit from one drawn by the originator of the modification (and credited him!) but I should have noticed the error. However, the notes and the photographs are correct, so anyone following those should be able to do the modification without a problem. Apologies for the error.*

£20 STAR LETTER

Back After 32 Years

Dear Don,
I am just starting to get back into the hobby after a short 32-year absence! It started with me needing a new scanner (I've had one permanently throughout that period). I thought, why not combine it with a 2m/70cm portable, so a new VX8 was ordered. In 1984, aged 15, I had an FT-290, hence this week a successful eBay purchase saw a 1982 model (judging by the serial number) arrive. Chuck in some *PW* magazine purchases and I have been sucked in a bit more.

I read with interest the November *Letters* pages regarding repeaters, lack of people on VHF and project building. Things certainly have changed. I recall all repeaters within reception range being active when I lived in the northwest. Simplex channels also had much activity. Moreover, I used to build simple projects.

I find this CTCSS nonsense tedious. I must have spent an hour programming my VX8 for repeaters in various areas of the country! So, yes, bring back the simple 1750Hz access tone. Projects for me are now likely to revolve around antennas for 2m SSB rather than using a soldering iron on a PCB. As for the magazine, I've been hooked on **Harry Leeming's** pieces and think my FT-290 was bought from him at a rally. I have a confession! A few weeks after getting it, I hadn't bought a PSU so thought I would try my Scalextric one. Remember the blue drum-shaped versions? Something went pop and there was no output. Back to Harry's because it was under warranty, where he queried what had gone on. I guess, looking back, they were indestructible unless you did something stupid, like me. So after convincing him I had only run it on batteries, he fixed it and I went off to buy a proper PSU. Sorry Harry but I guess you recovered your costs from Yaesu?

Martin Kay
Leighton Buzzard

Editor's comment: *Good to have you back in the hobby Martin. Let's hope Harry Leeming will forgive you after all these years! I hope the Star Letter book voucher will further encourage your journey back into the hobby.*

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

A Different World

Dear Don,
I feel sometimes when I read the letters in *PW*, that I'm in a different world. I mainly operate CW and if the art of conversation is dead, why do I get through so many pens and pads. One QSO often puts paid to two or more sides of A4. I only wish I could read CW in my head because it would be more environmentally friendly. It's not just UK stations either. Every nation out there seems to have many operators who will hold long conversations and their English is every bit as good as mine. Conversation is a two-way thing, though. You do have to engage, otherwise it's "599 73", which I also have no problem with – it's another call in the log.

It takes me anything between 45 minutes to an hour and a half to get to work. Most mornings and evenings GB3KY and its residents make the journey more palatable. There is no shortage of conversation on there either. I agree that national societies and organisation such as FISTS can do things to promote activity but ultimately it's up to we licensees to increase activity and band usage.

On the subject of repeaters and the problems people experience with CTCSS, what I did was to download the RSGB repeater list as an Excel file. It has the option for you to input your locator and you can then sort by distance. Then select and delete all the repeaters that are not wanted, such as 10 and 6m, ATV and digital if not required. The file can then be loaded into the radio and provided the radio is set to encode and decode, you have access to every repeater in the country ascending in channel versus distance. If you are out of your normal area, just press scan and it will only stop on the local repeaters that are active and will even display the callsign. Of course, this only applies to modern radios.
Mike Lane G1SCT/G0SHC
Spalding, Lincs.

Licence Revalidation

Dear Don,
Following the advice on page 68 of November *PW* from **G4PVB**, I rang the first number mentioned which turned out to be the RSPCA! However, with the second number I hit the jackpot and was efficiently reassured by **Ian** that my licence was still valid.
Stuart Atkinson G3YPS
Gainsborough, Lincs.

Two Points

Dear Don,
I would like to comment on two issues mentioned in the November issue of *PW*.

Colin Redwood in *What Next* encourages eye protection when soldering. I recall when I was at school, a fellow pupil's father got solder in his eye and subsequently died. I do not know the full circumstances but it unfortunately proves the point about safety.

Also in *Letters*, **David Perry** questions the need today for CTCSS. I have to say as a recent returnee to the hobby, I have been very disappointed with the local repeater activity. Checking for the appropriate tone is not something you want to do when you are out and about so perhaps reverting back to a 1750Hz toneburst would be a useful experiment and prove the point one way or the other. I had to buy a new rig but if this happened, I could even bring out my trusty FT-290R that will currently no longer work repeaters without modification. Those with older rigs who do not have one with CTCSS might even appear back on the air again!
John Sones M0AAO
Ipswich

Making Waves with Data Modes

Dear Don,
I've just received the latest issue of PW and what a great read it is. I totally agree with **Steve White G3ZVW** and his article *Making Waves, The Skip Zone*. You do not need four tons of assorted ironmongery on a pole in the sky and enough transmit power to give God haemorrhoids. The use of low power and good weak signal propagation software will show you the paths that are open. I would point to two excellent articles in the October issue of *PW*. The first is by **Colin Redwood G6MXL** entitled *Getting Started With JT65*. It's a marvellous system that can decode signals that are so low that sometimes you don't even hear them. The software is free to download from the net and will open up a whole new world of DXing.

