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Reporting the RSGB Hamfest



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our history of Pye PMR sets



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SELECTING THE BEST DEVICE FOR YOUR SHACK

Product Review: The Zumspot-RPi

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D-STAR, DMR, C4FM, NXDN
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INCLUDING THE 2018 ANNUAL INDEX

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Peter Waters G3OJV



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Elecraft K3S 100W HF - 6m Transceiver



- Ultra low-noise synthesizer for strong-signal receive handling and transmit signal purity
- USB port remote control and line-level audio, eliminating the need for a PC sound card
- Second preamp for 12-6 m weak signal work (on included KXV3B module)
- Multiple attenuators, providing steps of -5/-10/-15 dB
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- Lower-loss ATU option with true bypass relay (KA13A)
- Redesigned AF output circuitry for outstanding speaker audio
- Accurate, high-speed CW transmit even in SPLIT mode
- Coverage of the 630-meter band (~470 kHz), and lower!

Superhet / SDR Architecture

The K3S delivers the best of both worlds: a hybrid of software-defined radio (SDR) technology and our proven, high-dynamic range superhet receive architecture. The optional KRX3 high-performance, fully independent sub-receiver offers true diversity operation to reduce fading. 32-bit DSP provides stereo effects, NR, EQ, notch, and built-in PSK31/CW/RTTY decode/encode.

The K3S offers great value for money. Still the best analogue transceiver currently in production, it has great versatility. Its light weight makes it easy to carry on DXpeditions. Its performance is legendary and beats any comparable transceiver, regardless of cost. You are protected against obsolescence by virtue of regular firmware updates and replacement modules. And you only pay for what you need! A wide range of options allow you to add a wide range of features to.

Elecraft K3S Transceivers

K3S/100-K.....100W Transceiver Kit.....	£2699.95
K3S/10-K.....10W Transceiver Kit.....	£2199.95
K3S/100-F.....100W Transceiver Ready Built.....	£2849.95
K3S/10-F.....10W Transceiver Ready Built.....	£2329.95

Accessories

KPA3A.....100W PA for K3 10W Models.....	£549.95
KAT3A.....Wide Range Auto ATU.....	£449.95
KFL3.....8-Pole Roofing filters.....from: £169.95	
KRX3A.....Second Independent Receiver.....	£849.95
K144XV.....2m Transceiver 8W.....	£449.95
KDVR3.....Voice Recorder.....	£199.95

Top Choice for DX & DXpeditions Elecraft Value for Money

Sherwood Engineering are the leading test house for ham radio transceiver performance. Their ratings are a great indicator for planning your purchase. You can check for yourself by going to www.sherwoodeng.com. Here are the top contenders - half of them Elecraft!

1st.....	FlexRadio Transceiver Flex-6700.....	£6,899.00
2nd.....	Icom IC-R8600 (Receiver only).....	£2,499.00
3rd.....	Elecraft Transceiver K3S.....	£2,849.00
4th.....	Elecraft Transceiver K3S (2nd).....	£2,849.00
5th.....	Elecraft K3 (upgrade).....	Discontinued
6th.....	Icom Transceiver IC-7851.....	£9,999.00
7th.....	Hilberling PT-8000A.....	£12,000+
8th.....	Elecraft KX3.....	£1,149.00

Elecraft KX3 160 - 6m, 15W



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

Kit: £1099 Built: £1149

- KXAT3.....ATU.....£239.95
- KXFL3.....Filter.....£189.95
- KXBC3.....Timer.....£99.95
- KXP03.....Key.....£159.95
- DC Lead.....£11.95
- 2m Transvert.....£309.95
- 4m Transvert.....£309.95
- MH3.....Mic.....£79.95



KXPA100-F0

100W PA for:
• KX3 • KX2
• FT-817

• FT-817/818 option.....£11.95
Kit: £899.95 Built: £949.95

KPA500 600W HF-6m Amplifier Matches Any HF Transceiver



Kit £2449.95 Built £2699.95

- 600W Solid State FET
- Same Size as K3D
- Built-in AC Power Supply
- Low noise analogue AC Supply
- Instant Operation
- RF sensed Band Change
- Ultra High Speed QSK
- No switching noise
- Able to receive band data
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- VSWR Protected

The KPA500 easily delivers 600W output and can be driven by any HF transceiver that can provide around 30W of drive power. Instant operation from switch on means that DX is not missed. The large bar graph give true pep indication and the small foot print will enable it to fit onto almost any desk.



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New From Ham Radio Store!

KX-33 For KX2, KX3, FT-817 and FT-818

A Power Supply in your Pocket!

NEW PRODUCT



This power supply is ideal for taking around. It fits into your pocket and plugs directly into Elecraft KX2 and KX3. Adaptor leads for FT-817/FT-818 and K3/10.

- 4 Amps
- 14V DC out
- 110 / 230V Auto
- Very Low Noise

£69.95

The Alex Loop MkII Portable 40-10m

Low Noise, Low Profile

NEW PRODUCT



A loop antenna is a very efficient antenna which also exhibits narrow bandwidth for optimum receive conditions and high noise rejection. Measuring around 1m diameter, it will handle up to 25W of power and now features gold plated connectors for extremely low loss

£449.95



The Alex folds down into this very small package. Assembly takes no more than a couple of minutes. Tuning is continuous and smooth. Typical VSWR is 1.5:1 or less and no ATU is needed. It's the perfect travel companion.

IC-7300 HF - 4m Transceiver



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

£1199



The New IC-R8600 Receiver

A Great Receiver at a Great Price

£2499

- 10kHz - 3GHz SDR wide band performance
- Absolute S-Meter Measurements
- Supr. FPGA for ultimate processing
- Great dynamic range for modern band conditions
- 2000 memories with full scanning
- Spectrum scope with waterfall
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A great range of 6m, 2m and 70cms light weight Yagi antennas rated at 100W with Japanese engineering



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A144S10R2m 10 Element 11.6dBi 2.13m boom.....	£73.95
A144S5R2m 5 Element 9.1dBi 1m boom.....	£39.95
A-430S10R70cm 10El. 13.1dBi 1.19m boom.....	£52.95
A-430S15R70cm 15 El. 14.8dBi 2.24m boom.....	£62.95
A-1430S7Dual 2m/70cm 7.9dBi 1.25m boom.....	£129.95

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Rotary Dipole	20m - 6m 2kW Fast Tune - No ATU needed.	£999.95
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All antennas include the remote controller box

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Pro-Set-EliteIncludes phase reversal *	£162.95
Pro-Set-Elite-ICAs above with lead for Icom.....	£197.95
PMS-6Micro headset - single ear *	£85.95
PMD-6Micro headset dual ear *	£99.95

* These headsets need adaptor leads £25.95 each
Please quote radio model



CUSHCRAFT MA6B

6-Band 1.5kW Compact Yagi

- 20m - 6m
- 1.5kW
- 2 Els. per band
- Boom 2.2m
- Turn Radius 2.9m
- Gain 3 - 5dB
- F/B ratio up to 20dB
- Weight 11.8kg

Hustler HF Verticals

4BT	40m - 10m 4 Band vertical that will handle full legal power and can be ground mounted. Height is 6.52m.	£209.95
5BT	The ever popular 5-band model that covers 80m to 10m. This is a great backyard antenna that can be ground mounted. The height is 7.64m	£269.95
6BT	This antenna is identical to the 5BT above but has the 30m band added. Again it handles full legal power and stands 7.3m high.	£289.95

All antennas are rated at 1kW.

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20 Amp micro PSU variable voltage switchmode power supply, excellent value.

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Power-Max-45

45 Amp variable voltage switched mode power supply with 'noise shift' feature.

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Power-Max-65

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Yaesu FT-450D-WB

Wide-Band Version. Please check if 'WB' version is legal in your country

£568.95

The FT-450D is a compact yet superb HF/50 MHz radio with state-of-the-art IF DSP technology configured to provide World Class performance in an easy to operate package. Suitable for all applications; beginners, casual operators, enthusiasts, portable/field users and emergency service providers. Exclusive 3-Year Warranty

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KENWOOD



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New 144-430MHz handheld featuring Kenwood's APRS, Automatic Packet Reporting System, and the popular D-Star. Kenwood has made it possible to use this handheld in a wide range of radio applications with wideband reception function allowing the user to receive HF SSB and CW.

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KENWOOD



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AOR of Japan



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- 10 Digital Modes
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£999.95

First shipment has now arrived!



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Decode: D-STAR, P25, NXDN, dPMR digital & AM/FM/WFM modes

- 0.1-3304.999 MHz Wide-band coverage
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- Large LCD and intuitive user interface
- Straight-forward operation of all functions.
- High speed scan - 200 Channels/Second
- Integrated GPS receiver
- Band scope function
- Speech function
- IP57 rugged construction
- And more!

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Portable all mode Communications Receiver



Tecsun PL-680

This NEW fully featured portable world band radio, with SSB reception, keeps you in with the action from Long Wave, Shortwave to VHF Airband!

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- Air Band 117-138MHz
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- Battery Operation (4 x AA)
- AC supply included

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Black Box Cockpit Monitor



This device allows you to listen to flight deck communications without any need for tuning. Just switch on and listen. Requires PP3. Includes earpiece.

£69.95

AOR BEST SELLING RECEIVERS



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ADVERTISED
PRICE

AR-DV1

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

NEW
UPGRADED
FIRMWARE
VERSION

£1299.95

AR-8200 MkIII

All mode receiver with a wide range coverage of 530kHz-3GHz and enhanced, brighter display. Extend the capabilities of the MkIII by expanding the memory to 4,000 channels with the memory card slot.

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AR-8600 MkII

The AR-8600 MkII is a high performance all-mode communications receiver that covers the frequency range from 100kHz to 3GHz. As such it covers the complete radio spectrum. DC lead included.

£619.95

LA-400

Indoor Loop Antenna

This loop antenna covers the range 500kHz to 500MHz and can be used with any receiver. It offers low noise reception and is directional. This is a serious accessory for the AR-8600 MkII. Includes connecting lead and AC power supply.

£399.95



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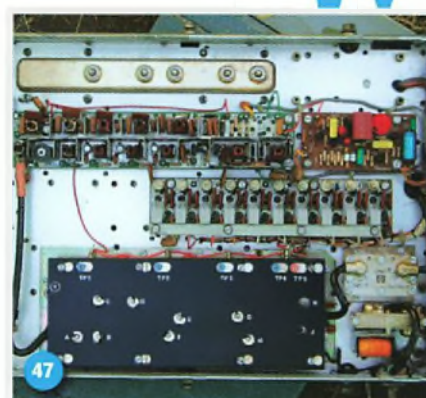
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On Sale
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2018



Keylines



Don looks back on his latest travels, points to some of this month's highlights and discusses the impact of the new exam syllabuses.

It's been another busy month. In my role as President of CDXC (the UK DX Foundation) I was a guest at the 40th anniversary of the 'other' CDXC – the Clipperton DX Club – in Troyes, southeast of Paris. It was great to catch up with old friends and enjoy the usual French hospitality (that is to say, an excellent multi-course dinner with local wines!). Then it was the Newark Hamfest and, most recently, the RSGB Convention, for both of which I have written reports for this issue. However, I do know that many readers attended one or both of these latter events because I met a number of you – my thanks for the many kind comments I received about the magazine.

This Month

This is another packed issue and I do hope there will be something for everyone. **Harry Leeming G3LLL** has a great article about tuning up valve amplifiers, something that I can relate to since, some years ago, I loaned my valve amplifier to the local club for a special event operation and the PA valves were destroyed when a member unfamiliar with valve amplifiers tried to tune it up. Thankfully, most modern amplifiers, whether valve or solid-state, have lots of inbuilt monitoring and protection circuits.

Moving right up to the present, two of our columnists talk about JS8Call, or FT8Call as it was designated until recently. This is probably one to watch, given the way that FT8, from which it derives, has taken the world by storm over the past year or so. That said, we are still seeing other new data modes appear – sometimes it seems as though there is a new one

almost every week! The common theme is that they harvest the power of modern home computers to process incoming signals to deal with whatever challenge the particular mode is designed to handle. This could be weak signals, fading, echoes off aircraft or meteors, various incarnations of noise or interference and so on. And, similarly, the various modes are designed for different types of message – ragchewing, contest or minimal DX exchanges, signal reporting, point-to-point or 'broadcast' (such as CQ) transmissions and suchlike. Horses for courses. There's no doubt that SDR transceivers lend themselves well to data mode operation because their software can easily be optimised and updated as new data modes come along, to provide the best signal path (filtering, pre-processing) before the data signals are passed to the PC for decoding.

New Examinations

The new radio amateur examinations come into effect late next year but you'll see from this issue that they are already being anticipated by the RSGB and those clubs involved in training. I was taken through the new online exam system at Newark and this month **Colin Redwood G6MXL**, in his *What Next* column, is looking at some of the changes to the syllabus. Regular contributor **Tony Jones G7ETW** is also preparing some suitable resource material that we will be publishing in the coming months. I didn't get to the discussion forum at the RSGB Convention but, talking to some of those who were present, it appears that some clubs feel the new material that has been added to the syllabus is sufficient to give them pause for thought as to

whether they will continue their training programmes. It also seems that two of the online training facilities may be discontinued once the existing exams cease to be run, which would be a shame. Hopefully there is sufficient time for the necessary changes and resources to put in place before the new syllabuses become fully operational.

Microwaves

I'm always looking for new material and am conscious that one area that has received less attention that it deserves in recent years has been the microwave spectrum. I know some excellent work is going on by a handful of dedicated specialists. I'd love to have more news (for **Tim Kirby's** column) and more constructional articles. Do get in touch if you are active on those bands.

Last but not least, I do hope you enjoy the two seasonal items we have included this month, the quiz and the Morse anagrams challenge. If you enjoy the latter, do let me know – the authors are prepared to produce some other amateur-radio related puzzles, which don't necessarily have to wait another year. Meanwhile, of course, I want to wish you all the very best for the festive season – although this magazine will appear in November, the following issue is the January one and remains on sale until well after Christmas. Having said all that, I'm trying not to think of Christmas as I write this – there are still the two big CQWW contests to look forward to and my wife and I have a cruise in November too!

Don Field
G3XTT



Practical Wireless

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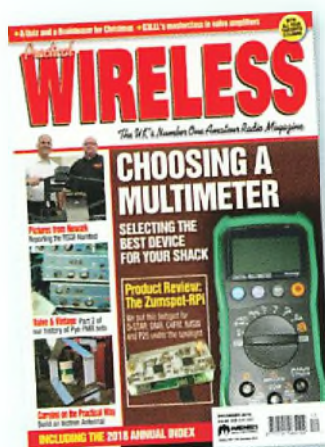
In general, all components used in constructing PW projects are available from a variety of component suppliers. Where special, or difficult to obtain, components are specified a supplier will be quoted in the article.

Photocopies & Back Issues

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

Technical Help

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



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The TS-890S Arrives

As we report in our Hamfest write-up, The new Kenwood TS-890S arrived with UK dealers the week prior to the Hamfest.

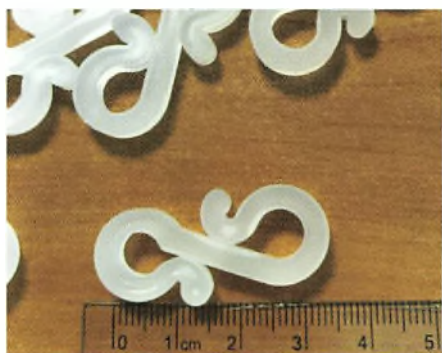
Martin Lynch G4HKS is seen in the photo handing over a new TS-890S to RAOA President David G3ZPF with a rather unique serial number 730001. Martin suggests it must be an omen!

M7 Callsigns Released

Otcom report that they are now issuing M7 + 3 callsigns to new Foundation licensees.

Open Days

Nevada Radio will have their first Open Day on Sunday November 18th (10am to 4pm) and Martin Lynch & Sons have their annual Hog Roast on Saturday December 1st, 8am to 4pm.



Gutter Clips for Stealth Wire Antennas

Many radio amateurs face restrictions when they want to install HF antennas at home. In the US, HOA restrictions can make getting on the HF bands especially challenging. Often the best solution is a wire antenna installed around the rain gutter of a house. SOTAbeams now stocks some handy hooks that can be used to clip a wire round guttering: <https://tinyurl.com/y9azntjf>



Remote Antenna Switch (V-RAT) V1.0

Vortex Antenna Systems have announced the release of the 'VRAT' (Vortex Remote Antenna Switch). The unit was designed by Steve G0UIH at Vortex with the RF work by Camtech PCB in Haverhill, Suffolk.

The VRAT consists of two parts, the indoor 'Switching Box', which would normally be located in the shack, and the outdoor/external 'Relay Box'. Both enclosures are professionally manufactured in the UK from 2mm aluminium complete with silk screen graphics and logos. The switch box also includes fully detachable front and rear panels and LEDs showing the output port and the 'Rat's Eyes' on power up.

The switch operates six ports, covers all HF bands and is an impedance-controlled design. To optimise port isolation, two relays per port are used. The bespoke relays are rated at 30A by ganging 2 x 15A outputs. Power rating is estimated at

around 5kW and at 2kW key-down the relay box never gets warm.

The VRAT is available with either SO239 (PTFE) sockets as the outputs or 'N-Type' (PTFE) as an option. Vortex also use professional 'Weipu SP17' plugs and associated sockets for the control line. The Weipu connectors are rated at IP68 (which is 100% waterproof) and all hardware is included. A standard 13.8V DC power supply is all that's needed to power the unit and a DC lead and plug are also included. As additional user protection, each port has an MOV (Metal Oxide Varistor) for additional lightning and static protection and the DC input on the switch box has reverse polarity protection.

The VRAT is currently available direct from the Vortex Antennas website and is priced at £380.

<https://tinyurl.com/ybroxlfp>

PACOTA

Six stations took part in this inaugural year of Pubs and Clubs on the Air (PACOTA). Staffordshire, Cheshire, Yorkshire, Lincolnshire, Greater Manchester and Somerset were all represented. Some stations had better results than others, some were active for three days, some only for the Saturday.

GB4TRO, which the South Cheshire Amateur Radio Society operated in Harsiehead for the weekend, had a great take-off East, South and West, with just the local landmark of Mow Cop hampering VHF/UHF to the north.

GB0TGI, Tuckers Grave Inn near Bath, run by the Trowbridge and District Radio Club was very successful with 392 contacts. "400W on all bands - life's too short for QRP. We were given many huge signal reports! Loud signals means more contacts - simple!" reports Russ M0WYB.

In conclusion, as the first time of operation PACOTA was well received. The organisers thank all those involved. The participants would love to do it again, so make a date in your diaries for the weekend of May 11/12th 2019. See this website for more details: g6tw.org.uk

WWV & WWVH at Risk

The US standard time and frequency stations WWV (Colorado) and WWVH (Hawaii), operated by the National Bureau of Standards, have long been popular with radio amateurs as a frequency check and as propagation indicators. Now it looks as though they may be under threat from US Federal budget cuts. WWV is believed to be the oldest continuously operating radio station in the US, dating from 1919. US radio amateurs (and no doubt other enthusiasts) are petitioning to have the stations remain on the air.



Air Ambulance Week

In support of International Air Ambulance Week, Essex Ham operated for three days from Earls Colne Airfield near Colchester, home of the Essex & Herts Air Ambulance.

The team used the callsign GB4EAA for two of the three days and GB1NHS for one day, thanks to the attendance of callsign holder **Paul Devlin G1SMP** from the NHS. Three stations were active. Operating from an active airfield presents several challenges, including additional precautions regarding interference and antenna height, plus noise from aircraft taking off and landing.

The Essex & Herts Air Ambulance crew were deployed to incidents on numerous occasions during the activation, resulting in stations going QRT to watch the sight of the helicopter in flight. Essex Ham was fortunate that the crew had a short pause between callouts to allow the opportunity of a chat about the service (which is totally funded by public donations) and to check out the equipment onboard the helicopter.

Paul Devlin is keen to create closer links between the NHS and amateur radio, and this event was an ideal way of helping to raise awareness of the hobby within the NHS, and of GB1NHS within the amateur radio community during the NHS 70th anniversary. A series of interviews with the crew and the amateur radio team were recorded, to be circulated to hospital radio stations, to raise awareness of the air ambulance service and of amateur radio.

Paul (on the right in the photo) said of the event: "We're embarking on an exciting adventure to use amateur radio to help promote activities that can improve the health of the communities that the NHS serves. We plan to do more to link the NHS and amateur radio, including initiatives to promote amateur radio as a public health means to tackle things such as isolation and loneliness".

Essex Ham would like to express its thanks to the Essex & Herts Air Ambulance, and also to Anglian Flight Centres for the hospitality.

As a related news item, special event callsign GB1AHP was recently activated by the team behind GB1NHS in support of Allied Health Professionals Day. An Echolink bridge between the MB1IDP and MB7IDA gateways allowed participants on Essex Ham's Monday Night Net to be the first to make contact with GB1AHP, and a live audio stream was made available to allow NHS supporters to listen in online.

Bram Grisnigt

In this month's *HF Happenings* **Victor G3JNB** reports on the historic QSO commemorating **Bram Grisnigt** and his parachute drop into Holland 75 years ago

A look for Bram Grisnigt on Wikipedia reveals a horrendous story of escape from Holland by bicycle, betrayal, arrest and the Nazi death camps. Here is the message communicated by Bram on the day:

"Today, villagers of the small village of Beugen will lay flowers at the Pinpoint monument. This monument was erected in remembrance of the successful flight by F/O Bell and his crew and the parachuting of secret agents Piet Hoekman and Bram Grisnigt, on the night of September 20th 75 years ago. I am now the last living WWII Dutch secret agent of M16 Dutch Section. It is a great honour to take part in this historic Mk.7 link between the Amsterdam Resistance Museum, Duxford and Henlow Camp RAF Sig. Museum. I wish to take this opportunity to express my great admiration for the brave aircrews who flew from RAF Tempsford Airfield in support of Resistance movements in occupied Europe during WWII. Many



of the aircrews and secret agents lost their lives on these secret missions. We will always remember them. With warm regards and best wishes. Bram Grisnigt (agent St Patrick)."

The photo shows Bram operating the Paraset Mk.7.



GBONVR Railways on the Air 2018

David M0SKT of the Huntingdonshire Amateur Radio Society (HARS) reports that on Saturday September 22nd a team of HARS members arrived at the headquarters of the Nene Valley Railway (NVR) at Wansford Station, Peterborough to set up and operate for the Railways on the Air (ROTA) weekend.

Using a G5RV antenna and Icom IC-7200, they operated from a gazebo in the car park, with power from two 12V leisure battery (75Ah and 120Ah). On the Saturday they made some 101 QSOs, 11 of the being ROTA

stations, one Museum (Duxford), one special event station (Marconi) and a handful of European stations – operating conditions had been favourable. The final tally on the Sunday was 105 QSOs, nine of them Railways.

Thanks are extended to the NVR for accommodating the team in their busy car park and to Club members for their time: **Mervyn G4KLE**, **David M0VTG** (Organiser), **Steve G1KWF**, **David M0SKT** and for the Sunday morning stint **Richard 2E0FRQ**. The photo shows G4KLE on the microphone.



Mountain Goat

Congratulations to **David Stansfield G0EVV** from Morpeth, who has reached SOTA (Summits on the Air) Mountain Goat status after six years of participating as an activator. His first SOTA activation back in May 2012

was on Place Fell G/LD-027 in the Lake District, while his 1000th point (to achieve Mountain Goat) came on Ben Macdui GM/ES-001 in the Cairngorms, on September 11th 2018.

For more information about the Summits on the Air programme, visit the website at: www.sota.org.uk



Canvey Transport Museum

In September, the team from the South Essex ARS ran a special event station at the Canvey Transport Museum. Several of the museum visitors were interested in learning more about amateur radio, and

giving it a try, including museum regular 'Tiger', a YL cat who decided to come and inspect the club's station, making herself comfy on **Dorothy M0LMR's** lap for a few 2m QSOs.



Clipperton DX Club 40th

The Clipperton DX Club (CDXC) of France celebrated its 40th anniversary during its annual get-together in September, held this year in the attractive medieval city of Troyes. The club was formed following the successful activation of remote Clipperton Island in March 1978. Since then, CDXC members have been involved in many other DXpeditions and CDXC offers support to DXpeditions worldwide. The club has about 350 members. **PW** editor **Don G3XTT** was there in his role as President of the 'other' CDXC (the UK DX Foundation) and presented his French opposite number with a commemorative plaque.

Hospitals on the Air

The National Health Service is delighted to announce the first ever amateur radio special event associated with UK and overseas hospitals. HOTA 2018 will take place between December 10th and 16th 2018.

The aim of this year's event is to use the truly global communications capability of amateur radio to promote the importance of valuing patients.

Licensed radio amateurs and clubs can take part in HOTA by operating their station during the any of the scheduled dates in one of three ways:

- From a community hospital or acute hospital site
- From a club location or community centre
- From a home or portable location

For further information or to register your interest in taking part, please contact Paul.Devlin@nhs.net Guidance for operating at hospital locations will be available courtesy of Essex Ham in the near future.

Free Software

Icom UK have announced that the new RS-R30I (for iOS)/RS-R30A (for Android) remote control software for the IC-R30 Communications Receiver is now available for free download from the App Store and Google Play.

The RS-R30I and the RS-R30A enable you to wirelessly connect to the IC-R30 and remotely control VFO operation, memory channels, a variety of scans and the voice recording functions. Using the optional VS-3, Bluetooth headset, the VS-3 and iOS™/Android™ device can be wirelessly connected to the IC-R30 at the same time. You can control the IC-R30 from the connected device while listening to the received audio on the VS-3 optional Bluetooth headset.



Review: The Zumspot-RPi

Regular readers who have been with us for a while will remember that we have reviewed two digital radio hotspots in *PW* before, the **Helitron DV4Mini** and the **Shark RF openSPOT**. When I spotted the Zumspot/Raspberry Pi combination for sale at Martin Lynch, a quick word with both the editor and **Martin** himself ensued because I was keen to explore the possibility of this digital radio hotspot and find out what advantages and disadvantages it offered over those previous models.

The Zumspot is a Multi-Mode Digital Voice Modem (MMDVM) board, which piggybacks on top of a Raspberry Pi computer. A Raspberry Pi Zero W is supplied with the kit, so you have everything you need.

Jim KI6ZUM is the designer of the Zum board and is very busy continually improving the Zumspot and the Zumradio boards. The Zumradio board enables users with a Notice of Variation (NoV) to use a suitable FM (2m and/or 70cm) radio that has 9600 baud receive to be used with Pi-Star. You can consider it a giant Zumspot.

The Zumspot can connect through WiFi to the internet, either through your home router or even via a personal hotspot on your mobile phone, perhaps in the car. The Raspberry Pi runs software called Pi-Star, which controls and configures the Zumspot board.

Back to basics, then. What's a digital radio hotspot? It's a very low powered repeater, capable of transmitting and receiving digital voice modes (DMR, D-STAR, C4FM, NXDN and P25). To use it, you'll need one or more digital radios to cover those modes and to access the hotspot.

In the case of the Shark RF openSPOT, which we reviewed before (April 2017) and the Zumspot, you can configure the hotspot through a webpage accessible on your computer, tablet or mobile phone.

What's in the Box?

In the box, you get the Zumspot transceiver board and a Raspberry Pi Zero W, together with a SD card with the Pi-Star software already flashed. You'll need to download the setup instructions via the

Tim Kirby G4VXE gets to grips with the Zumspot/Raspberry Pi Zero MMDVM Digital Radio hotspot for D-STAR, DMR, C4FM, NXDN and P25.



The Zumspot/Raspberry Pi Zero W combination is tiny!

ML&S website – there's also a link later in this review if you need it. The review Zumspot and Pi Zero were fixed together using four nylon standoffs but I understand that the unit is now supplied in a case. You'll need to provide a USB power source to run the Zumspot and Raspberry Pi.

Setting up

The Zumspot setup instructions are written by **Toshen KE0FHS**. I found them very comprehensive and easy to follow. You can find them here:

<http://pi-star.ke0fhs.com>

It's probably worth saying that the Zumspot and Pi-Star probably require you to be reasonably comfortable with computers and digital radio. It's a highly flexible system, which does mean that it comes with many different configurable options and possibilities.

Pi-Star is configured to work with the Zumspot/Raspberry Pi to make it easy to set up your WiFi connection. If you boot the system up and it doesn't find a WiFi network that it knows about within two minutes, it will automatically activate its own access point, which you can connect to with a computer or your smartphone and start the configuration.

That was exactly what I did. I plugged a micro-USB connector into one of the ports on the Pi Zero W and waited. After two minutes, I scanned WiFi using my phone and, sure enough, there was a new WiFi network called Pi-Star-Setup.

If Pi-Star boots up having been configured before and doesn't find a network it recognises, it will create a new WiFi network called Pi-Star, which you can use to set up a new WiFi network to connect to.

The password for the Pi-Star-Setup

(and Pi-Star) WiFi networks is 'raspberrypi' (without the quotes).

Once you have connected to the WiFi network, you will be guided through, using the excellent instructions provided, setting up the Control Software, the MMDVMHost configuration and the General Configuration. All of this is done using a web interface on your computer or smartphone. After each of these sections, the system will restart. Although all of this configuration seems quite extensive and a little scary, I found that everything worked as the instructions said it would.

Once into the General configuration section, it was familiar information that I was entering, such as my callsign, latitude, longitude, DMR ID, Hotspot receive and transmit frequency (remember to abide by your bandplan and choose a suitable frequency).

Getting on the Air with D-STAR, DMR and Fusion

Having done all this, I was ready to see if I could connect to one of the various networks. My D-STAR handheld, an Icom IC-E92, was nearest to hand so I thought I would try that to start with.

In the configuration screen of the Pi-Star software, I found the D-STAR configuration section, having switched D-STAR mode on, and entered my RPT1 callsign G4VXE B, with the software filling in G4VXE G as my RPT2 callsign for the gateway. I decided to select the Default Reflector as REF001C because that is usually busy and would be a good test to see whether I could hear signals.

And sure enough, I could. As soon as the system had reconfigured itself, I started to hear traffic coming through the IC-E92 on D-STAR. Great news! The fun started when I tried to respond to stations. The hotspot didn't seem to be hearing me. I checked the configuration and all seemed as it should – until I found that there's an interesting wrinkle that you need to take account of in your radio setup. Although the Zumspot is set up as simplex, with transmit and receive on the same frequency, I discovered that I had to set up the IC-E92 in repeater mode, albeit with a shift of 0MHz! As soon as I did that, the hotspot heard me just fine. In a nice coincidence, the first station I worked on D-STAR was **Jonathan MOJSX**, one of the team at Martin Lynch, so I was able to ask him to report back that I had got the Zumspot working. Jonathan and I noticed that there was a little break-up on the



DMR through a Fusion Radio, the FTM-400XDE.

D-STAR signal so I moved the Zumspot a little closer to the WiFi router, which immediately resulted in much less R2D2 corruption on the signal.

Next was to try to configure the DMR system. There are all sorts of different ways you can set up DMR. My first test was a straightforward connection to the Brandmeister network, using the UK master server 2341. Having done that, with DMR mode selected, I set my TYT MD-380 to send a private call to the worldwide reflector 4639 and was delighted to get a 'connected to reflector 4639' message back from the hotspot. A quick test transmission resulted in a contact so all was well.