The second article that I would draw your attention to is by **Mike Richards G4WNC** on the subject of WSPR (Whisper) mode, basically a propagation tool. It consists of stations transmitting a low power beacon ever other minute. You can then log onto the WSPR net and see where your signals have been heard. As Mike says in his article you should tick the box marked upload spots so that everybody can benefit from your spotting.

I have been using both of the above software packages and with JT65 have worked stations in the Azores and across to Asiatic Russia using just 15W to my MJF Hi-Q Magnetic Loop. Which brings us back to my opening paragraph agreeing with Steve G3ZVW.
Tony Kaye G1YIL
Birmingham

Editor's comment: *Thank you Tony. We do indeed try to cover modern data modes in PW but many radio amateurs still enjoy person-to-person communication by way of phone or CW, rather than letting their PC do all the work (although, as you rightly say, that opens up a whole new world of itself).*

Classified Adverts

DISCLAIMER Some of the products offered for sale in advertisements in this magazine may have been obtained from abroad or from unauthorised sources. *Practical Wireless* advises readers contemplating mail order to enquire whether the products are suitable for use in the UK and have full after-sales back-up available. The publishers of *Practical Wireless* wish to point out that it is the responsibility of readers to ascertain the legality or otherwise of items offered for sale by advertisers in this magazine.

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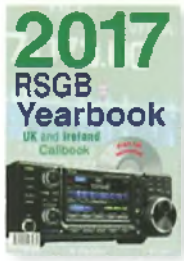

There is nothing quite like the *RSGB Yearbook 2017*. Not only does it contain the latest details of over 86,000 UK and Irish Republic callsigns in its massive 544 pages but it remains the most comprehensive guide to amateur radio in the UK and worldwide.

The *RSGB Yearbook 2017* remains the very latest and most accurate callsign information available for the UK. Added to the callsign data there are 176 pages of invaluable reference material for just about everything you are ever likely to want to know about amateur radio. There is all the latest information on every aspect of the RSGB from how the Society is organised, the services it offers, committees, who to contact for assistance, etc. Regional information provides details of the RSGB Regional Manager Team, local clubs, contest, repeater and emergency groups alongside examination details. There is a huge range of information sections included from Repeaters, Beacons, Band Plans, RSGB Awards, RSGB Contests and HF Propagation Predictions for 2017. There are also listings of special contest callsigns, permanent special event callsigns and much, much more.

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The *Radio Listener's Guide* is an annual guide for UK radio listeners. It is packed with news, radio reviews and station information. This year's edition includes reviews of personal radios, analogue portable radios, clock radios, DAB radios, internet radios, mini systems and tabletop radios. You'll also find our list of recommended best-buys.

The *Guide* is full of information about analogue and DAB digital radio stations. You'll also find details of radio carried on the main TV platforms, as well as information about Internet radio and podcasts. This year we have looked at the latest developments with new technology – including BBC iPlayer. Radioplayer's new in-car device and the Amazon Echo Dot.

Frequency and transmitter information is listed for UK and Irish national, local and community stations. Our frequency indexes, for both FM and AM, will help you to identify unknown stations.

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There are 'amateur radio equipment reviews' and then there are 'Peter Hart, G3SJX equipment reviews'. For 35 years Peter has been writing amateur radio equipment reviews for the Radio Society of Great Britain's journal *RadCom*. These have simply been some of the best equipment reviews published anywhere. These reviews are not theoretical testing or publishing of claimed data but real world testing of performance and analytical reporting of how amateur radio antennas, radios, amplifiers, etc. really work.

Hart Reviews - The Best of RadCom Equipment Reviews builds on Peter's first book that covered his first 25 years of his reviews and collects together reviews that have been published in *RadCom* since 2004. Readers will find an array of equipment and manufacturers represented with all the major radios launched in the last 10 years included. From the Acom to Yaesu you find much represented here including Kenwood, Icom, Elecraft and even the mighty Hilberling PT-8000A. SDR radios are not forgotten and you will find Flex, Elad, SoftRock and others included. Antennas and Amplifiers reviews from suppliers as diverse as Butternut, Alphin and Linear Amp also get the same Peter Hart treatment. With Peter's practical review style, the ability to compare equipment tested in the same real world cannot be underestimated. The performance figures can be relied on as what an average amateur is likely to achieve. This book is not only a fascinating view of the advance of amateur radio equipment in recent years but is a valuable guide to anyone seeking to buy new and second hand equipment. There are even a few of the more popular equipment reviews from the previous book have also been included to allow comparison.