On DMR, you can connect to both the DMR-plus and Brandmeister systems at the same time, with traffic from one system coming out on talkgroup 9 and traffic on the other coming out on talkgroup 8. Obviously, you can't hear them both at the same time but if you want to focus on the traffic you hear on talkgroup 8, for example, you can quickly key up using the DMR radio on talkgroup 8 and this will take priority.

Not only that but you can still have your D-STAR connection going as well, so you are able to listen to D-STAR from, say, REF001C, DMR plus from the UK Wide

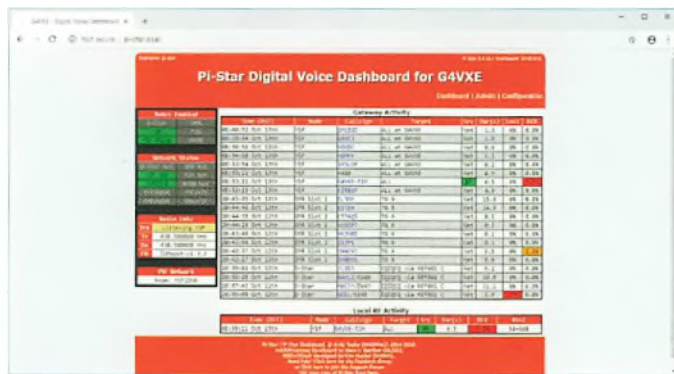
talkgroup and the Brandmeister reflector 4639, as an example.

With all that working, of course I wanted to try out C4FM, the Yaesu Fusion system. I set up my Yaesu FTM-400XDE on the hotspot frequency, switched on YSF Mode in the configuration section and then within the YSF configuration, pointed a connection at the CQ-UK Fusion room using one of the FCS reflectors. I put out a call and was delighted to be answered by **Rickie MI5DAW** who manages many of the connections in and out of the CQ-UK Fusion room to other modes. Rickie confirmed that everything was sounding good.

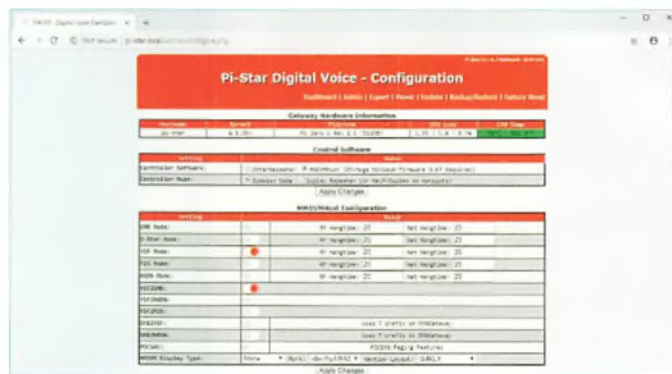
With that, the Zumspot was successfully working with D-STAR, DMR and C4FM modes. But there's more!

Cross-Moding

One of the really nice features of the MMDVM system is that it allows you to work across modes. So, if you have a DMR radio, you can also connect to YSF (Fusion) and NXDN systems. If you have a C4FM radio, you can connect to DMR (both Brandmeister and DMR-plus networks), NXDN and P25 networks! You'll notice that there are no cross-mode capabilities to D-STAR. This is because trans-coding would be required, which is not possible.



The Pi-Star dashboard.



Part of the Pi-Star configuration screen.

But, with a D-STAR and a C4FM (Fusion) radio you would be able to connect to all the modes D-STAR, DMR, C4FM, NXDN and P25! Before you get too excited, there is not a huge amount of activity on the NXDN or P25 networks but if you are anything like me, you will want to try it out and see what is possible.

I thought I would try to connect to the NXDN network using my DMR handheld. I found a very useful YouTube video from W1MSG about how to configure the DMR2NXDN cross mode feature: <https://youtu.be/wghOT7mFxjE>

Once I'd seen that, under the MMDVM Host Configuration, I enabled both DMR Mode and DMR2NXDN Mode. Under DMR Configuration, I selected the DMRMaster as DMR2NXDN and under the NXDN Configuration, I pointed at the NXDN Worldwide reflector 65000. I hit 'Apply Changes' and waited for the system to restart. When it did, voices appeared from my radio. My first instinct was that I had done something wrong and I was still hearing a DMR reflector but actually it proved not to be, and it really was **Dock N4HYK** coming through from NXDN. I hastily changed the talkgroup on my MD-380 so that I was transmitting on a talkgroup to match the number of the reflector that you are accessing) and gave him a call. Dock kindly confirmed that all was working correctly.

Naturally, the next thing to do was to try cross-mode from DMR to Fusion (YSF). Using the same principles, I selected DMR2YSF in the MMDVM configuration panel, selected the DMR Master as DMR2YSF and then the YSF Configuration panel to select the America-Link Room (via FCS002/90). This too, seemed to work just fine and I had an excellent contact with **Walt N2WJR** in New York, who was also using a Zumspot with his new FTM-100DE radio.

Finally, I wanted to try cross-moding from my Fusion radio in the shack, the FTM-400XDE. This is a particularly nice radio to use and I was keen to be able to use it cross-mode to all the different systems (DMR, NXDN and P25). The same principles apply as cross-moding from DMR. Set the MMDVM configuration to YSF Mode and the cross mode you want to use (such as YSF2NXDN). Apply changes and then under the YSF Configuration, you will need to select the YSF2NXDN bridge, which you will find in the drop-down list (towards the end of the YSF list). Then, under the NXDN configuration, I made sure that 65000 was selected. I keyed up on the Fusion rig and although the NXDN reflector was, on that occasion, quiet, I could see that I had reached the reflector by going to the online dashboard at:

<https://nxdn.n18.de>

I was pleased to find that I could use cross-mode functionality from my Fusion radio to DMR, NXDN and P25 as expected. Again, the P25 networks were quiet when I tested a connection but I was able to verify that I had reached the network and the TG10100 worldwide reflector using the dashboard at:

www.george-smart.co.uk/p25

Note that when you cross-mode from YSF to P25, you need to make sure that your Fusion radio is in VW (Voice Wide) mode.

A Mobile Hotspot

Because the Zumspot will work over WiFi, it would be easy to connect it to the personal hotspot on your smartphone (or even your Network Radio!) to be able to listen to the various digital networks in the car.

Other Things You Might Want To Do

Something else you may wish to look at is adding a display to the Zumspot so that you can see at a glance from the unit itself,

rather than the webpage, which networks you are connected to and what is happening. There are some very nice Nextion displays available that interface with the unit. You will just need to go into the configuration screen via the web interface and switch the screen display on. I didn't test this option myself.

Conclusion

I thoroughly enjoyed using the Zumspot and it's my favourite hotspot to use so far. Because it's perhaps the most flexible, it has the most configurations to play with. If you are new to digital radio and hotspots, then you may possibly just want to set it up to do the basics and then build up on that to do cross-mode working as you get more familiar with it. There's a whole variety of YouTube videos on the various aspects of setting up the Zumspot. If you're interested in the Pi-Star initial setup, you might find this one from W1MSG of value:

<https://youtu.be/B5G4gYDdJeQ>

The built-in WiFi connectivity means that you can very easily use the Zumspot as a portable hotspot with your mobile phone.

A real advantage of the Zumspot over, say, the Shark RF openSPOT is that you can be connected to D-STAR, DMR and Fusion (plus NXDN and P25 if you have them) networks at the same time and you will hear traffic from them all – though, of course, you cannot listen to two modes at the same time but the unit will seamlessly switch between modes as the different networks come into use.

If you like playing with digital radio and enjoy experimenting, you will not be disappointed with the Zumspot/Pi Zero W.

Thanks to Martin at Martin Lynch for the kind loan of the Zumspot. I think it's very unlikely that it will be going back to the shop and a purchase will have to be made. The Zumspot and Raspberry Pi Zero W cost £144.95, including the case.

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Choosing a Multimeter

Chris Murphy MOHLS explains the ins and outs of multimeters – which to choose and how to get the best out of them.

The multimeter is without doubt the most useful test instrument in the electronics workshop and is an instrument that all of us who get involved in anything but the most basic of electronics will require sooner or later. The aim of this article is not to explain how to use a multimeter but what to look for when going out to select and buy one.

Analogue or Digital?

Perhaps the first question that arises is whether to buy an analogue meter or digital. These days the obvious choice may seem to be digital but don't discount analogue meters too quickly. Working professionally in electronics, I have used a wide range of digital multimeters from manufacturers such as Fluke and Keithley, some of which must be considered as being at the top end of the range of multimeters available. As an electronics hobbyist, however, a lot of my work is involved with repairing valve and transistor radios and for this I prefer to use analogue meters for reasons that I will explain later. I do, though, own a fairly cheap (less than £20) digital meter D03040, **Fig. 1**, which has a lot of facilities that are not available on analogue meters and also a Fluke 25, **Fig. 2**. I also own a couple of analogue AVO meters, an AVO 8 MkV, **Fig. 3**, and an AVO 73, **Fig. 4**, the MkV having been picked up as an absolute bargain for £20 at a radio rally. I have had my AVO 73 since the mid-1970s.

Apart from the very cheapest, most digital meters will be autoranging and even many meters under £10 will have autorange. That is to say, assuming that the correct type of measurement range – DC volts, for example – has been selected, they will automatically select the most suitable range in terms of accuracy and resolution. Analogue meters require the correct range to be manually selected. Digital meters also tend to have higher input impedances on the voltage ranges. Most are 1M Ω or more. This can be impor-

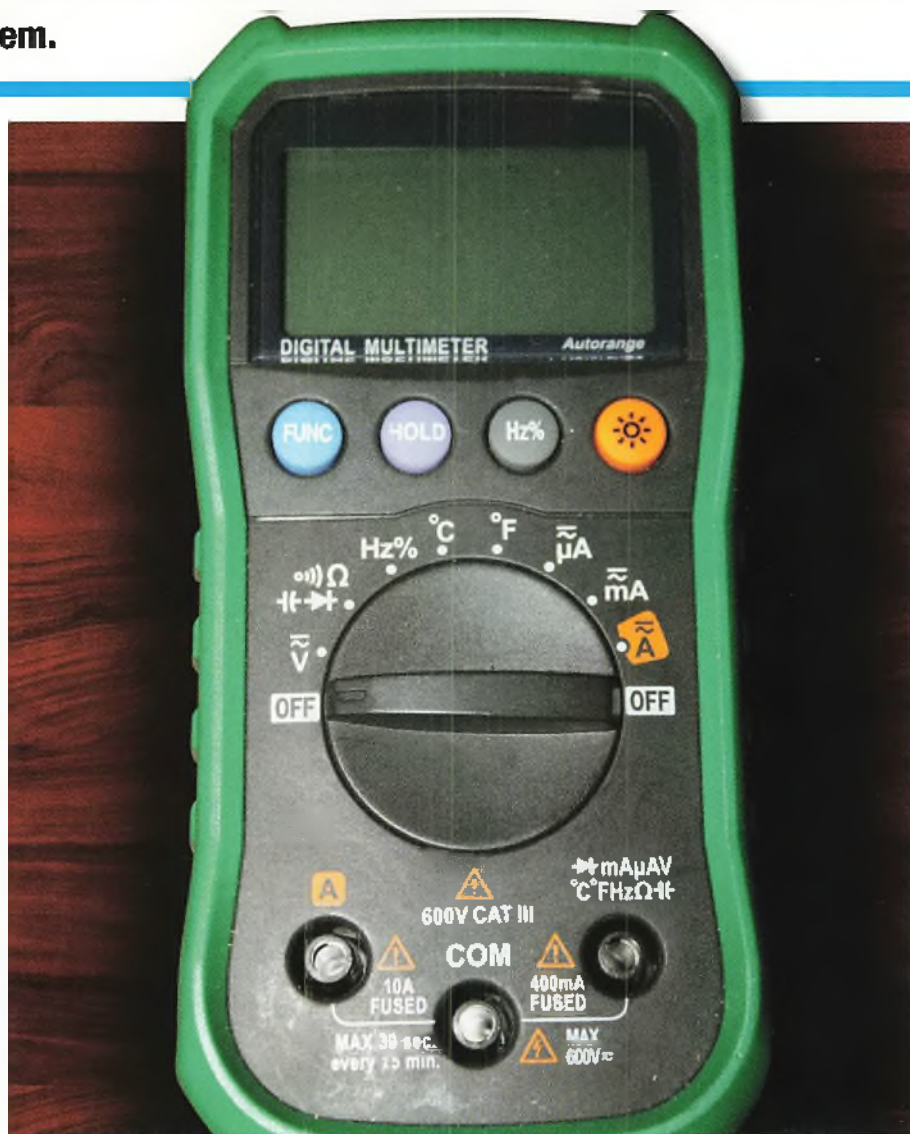


Fig. 1: D03040 digital multimeter.

tant and is discussed in more detail later. One downside that may be encountered with low cost digital meters is the lowest value of resistance that they can measure. Some cannot measure below about 200 Ω .

When considering what multimeter to buy, it is important to understand some of the characteristics and specifications that are used to describe the instrument's performance and some of these are described below.

What Can be Measured?

Most multimeters, both analogue and digital, can measure:

- DC Voltage
- AC Voltage
- DC Current
- Resistance

Many multimeters also have the ability to measure AC current – often up to 10A or more. In addition to the four basic measurements above, many multimeters, especially digital, can also measure:

- Capacitance and inductance
- Frequency
- Continuity
- Diode and transistor junction voltage drops
- Temperature

True RMS and Averaging Response DVMs

You may see a digital multimeter advertised as either an Averaging RMS instrument or a True RMS instrument. For most people an Averaging RMS meter will suffice. The difference applies when measuring AC voltages and currents. Both will measure sinusoidal waveforms fairly accurately but an averaging RMS meter may give false readings on non-sinusoidal waveforms such as square waves, sawtooth waves and the like. Also, be aware of the fact that the accuracy of the AC ranges may deteriorate at very low or high frequencies. Many have the accuracy of their AC ranges stated as when measuring a 50Hz signal.

Counts, Digits and Resolution

Digital multimeters are often described by the number of digits that they display. Handheld meters are usually 3½ or 4½ digits although 5½ digit meters are also available. For bench meters, 8½ or more digit instruments are available although these may be a bit ambitious for the electronics hobbyist. The terms 3½ and 4½ digit describe, as may be imagined, the number of digits that the meter display can show. But how should these be interpreted?

A 3½ digit meter will display readings in the format X.YYY. The 3 digits (Y) to the right of the display can be any value 0 to 9 but the most significant bit of the reading (X) can only be either 0 or 1 and for this reason is called a half digit. A 4½ digit meter will display readings up to XXXXX where, again, Y can be digits from 0 to 9 and X either 0 or 1. This means that a 3½ digit meter can produce a display of up to 1999. Since most meters have auto-polarity indication, it can actually read from -1999 to +1999. This is called a 1999 count meter but since it can also read 0, we add one and call it a 2000 count meter.

It follows that a 4½ digit meter can read up to 19999, plus 0 and is hence called a 20000 count meter. There are also 3¾ digit and 4¾ digit meters available where the most significant (first) digit can have a value higher than 1. They cannot, however, have a first digit that goes all the way up to 9. The maximum value of the first digit depends upon the manufacturer of the instrument and is often 3. A typical 3¾ digit meter can read up to 3999 and is therefore called a 4000 count meter.

The resolution of a multimeter is the value of whatever is being measured that will cause the least significant digit (the digit at the far right of the display)

to change. This will depend upon the range that is being used and is not the same for all ranges. For example, if a 4½ digit multimeter is measuring a voltage of 1.0000V, and the display shows 1.0000V, the least significant figure (right hand side) will show values in increments of 100µV (0.0001V). If we now try to measure 10V, the display will show 10.000V and the value of the least significant figure is now 1mV. Hence, as we measure higher and higher voltages the multimeter changes range to allow the higher values to be shown and as the range increases in value so does the value of the least significant digit. If we measure a voltage of 1000V, the display will show 1000.0 and the resolution is now 100mV. On a 3½ digit meter it would read 1000 and the resolution would be 1V.