It is not difficult to see why equipment reviews have always been popular and it is not surprising to see why *RadCom* equipment reviews by Peter Hart are considered by many as the 'best' amateur radio equipment reviews available. *Hart Reviews - The Best of RadCom Equipment Reviews* is a great book for everyone interested in amateur radio equipment in the real world.

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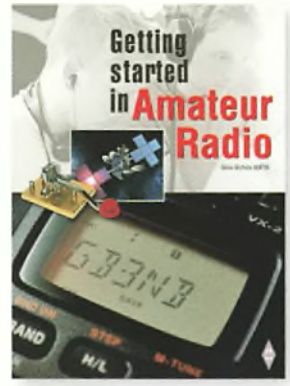

GETTING STARTED IN AMATEUR RADIO

If you want to know something about the hobby or are newly licensed, or are even just looking for something different, *Getting Started in Amateur Radio* provides the answers. What about receiving digital images from the International Space Station? Or talking to friends around the world via satellite? Or perhaps being able to help out during natural disasters? All of these things are possible with amateur radio and *Getting Started in Amateur Radio* details these and many other possibilities.

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Getting Started in Amateur Radio provides information on the activities to explore when using your first VHF/UHF or HF station and what other equipment you might need.

WORLD RADIO TV HANDBOOK 2017

The Directory of Global Broadcasting

The best selling directory of global broadcasting on LW, MW, SW & FM.
This is the 71st edition of *World Radio TV Handbook* and this great directory continues to offer the most comprehensive guide to broadcasting on the planet providing the most up-to-date information on medium wave, short wave and FM broadcasts and broadcasters available in any publication.

- The Features section for this 71st edition contains articles on Remote Receivers, A Pacific Radio Adventure, The Mighty KBC Station, CKZN St. John's, and the International Radio for Disaster Relief Project as well as equipment reviews and other articles of interest.
- The remaining pages are, as usual, full of information on:
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- International SW broadcasts in English, French, German, Portuguese & Spanish.
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The Rig Guide continues to define the prices of amateur radio equipment in the UK, fully updated and covering more than ever before. Which is why *The Rig Guide* is rightly one of the most popular amateur radio books around.

If you are planning to buy or sell any amateur radio equipment you should not be without *The Rig Guide*. The book begins with tips for buyers and a guide to selling and trading. There is a handy guide to selling on ebay and even tips on how to avoid getting lumbered with stolen gear. *The Rig Guide* contains a list of the abbreviations used in the descriptions and an explanation of them all. Amateurs trust RSGB reviews and a full list of *RadCom* reviews since 1990 is included and when piece of equipment was reviewed by *RadCom* it is highlighted on the listing.

The Rig Guide isn't limited to popular commercial amateur radio transceivers but also covers receivers, scanners and linear amplifiers too. You'll find extensive lists of past models from Acom to Yaesu, with over 20 manufacturers listed in-between, including Icom, Ten-Tec, Kenwood, etc. We're not just talking about current models either and you will even find details on the many Chinese manufacturers. DSP isn't forgotten either with a dedicated section on the equipment available. Overall, *The Rig Guide* contains details of around 400 of pieces of amateur radio equipment covering HF, VHF & UHF. Each item is described in an easy to understand listing that covers its main features, band coverage etc. with a photograph of the equipment.

Knowing the worth of any piece of equipment means you can easily cover the cost of The Rig Guide with just one purchase or sale.

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The Life and Times of the Merchant Navy Radio Officer 1900-2000

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The previous volume, which is now out of print, was extremely successful and sales far exceeded wildest expectations. From the very earliest days of radio, ships carried Radio Officers. However, with the onward march of technology this post has become redundant and since 2000 ships no longer carry specialist Radio Officers. *The Long Silence Falls Volume II* continues with more stories, written by the Radio Officers themselves, which are broken down into various sections covering many topics from a life at sea. This book is published by the Radio Officers Association and reflects the wide experience of their members over the years. At over 376 pages, *The Long Silence Falls Volume II* is an extensive book with an extraordinary glimpse into the practice and art of the Radio Officer. If you are fascinated by this now past age and enjoyed the first volume, this book is hugely interesting and thoroughly recommended.

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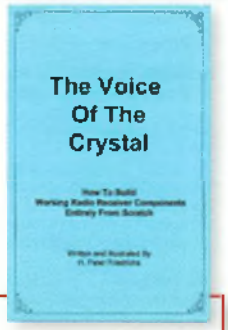

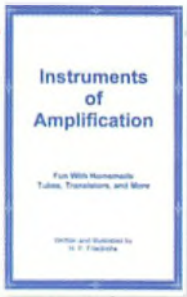

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