For example, if we measure a voltage of 1.000V with a 3½ digit meter, we would ideally get a reading of 1.000. The photo, Fig. 5, shows such a reading being made and here the meter reads 1.002V where each count of the least significant digit represents 1mV. If we now try to measure 10.000V, we will lose one of the decimal places and each count of the least significant digit will now represent 10mV as shown in Fig. 6.

Accuracy

Basically, the accuracy of a multimeter is how certain we can be that the value being displayed is the correct value. All multimeters, no matter how expensive, will have some degree of inaccuracy. That is to say, there will always be some uncertainty about the value being displayed.

Different manufacturers quote the accuracy of their instruments in different ways. Some quote the accuracy as a percentage of the range. The problem here is that it doesn't take into account processing errors. A better, more common way is to quote the accuracy as a percentage of the range plus a number of digits for the least significant bit.

As an example, the accuracy of one of my meters when measuring DC volts is quoted as being $\pm 0.5\%$ of the reading +3 digits. What does this mean? If, say, my meter is indicating a voltage of 1.5000V, then I can be confident that the actual voltage being measured is within the range $1.5000 \pm 0.5\% + 3$ digits and $1.5000V - 0.5\% - 3$ digits. So, a bit of maths.

0.5% of 1.5000V is 0.0075V, so $1.5000V \pm 0.5\%$ gives us a range of 1.4925 to 1.5075V.



Fig. 2: Fluke 25.



Fig 3: AVO 8 MkV.

But we then have the 3 digits to consider. This means that the last digit of the reading can vary by up to a maximum of 3 digits. So, at the lower end we have 1.4925V minus a maximum of 3 digits which is 1.4922V and at the higher end 1.5075V plus a maximum of 3 digits, which is 1.5078V. We can be confident, then, that the real value being measured is somewhere in the range 1.4922V to 1.5078V.

The way in which analogue multimeters have their accuracy quoted is somewhat different to digital meters. For analogue meters the accuracy is usually stated as a

percentage of the full-scale deflection or reading.

An AVO Model 8, for example, has its DC voltage and current accuracy stated as $\pm 1\%$ of full-scale deflection and its AC accuracy as $\pm 2\%$ of full-scale deflection at 50Hz. Note the "at 50Hz" statement. At other frequencies the accuracy is likely to be worse than $\pm 2\%$.

What does this mean? If the AVO is set to its 100V DC range, it will have an accuracy of $\pm 1\%$ of 100, which is $\pm 1V$. Therefore, if the meter measures 95V, the reading could be anywhere between 94V and 96V, which isn't too bad. But if we now measure 9V with the meter set to its 100V range, the reading could now be 9V $\pm 1V$ so the meter could read between 8V and 10V. This gives an accuracy of $\pm 11\%$.

So, an analogue meter will give more accurate readings the closer the measured value is to the full-scale deflection and for this reason the measured value should be around 75% or more of the full-scale deflection of the range that the meter is set to. The trick here is to start with the meter set to its highest range and work down through the ranges until the meter is reading close to its full scale. This also helps to prevent damage to the meter by trying to measure, say, 200V with the meter set to the 3V range. Many analogue meters have mechanical overload cut-outs that trip if the meter is overloaded. Analogue meters also have a mechanical zeroing control whereby the pointer should be set to zero – or at least checked that it is set to zero before use.

Displays

The most obvious difference between analogue and digital multimeters is the type of display that they use. Some digital meters also have a bargraph under the main reading. But beyond the obvious there are other considerations. The first is that digital meters can usually display small voltages or currents better. For example, the lowest voltage range on an AVO 8 is 3V and the scale is marked in increments of 50mV. A voltage of, say, 70mV will fall between the 50mV and 100mV lines and a bit of guesswork is required to assess what the voltage is. Digital meters set to a low range can usually display voltages in increments of 1mV or less. Another drawback of analogue meters is what is known as parallax error. Unless the pointer on an analogue meter is viewed from directly above, the eye will see the pointer to one side of its true position. This will result in a false reading being seen.



Fig. 4: AVO 73.



Fig. 5: 3½ digit meter reading just over 1V – the right-hand figure is displaying millivolts.



Fig. 6: 3½ digit meter reading just over 10V – the right-hand digit now displays increments of 10mV (hundredths of a volt).

To overcome this, analogue meters have a mirror underneath the scales that can be used to ensure that you are looking at the pointer from directly above.

An advantage of an analogue meter is when it is required to see a peak in a voltage or current. An analogue meter will show when a rising voltage reaches its maximum value before starting to fall again better than a digital meter with rapidly changing digits. This is useful when, for example, using a multimeter to show the output from a tuned circuit as the tuning is varied.

Input Impedance.

As I mentioned earlier, the instrument's input impedance can be important, especially on the voltage ranges. When we measure voltages, we measure across two points

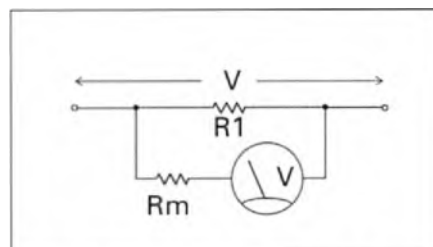


Fig. 7: The meter resistance, R_m , acts as a shunt across the circuit being measured.

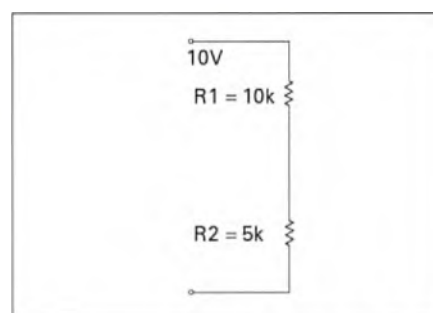
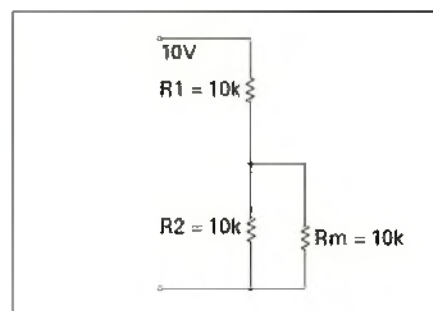
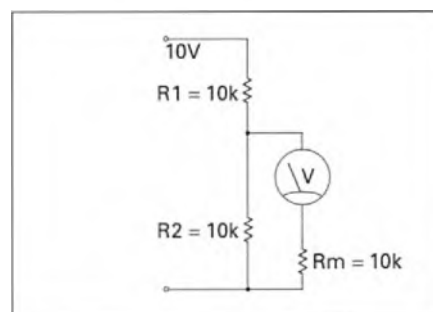


Fig. 8: The meter is in parallel with R_2 and, in this example, halves the value of R_2 , leading to a false reading.

that will usually have some resistance between them, Fig. 7. Here the input impedance of the voltmeter is represented by R_m .

Consider the potential divider consisting of two 10k Ω resistors in series and with 10V applied to them as shown in Fig. 8a. Since the two resistors are equal, half of the supply voltage (5V) will be dropped across each of them so to measure the voltage across R_2 a multimeter set to its 10V DC range would be suitable.

If the multimeter has a sensitivity of 1000 Ω /volt, then on the 10V range the voltmeter resistance R_m will be 10 x 1k Ω

= 10kΩ. When the voltmeter is connected across R2, there are effectively two 10kΩ resistors in parallel as in Fig. 8b, which have a combined resistance of 5kΩ as shown in Fig. 8c.

Using the formula for a voltage divider $V_{out} = V_{in} \times R2 / (R1 + R2)$ we have $V_{out} = 10 \times 5/15 = 3.33V$ so the indicated voltage is 1.67V or 33.4% lower than expected.

If the meter is replaced with one having a sensitivity of 10kΩ/volt, Rm will be $10 \times 10k\Omega = 100k\Omega$. This means that R2 now has a 100kΩ resistor in parallel with it, which is a combined resistance of 9.1kΩ. Using the voltage divider formula again gives $V_{out} = 10 \times 9.1/19.1 = 4.77$ which is 0.23V or 4.8% lower than expected – a much closer result.

It can be seen, then, that the higher the Ohms per Volt sensitivity of the meter, the closer the meter will read to the true value. Don't be fooled, however, by thinking that a digital meter with an input impedance of, say, 10MΩ will give readings that are spot on. Consider the arrangement in Fig. 9a. Here we have two 500MΩ resistors connected in series to a 10V supply. Again, since the resistors are equal we would expect to see a voltage of 5V across each of them.

If, however, we now connect our DVM with 10MΩ input impedance across R2, this parallel arrangement results in a combined resistance of 9.8MΩ and is shown in Fig. 9b. Using the voltage divider formula again we have $V_{out} = 10 \times 9.8/509.8 = 0.19V$.

This is an extreme example but serves to show that just because you have a high impedance meter, you cannot assume that no loading effect will be present.

As an aid to determining whether what the meter is reading is correct or not, many suppliers of electronic equipment who included expected voltages on their circuit diagrams as an aid to fault finding used to include a statement saying what sensitivity the meter that they used to obtain the voltages had. An example I came across for a transistor radio is "They are negative values and they were measured on the low voltage range of a 20,000ohms/V meter whose positive lead was connected to the common positive battery ..."

Right at the beginning of this article I stated that I prefer to use analogue meters for the work that I do on valve and transistor radios and it is for this reason. Most of the circuit diagrams that I use were produced in the days before digital

meters were widely available and voltage readings are given with the assumption that an analogue meter would be used for fault finding. A digital meter would almost certainly produce voltages higher than those provided on the circuit diagram.

It is possible to get analogue meters that use Field Effect Transistors and/or Op Amps in the input stage to produce a high impedance input. These were preceded by Valve Voltmeters.

Safety

Modern multimeters are manufactured to a CAT standard. These CAT standards are an indication of what type of system the meter may be safely used on. It might be assumed, for example, that if a meter has a 1000V range, then it can be safely used to measure, say, 500V. But the voltage, or steady-state voltage, that you are expecting to see isn't the whole story. Power distribution networks and motor drive circuits, for example, often have voltage spikes called transients superimposed on the steady-state voltage. These transients can reach many thousands of volts in amplitude and can easily destroy a multimeter and, more importantly, the user.

Meters are rated as being CATI, CATII and so on and the differences between the various ratings can be quite complex and would warrant an article in their own right. For those interested, there is plenty of information available on the internet. For the electronics hobbyist who only works on equipment powered by a low energy source such as a small battery of low voltage transformer powered PSU, a CATI multimeter will be suitable. If, however, you intend to use the meter to measure mains voltages or carry out tests on mains powered domestic equipment, then a meter rated at CATII or higher is required. If you venture into the world of three phase, then a CATIII meter meets the requirements.

As well as the CAT ratings the meter should be designed and manufactured to internationally recognised standards and carry the appropriate markings such as CE marking, for example.

Leads

The test leads are an important factor when using a multimeter. Make sure that the leads that are supplied with the meter are of good quality and meet the requirements discussed below. If you make up your own leads for custom applications, make sure that you use good quality cable and con-

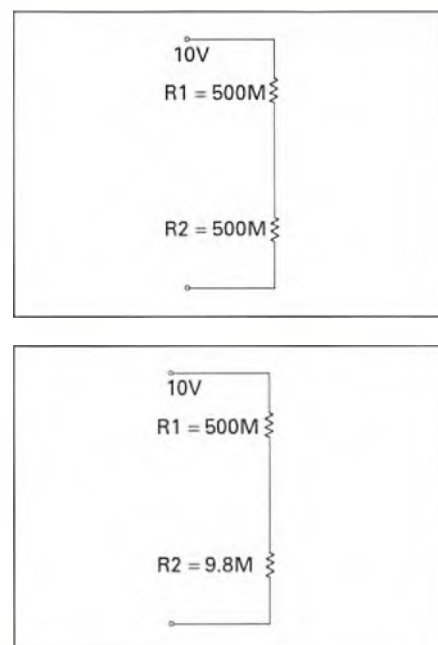


Fig. 9: Even when using a meter with high input impedance, it cannot be assumed that readings will be 100% accurate.

nectors, especially if high voltages and/or heavy currents are to be measured.

The leads themselves should be well insulated and free from damage. Before use check that the insulation isn't split or has been damaged by a hot soldering iron, for example. The cross-sectional area of the conductors in the leads should be adequate for the tests being carried out, especially if high currents are being measured. The connectors at the meter end of the leads should be of good quality and, ideally, shrouded.

Various types of probe and attachments such as crocodile clips are available and, again, these should be well insulated. Wherever possible use probes where the amount of bare metal exposed is at a minimum. There are test lead kits available that contain various types of probes and attachments that can be fitted to the probes and it is worthwhile investing in a good quality one to complement the leads supplied with the meter.

Some probes have insulated sleeves that fit over the probe tips and which can be removed to allow a longer bare metal probe to be used if necessary. Beware, the tips are easily lost. The probes should be fitted with finger guards that help prevent fingers slipping down the probe towards the tips. When using a multimeter to measure mains voltage and similar, it is advisable to test the continuity of the leads both before and after the test to ensure that they are in good order.



I have missed just one RSGB Convention (formerly the HF Convention) in the more than 30 years that it has been running. This is the single must-attend event in my amateur radio diary. My problem is always that, although there are some excellent presentations and other events scheduled, I usually spend most of my time socialising with old friends.

This year was no exception. Although I haven't seen any attendance figures at the time of writing, my impression is that it was probably a record. Certainly, there seemed to be a constant buzz about the place.

The event, as they have for many years now, was sponsored by Martin Lynch & Sons, who had an extensive stand, and the 'big three' manufacturers – Yaesu, Kenwood and Icom – were also represented.

Keynote Speaker

This year's keynote speaker was **Tim Duffy K3LR**. Tim has spent 32 years building his superb contest station in Western Pennsylvania and the string of contest wins is testament to his achievement. The station is truly awesome but a station is no good without an excellent team of operators. Most of the operators themselves have many years of amateur radio contesting experience. However, Tim was also the after-dinner speaker on the Saturday evening and made a truly inspirational pitch about encouraging and nurturing newcomers to the hobby, especially youngsters. And he speaks from personal experience – having used his contest station as a focus for mentoring a large number of young people over the years, many of them having gone on to be high profile exponents of the hobby in their own right.

There was another US visitor too – **Don Greenbaum N1DG** who presented the summer KH1/KH7Z DXpedition from the Baker & Howland Islands.

Roger G3KMA's presentation on Islands on the Air (IOTA) included the announcement of six 'new' island groups, one of them even being in Europe. IOTA chasers can no doubt look forward to early activations of at least a few of these.

Other Talks

As well as the usual DXpedition presentations, the wide range of talks ranged from classic subjects such as antennas and propagation to the flavours of the month, including FT8, FreeDV and Network Radio.

The 2018 RSGB Convention

Don G3XTT reports on the RSGB Convention, held once again at Kents Hill Conference Centre, Milton Keynes.



Digital TV gear on the BATC stand.

Talks also covered all parts of the spectrum, from LF (136kHz) to microwaves. And there were some serious technical talks too, such as **Sam G4DDK** presenting a high-performance 70cm transverter for the home constructor. Long-time readers will remember Sam as the brains behind the classic *PW Meon* transverter for 50 and 70MHz, from the 1980s.

The ICQ Podcast team hosted a discussion about the future of the hobby. I wasn't there but I feel sure the podcast will be worth listening to, from what I gathered from those who were present. And the AMSAT stream appeared to have some very high-powered lecturers dealing with many aspects of satellite working.

Training/Exams

Over the weekend, there were three ses-

sions dedicated to training and exams. **Mike Bruce M0ITI**, the RSGB's Director responsible for exams, discussed the review process for the new syllabus, which is set to roll out from August 2019, the ongoing transition from paper to online exams at all three licence levels, handling of questions deemed to be unfair, and the work required to update the exam question bank. At the Tutor's Forum on Sunday, it was acknowledged that clubs have expressed concerns about the changes and the amount of new content added to the syllabus, and the concerns are something that the RSGB said they will be looking to address over the coming months.

Club Stands

As always, there was a wide range of stands representing national clubs of



RSGB President Dave Wilson M00BW introduces K3LR's talk.



The silverware, all ready for the trophy presentations.



Victor G3JNB, an old friend of PW.



AMSAT 'village' with a fully working satellite station.

various sorts. The AMSAT stand featured a fully working satellite station, working various amateur satellites over the course of the weekend but also, much to their delight, achieving a QSO with the International Space Station.

Other stands included CDXC (The UK DX Foundation), the British Amateur TV Club (BATIC) showing some state-of-the-art amateur radio art in digital TV equipment, UK Six Metre Group, Worked All Britain, RSGB ARDF (Direction Finding), Worked All Britain Group, UK Microwave Group, RAIBC and the Radio Officers Association (my apologies if I have omitted any). The First Class CW Operators Club (FOC) were running a Morse pile-up copying competition. There was a demonstration of the RSGB's online examination system. Elsewhere in the building, examinations

were being held for the FCC (US) licences. A meeting was held for those hoping to be part of next year's GR2HQ team in the July IARU International DX Contest. There was a Buildathon (an introduction to SMD construction techniques, building a two-tone tester from Kanga UK), a construction competition, UK licence exams, the AMSAT AGM, various Committee and contest forums and, of course, the usual contest and other trophy presentations.

Raffle and Wrap-Up

The event wrapped up, as always, with the raffle draw. I was delighted that regular contributor to our HF column, **Victor G3JNB**, won the Yaesu FT-818 (donated by Yaesu UK). This was particularly apt given that Victor is a QRP aficionado. The main prize, from Icom UK, an Icom

IC-7300, went to **Peter G3PHO**. The third major prize was a TH-D74 D-STAR hand-held from JVC Kenwood.

The good news for those of you were not at Milton Keynes or struggled to get to all the talks that interested you is that, thanks to the volunteer efforts of the Camb-Hams, most talks were videoed and will, in due course, be put on the RSGB website. However, the best solution each year is to actually come along and be part of the vibe yourself. With so much going on – and I may well have missed a few things because there was indeed so much – there is surely enough to tempt everyone's palate. Thanks are due to the RSGB, Martin Lynch & Sons, **Graham Murchie G4FSG** (Convention Chairman) and all the volunteers who made the event such a success once again.

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

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Little Tarheel II-HP 40-6M (7-54MHz) 500W £449.95

Tarheel 40A-HP 40-10M (7-34MHz) 1500W £499.95

Tarheel 75A 80-10M (3.7-34MHz) 250W £499.95

Tarheel M100A-HP 80-10M (3.4-30MHz) 1500W £529.95

Tarheel M200A-HP 80-10M (3.4-28MHz) 1500W £509.95

Tarheel M300A 160-10m (1.7-30MHz) 250W £499.95

Tarheel M400A 160-10m (1.7-28MHz) 250W £529.95

Accessories

MT-1 mobile mount for Models 100,200,300,400 £149.95

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From their beginning in Cleveland, Ohio, Hustler Antennas have been produced in the U.S.A. for over 40 years. Occupying over 55,000 square feet of factory and warehouse space, New-Tronics performs much of the fabrication, and all of the assembly of Hustler Antennas in its plant. The combination of a high percentage of in house manufacturing, and low overhead allows New-Tronics to minimize cost and offer what we believe is the best antenna value in the US and international communication markets.

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HM-40 400W 40m mobile whip £34.95

HM-80 400W 80m mobile whip £37.95

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HM-40S 1000W 40m super resonator mobile whip £44.95

HM-80S 1000W 80m super resonator mobile whip £44.95

Accessories

MO-1 54" mobile mast section £47.95

MO-2 54" mobile mast section £47.95

MO-3 54" mobile mast section £37.95

MO-4 22" mobile mast section £32.95

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Alpha Delta Communications, Inc. has been producing industry leading RF management products for the communications industry for over 30 years. Their coax surge protectors, surge protected coax switches and severe weather rated multi-band and single band HF antennas are ALL made in the U.S.A. When you select Alpha Delta, you select quality!

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Palstar BT-1500A Balanced Antenna Tuner £859.99

Palstar AT-500 600W Antenna Tuner £499.99

Watt Meters

Palstar PM2000A Base SWR/PWR Meter 1.8-60MHz 2000W £249.95

Palstar PM2000AM Mobile SWR/PWR Meter 1.8-60MHz 2000W £249.95

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Palstar DL1500 Dummy Load 1.5kW (short burst) 0-30MHz 100W up to 500MHz £229.95

B4KC-1 1:1 Super High Power 4kW balun £99.95

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The 2018 National Hamfest, organised by National Hamfest (Lincoln) Ltd in conjunction with the RSGB and the Lincoln Short Wave Club, this year celebrated 10 years at this venue and drew what felt like a record number of visitors (though I haven't seen any official figures).

Our PW stand focused on selling subscriptions to *PW* and *RadioUser* and Katherine Brown of Warners Group did an exceptional job, allowing Georg (*RU* editor) and me the opportunity to get around and meet readers and traders.

The Hamfest guide listed around 45 trade exhibitors, from one-person companies to the major vendors and manufacturers. More than 20 special interest groups and clubs also had stands and the RSGB was, as always, there in force with a large bookstall and committee representation. Dave Wilson MOOBW, RSGB President, took me through the new online examination system, being rolled out for all levels of amateur radio examination. It certainly appears to be a major step forward in making the exams easier to administer while also providing instant feedback of the result.

Outside the main hall the number of bring-and-buy traders seemed to be higher than usual while once again the Camb-Hams ran a special event station – GB18NH.

The RSGB ran a Buildathon the Saturday, with several young people being taught the basics of soldering and related construction techniques.

New Transceivers

Not surprisingly, there was a huge amount of interest in the new flagship transceivers from the three major vendors. Icom's IC-7610, which we have already reviewed in *PW*, has been around for a while now but still warrants lots of attention, while lots of questions were being asked about the IC-9700 VHF/UHF/23cm transceiver, announced at this year's Tokyo Ham Fair although not yet available in the UK.

Kenwood had just shipped the first of the TS-890S transceivers and had one on show. It certainly looks the part and we look forward to getting our hands on one to review in the near future.

Yaesu were showing a prototype of the FTDX101D, lacking some features at this stage but a big step forward from the mock-up I had seen at Friedrichshafen in

The 2018 RSGB National Hamfest

PW had another successful Hamfest, as did other vendors and visitors. Here's our overview.



Martin Lynch himself, with colleague Gary Spiers, shows off the new compact loop from Ciro.

June. This one will probably arrive on UK shores early in 2019.

Other New Products

RigExpert had several new products on display, not just analysers but interface boxes and the Shape 8, a double magnetic loop antenna.

www.mixw.co.uk

Martin Lynch & Sons also displayed several new products. These included the BoxChip 70cm DMR + 4g LTE handie-talkie plus phone, the Nissei NS-1230D 30A Micro PSU featuring Powerpole connectors and the R2GEAR Mk3 Bluetooth Speaker/

Microphone for use on Network Radios. Their stand also featured the Yaesu FT-4XE, a tiny 2m/70cm dual-band. Finally, they were showcasing the new 'Stealth Loop' by Ciro. This covers 6.6-30MHz, with a maximum power handling of 125W.

www.hamradio.co.uk

Others

I was pleased to see recent new *PW* advertiser South West Broking at the Hamfest. We will feature an article from them in the near future, advising on how best to insure your gear, club activities and the like. I had a long chat with proprietor Julian Dent,



Lots of activity around the RSGB bookstand.



The VMARS (Vintage and Military ARS) stand was popular, and there were outdoor exhibits too.



Yaesu were proudly displaying the historic progression of the FT-101 series of transceivers.



RigExpert had several new products on display.



The South West Broking stand generated a lot of interest in amateur radio insurance.



Katherine Brown of PW owners Warners Group busy selling subscriptions to PW and RadioUser.



The boot sale area, as always, featured a fascinating collection of gear.

who is a radio amateur as well as having worked in the insurance industry for many years and obviously understands our sometimes unusual requirements.

RSGB/W&S Club of the Year

Waters & Stanton were at the show once again, with a larger stand than 2017. As always, they also sponsored the RSGB Club of the Year and the winners were announced at the Hamfest. Congratulations to all, and especially to Essex Ham who so often feature in our *News* pages because of their full and varied programme of activities.

Small Clubs

National Winners: South Kesteven ARS
Runners up: South Bristol ARC
3rd place: Greenisland Electronics & ARS

Large Clubs

National Winners: Essex Ham
Runners up: Wythall Radio Club
3rd place: Stockport Radio Society

All in all it was a great show as always. Friday tends to be busier than Saturday (folk looking for early bargains?). The organisation was smooth (I don't envy those stalwarts who take care of the gates and car

parking each year – it can be very cold first thing!). I have only scratched the surface in those items I have highlighted. Other regular PW advertisers such as bhi, LAM, Moonraker and SOTabeams were there in a big way and getting lots of attention. The club stands are always worth a visit too. For many of them it is the one occasion in the year when they can promote themselves to a captive audience of thousands. With the unfortunate decline of many other once regular amateur radio shows and rallies, this is the definitely the one that should be in your diaries for next year.

The Practical Wireless Christmas Quiz

Have a go at our Christmas Quiz, brought to you this year by our HF columnist Steve Telenius-Lowe PJ4DX. Not surprisingly, it has an HF operating flavour. There are two rounds – ten written questions and ten picture questions. There are no prizes – you can find the answers on page 69. Enjoy!



- 1a. There are two Christmas Islands in the world. Which two countries do they belong to?
1b. What are their normal amateur radio prefixes?

2. What do the letters "OQRS" signify?

- 3a. In which ITU zone is the UK located?
3b. What about the CQ Zone of New York?

4. What major change to UK amateur radio licensing took place in 1964?

5. The first three pages of the UK licence are written in which languages?

6. What in Germany is a "DOK"?

7. GB is used for special event stations in the UK, but which country allows all its amateurs to use the special prefix AX on three days of the year?

8a. In which contest are "QTCs" exchanged?

8b. Which three items are included in a "QTC"?

9. In which year do most experts expect the next sunspot minimum to occur?

10. What does the digit zero denote in a VE0 callsign?

Picture Round

Which countries (DXCC entities) do these QSL cards come from? The full callsigns have been obscured, but enough clues remain!



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Another New Region 1 Tropo Record for 144MHz!

Tim Kirby G4VXE reports a new record for the 2m band and has all the usual VHF news, including a well-deserved accolade for one of his regular contributors.

You may remember that last month I reported that Mark Turner EI3KD had established a new Region 1 tropo record on the 2m (144MHz) band. Well, on September 25th, Peter Torry G3SMT set a new record by working D4Z in Cape Verde on CW over a distance of 4431km, beating Mark's record, which was 4163km.

I should also mention GW0KZG in IO71LW who held the record for a minute, at a distance of 4270km, before Peter G3SMT made his contact with D4Z.

On FT8, D41CV was active too, with G7RAU, GW0KZG, EI3KD, M0BUL and G4RRA all known to have made contacts.

For me, the really interesting thing about Peter G3SMT's contact is that he is not in a coastal location but well inland, near Oswestry, so it gives hope to those who are some distance from the coast that they too may be able to make contacts like this.

Congratulations to everyone involved in a really fascinating opening with some great contacts.

Southern Ireland Repeater Group

The Southern Ireland Repeater Group run a network of seven analogue repeaters across the south of the country, two of which are on the 2m band and the remainder on 70cm (432MHz). In addition, they run APRS digipeaters and two digital repeaters.

Looking to increase the usage of the analogue network, they have a variety of options to link to it, including an IRLP node. More recently, however, the group have introduced a link, which has proved very popular, from the Zello platform on Network Radio. Using your phone or your network radio you can connect to the 'Southern Ireland Repeater Network'

channel and hear the traffic through the interlinked repeaters. Assuming that you have an amateur licence, you can call on the Zello channel and speak with one of the moderators who will 'approve' you and then you will be able to chat through the network of repeaters.

This works very well indeed and I have had many interesting contacts through the system already – most often just monitoring the group on my phone. One contact I enjoyed was to be able to speak with John EI7GL who writes an always interesting blog at:

<https://ei7gl.blogspot.com>

As well as the Zello and IRLP links, you can also access the analogue network from the Brandmeister DMR network, on talk group 27240. The Brandmeister link works well too, which I have been able to use from one of the digital radio hotspots around the house.

Irish DMR Net

To try to promote DMR activity across Ireland, North and South, a DMR net has been established on a Monday night at 2030 on Brandmeister talk group 2722. DMR operators from across Ireland call in and then at the end there is an opportunity for anyone outside Ireland to call in and make contacts if they wish. The call-ins from Ireland are managed by county. It is interesting to hear where the operators are and it's great for people in more outlying areas to have a focus enabling them to make some contacts.

Talkgroup 2722 is designated as the Ireland National Calling talkgroup, with talkgroup 2723 designated as Ireland Chat, for those longer contacts. Having said that, activity is not so extensive on talkgroup 2722 that I have noticed any rush for people to move to another talkgroup.

Mapping Locator Squares

Since Google made some changes to their terms and conditions of using the Google Maps API, many amateur radio sites (along with many other sites) have had to seek alternative mapping systems to avoid having to pay prohibitive licence fees for what is a hobby-based website. Like many of you, I suspect, I have always previously used the F6FVY site to find a locator for a particular place or, as I did when I was writing the piece about the new Region 1 record, to find out where the stations involved were located. When I went to the F6FVY site, I found it was suspended following the Google licence changes.

I had a quick look around and was very pleased to find an alternative at:

<http://k7try.com/grid>

This seems to work very well and in the same way. I note that there is a 'Donate' button and it may well be, given the circumstances, that if you find the site of use, a small donation is appropriate to show your appreciation of the facility.

More on the Baofeng BF-888S

Last month, I mentioned my new Baofeng BF-888S Plus transceiver, which I had bought for around a tenner. When I was in Pembrokeshire recently, I had a number of QSOs with it through the GB3SP repeater at Pembroke Dock. It seemed to work very well and I was delighted with the results from such a simple rig.

Ian Thomson GM0URD wrote with a couple of interesting pieces of information that may be of particular value to those trying to program the rigs from a Linux platform. Ian notes that when using the excellent CHIRP software on Linux, it seems to be important to have the channel selector turned to 16. I'm not sure whether this is the case with Windows as well but if you have problems, it sounds as though it

would be well worth a go. Ian also recommends that when you try to program the BF-888S from a Windows platform, you should run the programming software as Administrator. Ian also included some quite detailed information on resolving a programming issue with CHIRP on Ubuntu and Kubuntu, which revolves around permissions for the USB serial port. It's probably a little bit specialised but if anyone reads this and thinks 'that's what I need to know', please e-mail me and I'll be happy to send you the details that Ian has very kindly provided.

Readers may be aware that in the USA, the FCC have made a ruling in regard to 'non FCC certified radios', largely seen as 'Chinese radios'. The ruling says that if a radio is capable of transmitting outside the amateur bands and is not FCC approved, then it may not be used (or advertised, or sold) within the USA. Worth bearing in mind if you plan to travel to the USA and were thinking of taking your Baofeng or other similar radio with you. If you would like to learn more about the nuances around this, there is a useful video here: <https://tinyurl.com/y8beychr>

The 6m Band

Jef VanRaepenbusch ON8NT (Aalter) made some FT8 QSOs on the 6m (50MHz) band during the month using 10W from his IC-7300 to a Diamond V-2000 antenna, mostly ground-wave or extended ground-wave propagation, including F4GBW (JO10), M0NKR (JO02), G0GGG (IO81), F5UGS (JN09) and G4IFX (IO91).

Peter Taylor G8BCG (Liskeard) was delighted to work C21GJ in Nauru on his first moonrise and close to Peter's moonset on September 29th. **Lance C21GJ** told Peter that he had worked 119 contacts in 34 DXCC entities with some notable contacts, including first EME contacts for some stations, one using just 100W to a single Yagi! Peter was also very pleased to work the ZA5V EME expedition on both 50 and 144MHz. Other new stations worked on 50MHz EME were MM0AMW and GM3POL.

John Wood G3YQC (Hereford) says that things have been quiet with only near European stations being worked over the last month. John says, "don't think that's it for the season, though – remember last year's opening on Boxing Day!"

The 4m Band

Kevin Hewitt ZB2GI (Gibraltar) set up an FT-817, transverter and a two-element

Yagi along with an Ascom SE-550 and an inverted-V dipole at the top of the Rock during the PW 70MHz contest. However, despite calling CQ, monitoring for activity and watching the Cluster, there was nothing. What a shame! Fingers crossed for next time.

The 2m Band

It was good to hear from **Mike Cooley M6NVE** (Sandbach) following a 2m FT8 QSO we had on September 18th. Mike has been a consistently good signal here in Oxfordshire using 10W to a roof-mounted vertical and has been enjoying exploring 2m propagation since getting started on the mode recently.

After using a vertical on 2m FT8 for some months, **Keith Watkins G8IXN** (Redruth) is now using a 7-element horizontal Wimo beam, with 7m of RG214U coax. Although I consistently saw Keith's signals previously when he was using a vertical antenna, he has been more regular copy here in Oxfordshire since he changed the setup. Keith has fitted a TCXO (temperature-controlled crystal oscillator) to his FT-897 to reduce the possibility of drift. Keith also mentions that he sees many overdriven signals on FT8 and says you need to keep a careful eye on the ALC. He suggests only running a tiny amount of ALC, none being preferable! Or, he says, increase the audio input from the PC to the radio to the point where the power stops increasing and then back it off a fraction. Keith also notes that the power setting can vary quite dramatically depending on where in the spectrum from 800Hz to 1.9kHz you are transmitting. (You can set the 'Fake It' option in WSJT-X to avoid this and always be transmitting around 1500Hz.)

Don GW0PLP (Aberporth) has been getting started on 2m FT8 and I was delighted to work him from Oxfordshire on September 26th, when he had excellent signals over the mountains for a period of 24 hours or so. Don also sees a lot of enhancement on signals from the air traffic coming across Wales to the Strumble Head area. When I worked Don he was using a vertical antenna but he says he has a loft mounted 7-element Yagi, which he has used to work into Scotland and Northern Ireland.

It was great to hear again from **Roger Laphorn G3XBM** (Cambridgeshire) who has also been busy on 2m FT8. When he wrote on September 30th, he says that he had spotted 59 stations in seven coun-



Fig. : The installation at P12HWNK the new 70cm repeater at Noordwijk, Netherlands.

tries in a 24-hour period. Despite using a modest 2.5W to a Big Wheel antenna, Roger had been called by EA1UR at a distance of 1192km although, sadly, fading had kicked in and the contact was not completed. Roger says that he often works G7RAU (IN79) over a distance of 461km – acknowledging that Dave has an excellent site and great antennas. Roger also says that he is often spotted by G4LOH (IO70) when he calls CQ, as well as G4RRA (IO80). Although aircraft reflection works well with FT8 on the band, the mode makes tropo DX possible for QRP operators too. Like Marmite, Roger says, you either love or hate FT8, but for him it has been good!

Jef ON8NT was active during the 144MHz contest on September 1st, with the following stations worked over a distance of greater than 300km: G8XVJ/P (IO83), G8W (IO90), F6KCZ/P (IN99) and G5B (JO03) and then during the UK Activity contest on September 4th, he worked G4CLA (IO92), M0DXR/P (JO01), and G4RUL/P (JO00).

Roger Daniel G4RUW (Newbury) says it's been an interesting month. His new rotator for the 8-element LFA Yagi gave up, so he has had to take the whole lot down

and send the rotator in for repair, leaving just a 4-element up for the band, beaming east. Roger has been trying to get his FT-857 to behave nicely on FT8 but hasn't quite succeeded yet. In the meantime, he has heard some nice DX on the band, including EA, EI, ON, F, OZ and DL.

Peter Walker G4RRM (Crewe) says that he hasn't any FT8 DX to report on the vertical antenna this time but is busy trying to set up a single Yagi and JT65B in order to try to make his first EME QSO in the near future. Good luck Peter and please keep me posted.

Steve Macdonald G4AQB (Bolton) says there were some interesting tropo conditions on the band at the end of September and he managed to work some new squares at home and abroad. Highlights were EA1UR (IN53), F6DBI (IN88), PB0AHX, G7RAU (IN79), G8IXN (IO70) and GU8FBO (IN89).

Robert van der Zaal PA9RZ (Sassenheim) says that he's not worked much on the band apart from during the activity contest when he worked, pretty much as usual, OZ1ALS (JO44) quite easily despite the 470km distance although he struggles to work PA0FEI (JO33) over a much shorter distance. That's the joy of VHF/UHF!

Here at **G4VXE** there have been plenty of contacts on the band, all on FT8, with the highlights being September 17th MW6GUL (IO71); September 20th F6APE (IN97); September 25th M0MLZ (IO70), EI3KD (IO51), GW0PLP (IO72); September 26th F4CHB (JO00), G8BCG (IO70), G8ECI (JO03), G7RAU (IN79), F6HRO (IN88); September 27th PA2WCB (JO21), PB0AHX (JO22), PA2MRK (JO22) October 7th F6APE (IN97), GW1MNU (IO71); October 8th F4HMV (IN88), OZ1BP (JO55); October 9th F1SAL (JO11), OZ1BEF (JO46), F4DJG (JN09) and DD3KF (JO30). All using 50W to a vertical.

In early October, conditions were excellent from the east coast and I noted G4SWX and G4CDN on FT8 calling RA3LE although sadly, I don't think a contact was completed, but several other very long-distance contacts were. Magic stuff!

John G3YQC says it's good to see so much FT8 activity on the band. On September 25th he worked EA1UR and EI3KD; September 26th F4CHB, EI3KD, GU8FBO, F5BZU and EI4KP; September 27th F5BZU, F4CHB, PD9C, GU8FBO, ON4KHG and EI8IQ and September 29th EA1UR. John says that the first half of October didn't seem quite so good although there were still plenty of near continentals

as well as G stations from all over. John notes that the breakfast period is a good time for DX so it's worth switching on before you go out for the day. Unless, he says, you can operate remotely – I wonder who he means!

The 70cm Band

Jef ON8NT worked G7LRQ (IO91), G3MEH (IO91) and G4CLA (IO92) during the UK 70cm Activity Contest on September 11th.

Robert PA9RZ says that during mid-September, his local group installed a new 70cm FM repeater in Noordwijk (JO22FG) around a quarter of a mile from the beach. The repeater has the callsign PI2NWK and has an output on 430.050MHz and input on 431.650MHz, **Fig. 1**. Robert says it should be easily audible from East Anglia (and probably farther afield). If you have a good path to the Netherlands, please keep an ear out for PI2NWK and try a call if you hear it.

The 23cm Band

Derek Brown G8ECI (Louth) checked the 23cm (1296MHz) band on October 10th and found the DB0VC and OZ7IGY beacons quite strong. He had no time to check the SSB portion of the band but later, he worked OZ1CTZ and OZ2OE although conditions did seem to have dropped somewhat. OZ2OE mentioned to Derek that he had worked into the Baltic states but there was nothing at that distance heard in JO03. Derek also says that his 2 x 2C39A amplifier for the band is almost finished.

Satellites

Many congratulations to **Peter Goodhall 2M0SQL**, **Fig. 2**, for being awarded the G3AAJ trophy from AMSAT-UK. This is presented to an individual (or group) who have provided 'outstanding service to the amateur satellite community'. Peter is just that person – he's consistently active despite many challenges and encourages newcomers and old hands alike to try satellite operating. Congratulations Pete and well done to the committee of AMSAT-UK for a great choice!

Nice to hear from **Peter Atkins G4DOL** (Dorset) regarding his satellite activity. On August 1st, Peter made a rare contact with HZ1FI (LL34) through FO-29. Peter says that one of the interesting things about that contact was that he made it with just two hands! One hand was holding the antenna at low elevation and sorting out Doppler shift while sending CW, finding

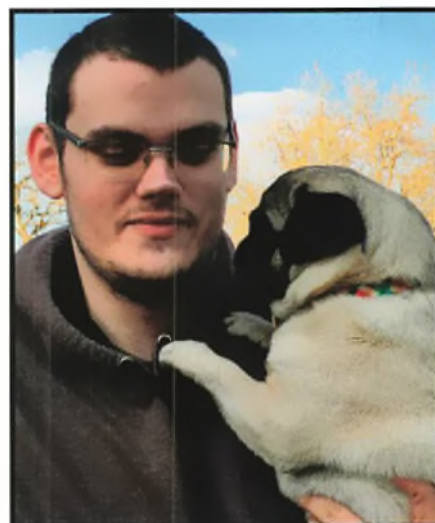


Fig. 2: Peter 2M0SQL, winner of this year's G3AAJ award from AMSAT-UK. Peter is pictured here with Monty the pug!

the station and tuning the receiver with the other. Even when you're 'just' operating phone, two hands is never quite enough so to manage this with CW must have been quite fun to try. On August 9th, Peter worked TF/G0MFR (IP05) through AO-92 and then UR5FA/MM (IM64) off the Moroccan coast. UR5FA was using 5W to a small antenna, which worked well, although there was some quite heavy fading. On August 22nd, Peter worked JW/OH8FKS/P (JO79) on Svalbard – a nice rare one. In another session through FO-29 on September 4th, Peter worked OH3NGT (KP21), RV9CHB (MO06), R7MU (LN07) and then on September 6th YO5BAK (KN07) but Peter was particularly pleased with a contact with UA0ADX (NO88) well into Asiatic Russia, again via FO-29. On September 13th, Peter worked R3YAO and YO9BIV (KN24) through AO-91 on FM. All Peter's contacts are made using a handheld antenna system.

Kev ZB2GI notes contacts via AO-91 with EA8CUZ (IL18) and EA8HB (IL18) and via AO-92 with EA5/DL9GB (IM99) and EA8CUZ (IL18).

Patrick Stoddard WD9EWK (Phoenix) reports that VY0ERC is about to return to the satellites for a few weeks from the Canadian Arctic, from grid locator ER60 with the possibility of other grids in the area. The operator will be **Pierre VE3KTB** who was the operator for the VY0ERC activity earlier in the year.

Once again there's been plenty to report on this month. Thanks for all your input and please keep it coming. Let's hope next month will be just as interesting. See you then.

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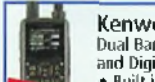
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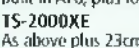
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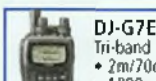
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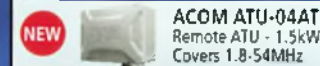
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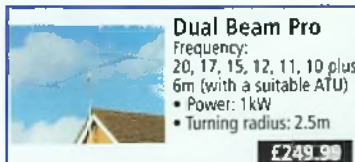


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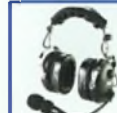
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News from Bonaire, JS8 and Reader News

Although it seems strange (writing this in October in temperatures around 33°C here in Bonaire), as this is the December issue of *PW* I'm happy to take this opportunity to wish all readers a very merry Christmas.

In consultation with the editor, Don G3XTT, I have been able to extend the deadline for contributions to this column by ten days to the 11th of each month, starting this month. Please note these are firm deadlines, though there's no need to wait until then. By all means send in material between (say) the 1st and the 11th of the month but anything received on the 12th or later will miss the boat! The later deadline will allow readers' news and logs to be more up to date and therefore more useful. Please only send in logs for contacts made in the month immediately prior to the deadline. For example, for the February issue contacts made between November 12th and December 11th.

News from Bonaire

On the Saturday of the Worked All Europe DX SSB contest in September I was operating on 20m when Victor Brand G3JNB called me at 2018UTC to say that my signal was peaking way over S9. It seemed that I had a direct 'pipeline' to Bedfordshire and we both were at our strongest-ever levels. But the following day Victor reported me at S7 – propagation was back to normal!

A few days later Victor also worked my neighbour Wilko PJ4/PA3BWK, Fig. 1, who was here on holiday and running his Icom IC-7300 at 100W on 20m CW – and having great fun being called by his European buddies.

Rinse PD2RF (also in Fig. 1) arrived on Bonaire on September 19th for a six-month visit to the island. He is staying in a small farmhouse out in the *kunuku* (countryside or the 'bush') and operating an eco-station because the location is off-grid. Rinse will operate as PJ4RF using 100W from battery-powered equipment charged by solar panels.

Steve Telenius-Lowe PJ4DX has another packed column, starting with news from his island paradise!



Fig. 1: Welcoming Rinse PD2RF to Bonaire on September 19th. Left to right: Peter PJ4NX; Bert PJ4KY; Rinse PD2RF; visitors Wilko PJ4/PA3BWK and Marja PA4DOC; Steve PJ4DX.

FT8Call Renamed JS8

Tony Usher G4HZW reports on the further development of FT8Call, the latest digital mode, which we mentioned in this column last month. Following consultations between Jordan Sherer KN4CRD, who wrote the code for FT8Call, and Joe Taylor K1JT and Steve Franke K9AN (the inventors of FT8), the group name of the new mode will be changed to JS8Call and the FT8CALL mode will become JS8 (Jordan Sherer-designed 8-FSK). FT8Call/JS8 is clearly developing very quickly but in early October Tony commented: "Currently FT8Call is very much at the Beta testing phase and each issue expires after 14 days... A number of changes will be made, including compression algorithms that will allow more data in each transmission and speeds equivalent to Morse sent at 15 to 20WPM. There is some activity on FT8Call but the uptake remains slow. I have had some complete QSOs: it does work but it's currently a bit slow and clumsy, especially with everyone new to the mode.

Things will no doubt improve as operators become more familiar with the techniques needed."

Readers' News

Victor G3JNB reports on a memorable event. "On September 20th, together with fellow Shefford Club members Andy G4DAQ and Paul G1GSN, I was invited to operate GB4SMH at the Signals Museum, RAF Henlow, Fig. 2. Using their venerable WWII station equipment, a T1509, we were set up to respond to a commemorative CW message to be transmitted using a Paraset Mk7 by 95-year old Dutchman Bram Grisnigt, known as agent 'St Patrick', from the Dutch Resistance Museum in Amsterdam. Bram is the last living Dutch secret agent from the MI6 Dutch Section and was dropped into Holland from RAF Tempsford, 75 years ago to that very day. A trained wartime telegraphist, a team of leading Dutch amateurs had arranged for him to transmit live Morse once again to mark the occasion, using the special

callsign PA6RAG (Bram's initials)." Bram's message was received by **Martin Ather-ton G3ZAY** at GB2IWM, the International War Museum at RAF Duxford, who can be seen in a BBC news report on YouTube. (Google "YouTube WWII 95-year-old Dutch Resistance member"). There's more on this fascinating story in this month's News pages.

Carl Gorse 2E0HPI is still unable to get out portable as much as he would like due to a chronic knee injury. It sounds as if it will be a long road to full recovery, with "plenty of physio trying to loosen the muscles around the knee joint as it's stopping me from kneeling down or bending my leg," Carl says. "I have only had a few chances to get out portable and [in the band reports] are some worked on 40m with my KX2 and simple dipole for 40m from the local beach. We've been very busy as well because we are getting married on October 29th this year so I think that month is going to be a very busy one." Congratulations to Carl and his bride-to-be from all at PW!

Kevin Hewitt ZB2GI wrote that his September highlights included "operating ZG2GI for Gibraltar's National Day and operating Maritime Mobile... Gibraltar National Day is celebrated on September 10th to commemorate the sovereignty referendum of 1967. The special prefix ZG2/ZG3 can be used for the occasion," he explained. Kevin made over 200 contacts with the special prefix, including one with PJ4DX, I'm pleased to report! Later, he also operated as ZB2GI/MM, **Fig. 3**, from the Bay of Gibraltar with **John King ZB2JK**, **Fig. 4**, using an Icom IC-703 at 10W to a 5m wire connected via a 9:1 balun with 2m taped to a fishing rod and the remaining 3m tied to guy rope secured to the bow handrail. Best DX was a QSO with KB9KTC in Illinois.

Etienne Vrebos ON8DN/OS8D uses both his callsigns to work DX. But he points out, "I do not re-call the DX station if others are still calling: I'm well educated and wait till the DX station spontaneously calls CQ and nobody else answers. Mostly it happens the next day, or some hours after the pile-up." Located close to Brussels Airport, Etienne uses a Hexbeam only 8m high: "I didn't manage to push it higher because this antenna really performs well at 8m. A good friend of mine told me not to move the Hexbeam because this is ideal if it performs that well and pushing it higher could decrease performance on some bands. That's the reason why I won't



Fig. 2: Andy G4DAQ and Victor G3JNB at GB4SMH in the Signals Museum, RAF Henlow.

change anything. Of course, the Hexbeam could perform better on a 30m-high tower but the airport authorities would be here within five minutes!"

Owen Williams G0PHY had "Quite a lot of activity this month, starting with the All Asian phone contest although the only contact with an Asian station was 7Z1SJ on 14MHz. Things improved with the Worked All Europe contest... The best 14MHz contact during this contest was with CB8E, whose qrz.com page states that he is near Punta Arenas in the far south of Chile. I heard Luis calling CQ contest at 2112UTC and as he was not too busy, managed a contact. The best contact on 7MHz was with YV1KK at 2150UTC. It took a little while to get him in the log but I got there in the end. The qrz.com page for this station shows that it's in western Venezuela at a height of 5410ft ASL so that must have helped things along. I listened for RI0B, a Russian IOTA expedition to various Arctic islands in the Kara Sea and only heard them at workable strength from AS-087, Arkticheskogo Instituta Islands, managing a QSO on 14MHz. One interesting contact on 14MHz was with LA/OH6GAJ/M who was operating from Nordkapp, the most northerly point in [continental] Europe. The month ended on a happy note with contacts on 14 and 18MHz with 9X0T, the Italian DXpedition to Rwanda."

Terry Martin M0CLH reports that, "As can be seen from the log this month [in the band reports], the Sporadic E has disappeared with little activity on the higher bands. Mostly data modes again but I did pick up the microphone, dusted it off, and



Fig. 3: The ZB2GI/MM station in the Bay of Gibraltar.



Fig. 4: John ZB2JK, operating GB18NH at the National Hamfest in September.

had a couple of SSB contacts! I was also pleased to complete my trio of phone, CW and data contacts with the ARRL headquarters station, W1AW. Further activity from Kosovo was welcome and some slots filled from Rwanda but so far have not had any luck with the Mayotte [TO6OK] expedition. Every year, there is a Bulgarian Saints award whereby each month, a special event station with a unique callsign can be bagged. Having gained contacts for 10 out of the 12 months, an application for the free and colourful PDF certificate can be submitted. I have a complete set from 2012 and just need LZ532PSO next month to

complete my 2018 submission."

Ed Spicer M0MNG, writing on behalf of the Amberley Radio Group, sent in a report on the group's Railways On The Air (ROTA) activity. "We were on the air both days using GB2CPM, which is our permanent special event callsign", Ed wrote. "The Amberley Narrow Gauge Railway, **Fig. 5**, runs right alongside the radio and television exhibition building that houses our shack. This meant that we could not have been physically closer to the railway line, even if we had put a tent up outside and operated Field Day style instead... Usually 40m is our 'bread and butter' band and we did manage a handful of inter-G contacts around Sunday lunchtime. However, for the most part the stations we heard were few and far between, tended not to be very strong, and came from the further-flung parts of continental Europe. Fortunately, 80m well and truly rescued us and stayed open throughout, even during the middle of the day." Unfortunately, high noise levels on 80m meant that some stations calling were not copied well enough for a contact. Ed continued, "It seems that many other ROTA stations had the same idea to concentrate on 80m. This allowed GB2CPM to work 13 ROTA stations on that band across the weekend, and three on 40m... Overall the weekend was a success and good fun. Thank you to everybody who called us or visited us."

Finally, it is always good to hear from new contributors to the column, so we especially thank **Rhodri Morgan M0RHO** for getting in touch and sending in his news. Rhodri enjoys low-power portable operation and on September 15th he went out portable in the New Forest using his new Yaesu FT-818 at 5W to an 8m high 20m dipole. **Fig. 6**. He worked 9H3XN, OM100CSR and LZ5DD and comments, "Conditions were quite good and I was really pleased to have worked Malta QRP. Compliments to the operator of the station in Malta for his patience in working me. I thoroughly enjoy IP QRP... Great publication and look forward to contributing further."

Band Reports

FT8 aficionado Tony G4HZW reports "many east coast Ws and EUs" on 40m FT8 plus: CO8TH, EA9CR, TF1A, TF/VE2DX, VK100, XP3A, ZL3IO, though "getaway of the month was FK8DD". 10m FT8: "no North America just a few EUs and occasional openings to South America": CA3JBD, LU1QAH, LU8DY, PU2TXZ,



Fig. 5: The Amberley Narrow Gauge Railway adjacent to the GB2CPM station.

PU5FGR.

Victor G3JNB shows what can be worked even at sunspot minimum using very modest power: 40m CW: V26K. 30m CW: RI0B. 20m SSB: PJ4DX. 20m CW: LU9DO, RI0B (AS-104), TO40CDXC (Cliperton DX Club anniversary), XQ6CFX. 17m CW: 3B9FR, CX5UA, DU3LA, PZ5RA, V26K.

Carl 2E0HPI/P, running QRP, offers on 40m SSB: DL7UWR/P, F4HGN/P, HB9RL/P, OT35PRA. OV1CDX, PA4VHF.

Kevin ZB2GI, operating as ZG2GI, worked 40m FT8: CT3MD. 30m FT8: 5P1KZX. 20m SSB: CU2GC, KD4D, LU9MBY, N5GJ, PJ4DX, PP5JR, PZ2A, VA3SF, VY2ZM, WB8FSV. 20m FT8: AB1HL, PY2AE, WB4RA, ZP4KFX. 17m FT8: 4X4DK, A41KB, JA5AUC, JI2FBG, JF4VZT, K0XB, VE9HF, ZS6HON. And, operating as ZB2GI/P from the Top the Rock, 20m SSB: EA9CSB, K1QS, M0XLT, PR7CPK, RW4M, W9OSI, ZS1SBW. 10m SSB: CE7VPQ, CX2CC, LU1ICX, LU7DGE, PT9AL, PU2UAF, PY2ADX.

Etienne ON8DN / OS8D used SSB only to work 40m: HB0/ON4ANN, Z68UR. 20m: 4L/R1CC, 9M6000 (an All Time New One - 'ATNO' - for Etienne), BG7AJH, DS3EXX, HB0/ON4ANN, KL7HRN, RI0B, UN8LWZ, Z68UR. 17m: 9X0T, TO6OK (Mayotte, another ATNO), ZS6JD. However, he found 15, 12 and 10m to be "totally dead bands".

Owen G0PHY also used SSB only on: 40m: CR3W, KC1XX, RF9C. 20m: 4X6FR, 9K2HN, 9X0T, HI8RD, JE6RPM, NP2P,



Fig. 6: This truly is portable operating: Rhodri M0RHO/P, with the cows in the New Forest.

PJ4DX, PY2NY. 17m: 9X0T.

Terry M0CLH offers 40m SSB: HB0/ON4ANN. 40m FT8: 5B4ALX, RY7G. 30m FT8: A41ZZ, A61EK, EA6/G8GNI, IS0AWZ, SV9RNG. 20m SSB: LZ920MLC, T71B, Z6/AZ5YHD. 20m CW: HS3NBR, LZ920MLC, RZ1OA/P. 20m PSK63: HZ88ND. 20m FT8: 5Q1K, 9X0Y, KI6DY, KV4FZ, PZ5RA, TA2JU, VA3AQB, Z68UR. 17m FT8: 9X0T, 3B9FR, 4Z5UY, A41CK, A65DR, AC7P, K6EID, KP3IV, KP4JRS, LU5HA, SV5/SQ9UM, SV9BMG, YB0EIN, YB0MWM. 15m FT8: TR8CA.

Signing Off

Remember the new - later - deadline: please send any input for this column to teleniuslowe@gmail.com by the 11th of the month (November 11th for the January 2019 issue, December 11th for the February edition). Thanks to all contributors. 73, Steve PJ4DX.



The CW Operators Club (CWops) Open Contest took place on September 1st. This actually consists of three separate contests

and operators can take part in as many of the three as they wish. They are scored separately. However, because there are also teams involved and now that CWops have a large UK membership, it was decided to enter a TEAM UK. The team members are listed in Table 1.

I was using the special CWops callsign G2CWO and entered all three contests, as did the rest of the team. At the time of writing we are still awaiting the results but it was a very rewarding contest to enter. I didn't have to sit at the rig for 16 hours at a time, managed to feed myself and the cat between contests, and even grab some rest!

CWops UK now have their own IO group to post to: CWopsUK@cwops.groups.io

The N1MM+ contest logging program caters for the CWops contests very nicely and although I was working with my antennas in a poor state, I did manage quite well. It looks as though my dreams of doing antenna work in 2018 have now laded until 2019. I just hope I am still about and able to climb the towers. I do need to go up three of them to sort things out.

We were quite pleased with the turnout in the Open event and decided to meet up at the Newark Hamfest, those of us that could get there, to have a group photograph taken. The Norfolk Club (NARC) coach just managed to get us there in time for me to rush straight to the RSGB stand. As you can see from the photograph, Fig. 1, we do look a motley crew, more like a line-up at the local police station! However, Newark is not demanding on appearance, so I don't think we were unduly worried.

CWops encourage others to learn CW with the CW Academy. Stew GW0ETF is a key figure in this and if you are interested, take a look at the CWops website for more details:

<https://cwops.org>

Bug Keys

FOC (the First Class CW Operators' Club) runs an event called Bug Day. The next FOC Bug Day is scheduled for Tuesday, January 1st 2019, 0000-2359UTC. There has been continued interest in an activity twice per year (to run alongside the Mechanical Key Days) where the idea is to get on the air using those classic bug keys. It is open to both members and non-members. Other CW clubs may have similar events.

CWops Open, Bug Keys & Bootcamps

Roger Cooke G3LDI has his usual bi-monthly cornucopia of things Morse.



Fig. 1: CWops team members at the Newark Hamfest – L to R: Jim G3YLA, Ray G3XLG, Roger G3LDI, John G4DRS, Stuart G000UD (Stuart was not in the contests, however) and Phil G4NVR.

	Name	Call	Operator	CWops
1	Roger	G2CWO	G3LDI	1843
2	Ray	G3XLG		1365
3	Jim	G3YLA		2015
4	Nigel	G4BSW		2083
5	John	G4DRS		1415
6	Bob	G4HZV		1636
7	James	G4ILW		1729
8	John	G4IRN		268
9	Phil	G4NVR		1583
10	Peter	GM2CWO	GM0EUL	1899

Table 1: Team UK (CWops CWOpen 2018)

Most operators of my vintage started with a straight key and after a while on one of those, hankered after a bug key. That was the Holy Grail of the day. If you had a bug key, you could reach astronomical speeds of 25WPM or even more. The Morse emanating from a bug was dependent on the set-up of the bug and the skill of the operator in handling the number of dots transmitted. Because the dashes were made by the operator, with the finger on the paddle (assuming he was right-handed), it was

possible to insert 'character' into the Morse. Lengthened dashes became a trademark of some operators and you could often tell who was sending before hearing a callsign. A swinging CQ could sound quite attractive in those days.

Unfortunately, all that has disappeared into oblivion with the advent of electronic keyers and paddles, together with the search for ever more accurate Morse and mark/space ratio.

I graduated to an Eddystone bug. They



Fig. 2: G4DYC's Eddystone bug key.



Fig. 3: The key of Fig. 2 with its cover – this one really looks like a bug!

were very popular in the 1960s and I now wish I had never sold mine! The one shown in the photographs belongs to **Mike G4DYC** and he has sent a few details:

"I attach a couple of images of my Eddystone Model No. 689 Bug Key. I understand they were manufactured between 1948 to 1949. Some sources state that only 350 were made. Personally, I am not sure about that production number. There are a number in circulation/on internet sites and the like – unless the same ones just keep circulating. Over the decades a number must have even been scrapped or lost."

"The serial number on my Eddystone key is DZ1023."

Looking at the photo, you can see why they are called bugs although see below for an alternative explanation. In fact, I think the Eddystone key was the only one to actually look like a bug. Mike also sent me a picture of his early Vibroplex bug key, **Fig. 3**, which as you see is nothing like a bug. Mike says the serial number on that is 100,272 giving the build date as 1926. You can actually see a picture of a red bug on the Vibroplex key if you look closely.

However, in a note from **Tom K3TW**, he says that a bug appeared on the early Vibroplex keys, so it may have been a trademark. Tom wrote this:

"I was curious why a semi-automatic key was named a Bug and I found this interesting article:

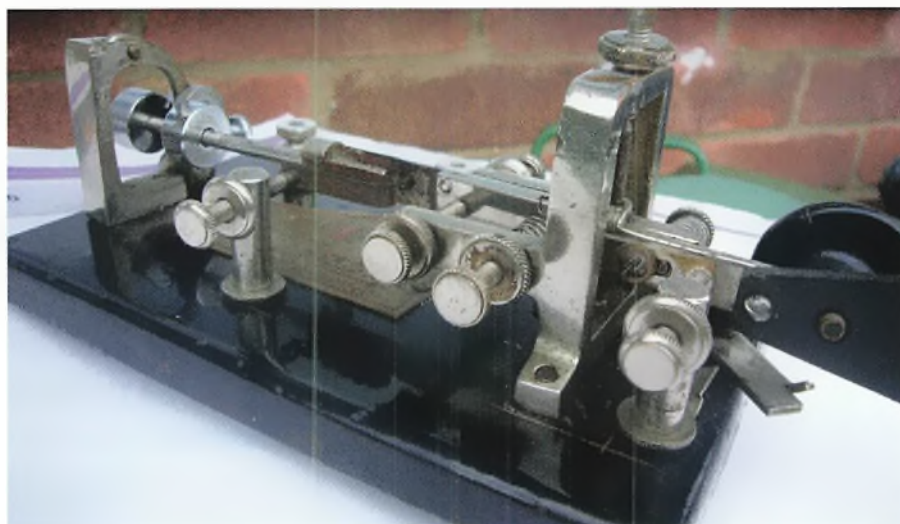


Fig. 4: G4DYC's Vibroplex 'bug'. This one looks nothing like a bug (but has the Vibroplex 'bug' trademark).

www.telegraph-history.org/bug

"This makes sense because there is an emblem of a real bug on Vibroplex bug keys."

"I owned my first bug (a Vibroplex Presentation) back in 1965 before I built a homebrew keyer with a pair of 12AU7A valves. I eventually graduated to a solid-state keyer with memories."

"The word Bug strikes a special feeling for me. Without going in to a lot of details, I worked for the Department of State Bureau of Diplomatic Security (and was on assignment for a few more Government agencies in the same business). My job was to identify and find 'bugs', also known as covert listening devices in our overseas US Missions."

More History

On the historical side of Morse, if you want to read how it was done in the dark ages, take a look here:

tinyurl.com/telegraphinstructor

The *Telegraph Instructor*, via the link above, is a good read for those seeking information about our Morse code 'roots' before wireless (radio). The first few PDF pages are almost blank but persevere and you will be well rewarded with a rare insight into early Telegraphy. This link was sent in by regular *PWW* reader and contributor **Bob Houlston G4PVB**.

Bootcamps

By the time you read this, the Essex Bootcamp (October) and the second Norfolk Bootcamp (November) will be history. However, here in Norfolk we plan on running two per year and I think Essex are doing the same. The really good news is that while I was attending the FOC 80th dinner in Cambridge, I learned that two more were intending running their own bootcamp. **Rich**

G4FAD and **Gavin GM0GAV** both plan to hold their own bootcamps and have promised to send me details when arrangements have been made. Indeed, why not plan one of your own?

Essex CW now have all the gear, available on loan, that is required. All you have to do is provide the venue. The following events are planned at the time of writing:

- October 27th, 2018. G0IBN at Witham Essex
- March 10th, 2019. GM0GAV. Venue to be arranged
- May 4th, 2019. G4FAD. Venue to be arranged

So, what started here in Norfolk several years ago is now spreading and that can only be great news. Actually, although **Andy G0IBN** mentions about borrowing equipment, it is easy to arrange a bootcamp with gear that most amateurs have available anyway. Andy has produced a list of what each attendee should bring along to the events he is involved with:

- Morse key with 3.5mm jack and 3.5/6.0mm adaptor.
- High impedance headphones, same jack requirements.
- Writing pad and pencil/pen.
- Name badge with call sign.
- Registration Fee £10.00 (exact amount, cash only).

Andy has obviously forgotten the cake, sausage rolls and so on! Here in Norfolk we don't charge anything because our Bootcamp is held at my place. Most of those attending bring some goodies cooked by the wives, so we have a great social day too. That is half the battle – enjoy the day and the rest will follow.

Please keep the input coming. 73 and may the Morse be with you! **Roger G3LDI**.



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This time, I am introducing a PCB assembly jig rather than an electronic item. I also include an accessory that I made because no-one

seems to think of the problems of holding components to the board when it is inverted in order to solder them in. Such assistance is available on commercial assembly jigs but most experimenters seem to get by with bending the component legs to retain them (See various YouTube videos).

The jig still fits in with our sub-£10 limit (£8.99 on eBay at press time – ed.) and is capable of holding PCBs up to 200 x 140mm.

One side is sprung, to enable mounting and removal of the PCB without disturbing the size set. The photo, Fig. 1, shows the jig holding a Pixie II board (I will not be covering the Pixie because there are thousands built and everybody has one!).

The accessories are a collection of resilient, heatproof foam, cut to match the PCB being built. The stiff part is heavy cardboard or Plastikard, on top of which is a layer of 1 or 2mm foam. I tried using wadding for home furnishings, cushions, duvets, but it was too thick, so I tried the thin foam often packed around items ordered online. This is ideal. Try Hobbycraft, perhaps. The heat from soldering may melt this, however, so I used a third layer of flexible, miniature steam boiler insulation known as Kayowool, from Camden Miniature Services and other model engineering suppliers, but your local model shop will probably not stock it. These are held together with rubber bands or stuck with PVA glue. In use, the device is held onto the PCB with a homebrew metal spring clip or rubber band running diagonally from corner to corner. These materials are cheap enough to make several sizes, to suit the boards being built. The second photo, Fig. 2, shows the jig supporting a PCB with components mounted ready for soldering.

This Month's Module

This month's module is assembled from several items but is not a 'kit'. It is a useful basic solar energy installation, which was begun several years ago and is slowly growing. I bought a £10 solar cell from Maplin, giving 12V at 1A (nominally), fixed it in my south-facing garage window and wired it back into my windowless basement shack. There, it runs an emergency lighting system, which will stay on if there is a power cut, Fig. 3. This consists of a 6 x 6

PCB Holder & Pad

Geoff Theasby G8BMI describes a handy jig for supporting PCBs under construction and has a cheap solar energy installation to round things off.

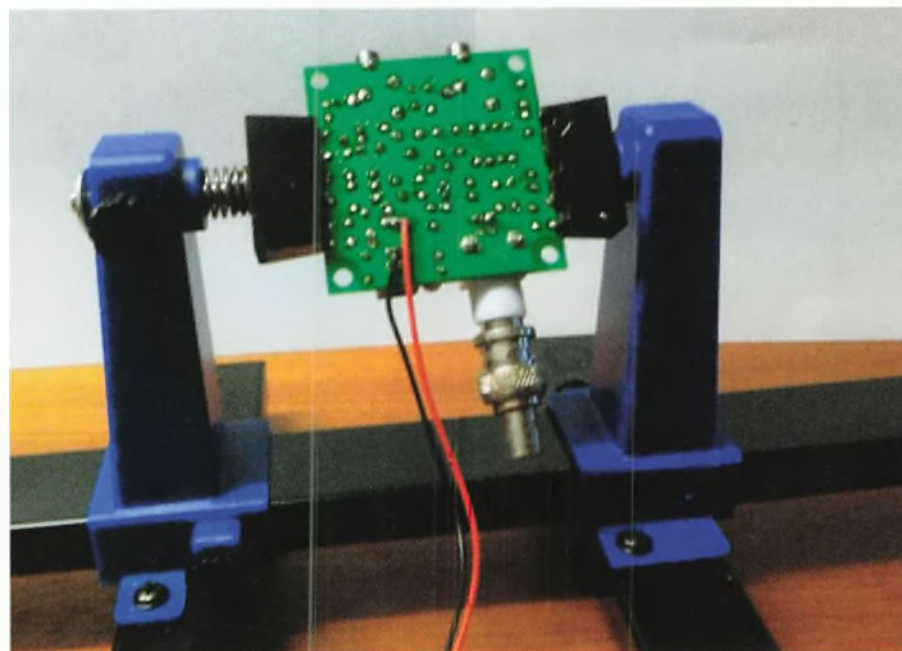


Fig. 1: The PCB jig holding a Pixie II board.

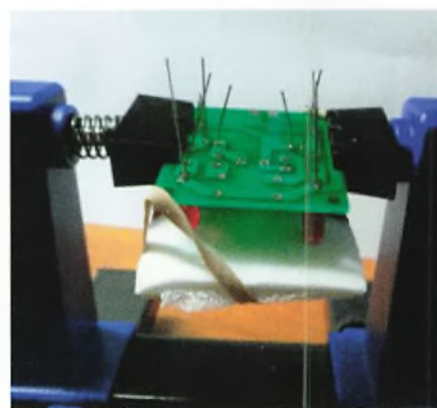


Fig. 2: The jig holding a board with components mounted for soldering.

array of white LEDs obtained at a rally for £1, which consumes 100mA, so there is power to spare for running other equipment such as a QRP rig, task lighting, charging batteries in smartphones, handhelds and torches (using suitable voltage regulators or chargers, of course). Similar panels are available from Rapid Electronics or Amazon. Smaller panels may easily be assembled in series or parallel, to obtain

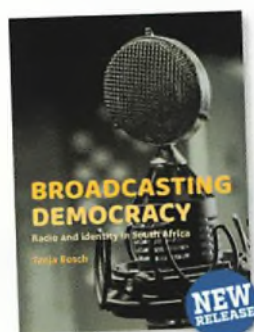


Fig. 3: The author's demonstration solar powered train.

the output required.

I built a solar powered train using four 3V panels mounted on Gauge 1 trucks to be pulled round the track at Sheffield SMEE by a small electric locomotive and demonstrated it to members and public at their Open Day, Fig. 4. I proved the concept by shading the train from the sunlight and it stopped. Removing the sunshade started it again, all with no physical contact.

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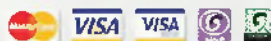
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Over the years I have always enjoyed building antennas. The first antenna that I built was a 144MHz Ring-Base Antenna designed by F C Judd G2BCX and published in *Practical Wireless* back in September 1982. I still have it in my shed and it still works perfectly. One antenna that has always caught my eye has been the Isotron as sold by the Bilal Company in America. There doesn't seem to be much published about them. In my library I have 16 books devoted to antennas and only two refer to the design, one being a review by Steve Nichols G0KYA and the other being a re-work of the same review. Searching around the internet turns up a few references – see below – and a couple of those references provided details for home construction. In particular, Ludovic Amathieu F5SWN provides details here: <https://tinyurl.com/ybjvtudm>

The urge to build, and experiment, then took over. One limitation of Isotron antennas is that they are single-band antennas but, nevertheless, I wanted to try out the concept and see how it worked. The design here is for 40m – for other bands, you will need to figure out your own dimensions from the references I have given or other sources.

Required Materials

For the build I needed two lengths of aluminium sheet, threaded rod, stiff insulating material, 100mm diameter plastic tube, a few nuts and bolts, and some wire. All the materials, except for the stiff insulating material, were bought from the local DIY store. For the insulating material I used a couple of cheap nylon chopping boards sourced from the local supermarket.

Construction

I started the build with the two plates that form the capacitor. The design provides all the dimensions necessary to draw out an accurate pattern. I did this on a few sheets of A4 2mm square graph paper stuck together as necessary to obtain the required size. I then used cheap sticks of paper glue to stick each pattern to the aluminium sheet ensuring that one edge of the pattern aligned with the edge of the sheet to cut down the number of required cuts.

I chose to cut the aluminium using a standard jigsaw with the appropriate blade. To ensure that the edges were as straight as possible I clamped a steel rule to the sheets and used that as a guide. The sheet

An Isotron Antenna

Martin Waller G0PJO builds an unusual antenna for the 40m band – an interesting project requiring both electrical and mechanical skills!

cut cleanly but do wear safety glasses while doing this because the jigsaw throws up lots of waste material. I then drilled small pilot holes where required.

The bending of the sheets proved to be the interesting and challenging bit. I wanted the bends to be accurate and sharp. After some thought I decided to clamp the sheet in my workmate with a scrap offcut of floor tile fractionally below the line of the bend on one side and a length of wood on the other side. The tile provided a solid object that was not going to give way when any force was applied. I thought about using wood but was worried that the edge may get damaged and hence spoil the bend. Then using a flat piece of wood to spread the force and a school protractor, I bent the sheet to approximately the right angle. I was never going to get the angle spot on using this technique but if the bends produced were clean and sharp, then further tweaks would be easy. Repeating this for all required bends produced a clean result that I was very pleased with. I then repeated the process with the second sheet, Fig. 1.

I then marked up the two side insulators. Again, I covered each part with 2mm square graph paper, cut with a jigsaw and drilled all pilot holes. Nylon chopping boards are very easy to work with hand tools and provide a very satisfactory result.

At this point I assembled the two plates and two insulators, using M3 nuts and bolts, to form the main loop. The loop came together quite readily with only minor tweak to the folds, Fig. 2. I left all the paper on as I wasn't sure if I'd be needing further cuts or holes.

The construction and mounting of the coil required some more thought. The first threaded rod goes from the top of the loop down to the top of the coil and then the second threaded rod reflects this below the coil. The problem was how to join the rod to the coil former in a secure manner. I decided to cut two nylon disks slightly larger than the diameter of the former with the intention of using plastic cable ties to secure the join.



Fig. 1: One of the sheets, after bending.

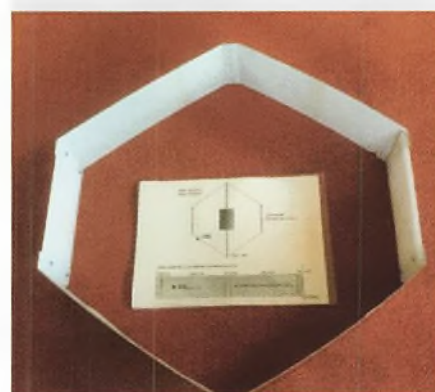


Fig. 2: The assembled loop.



Fig. 3: The first disc, designed to secure rod and coil.

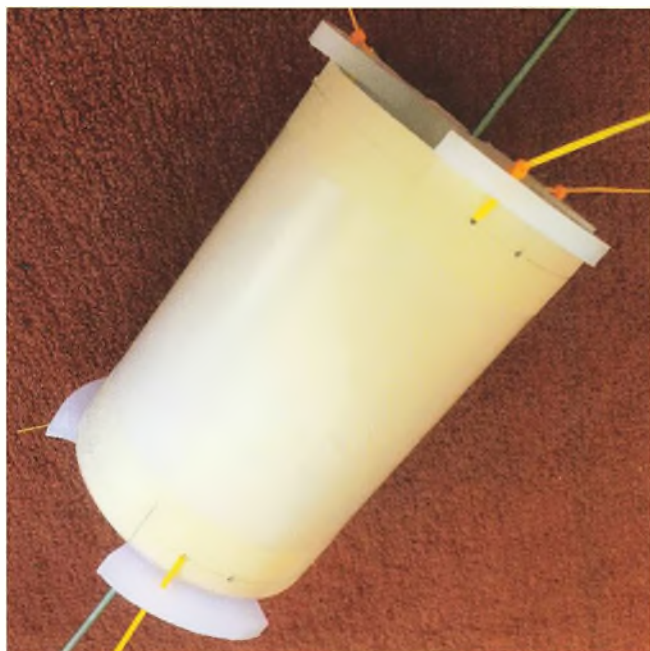


Fig. 4: The rod and coil support assembly.

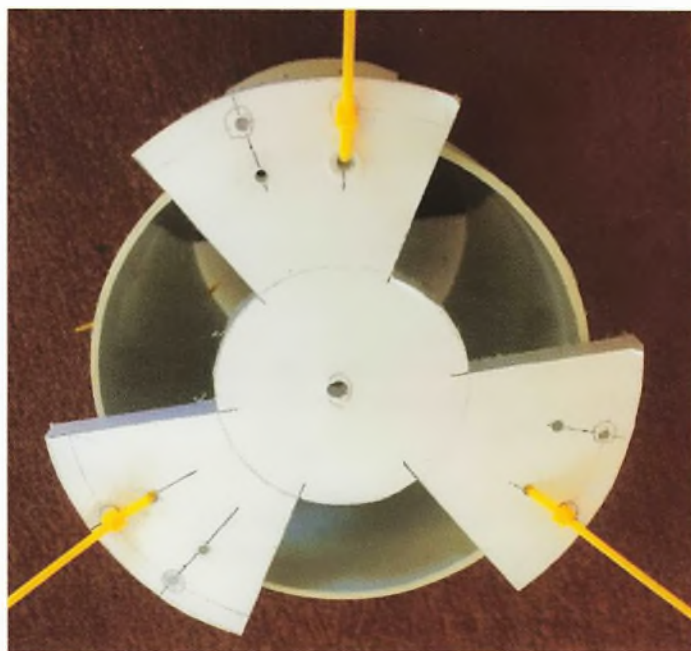


Fig. 5: End view of the rod and coil support assembly.

The problem with this idea was that I would still need access to the centre of the former when winding and adjusting the coil. To allow access I cut out three segments from each disk and ended up with the shape as shown in the photo, Fig. 3.

Again, all construction of the final disk and cut outs was first drawn on 2mm square graph paper and stuck on the nylon cutting board before presenting the material to the saw.

I then cut the main coil forming tube to length. To ensure a parallel cut I placed a band of masking tape around the tube approximately where I wanted the cut. I then placed the tube vertically on the table and using a glass and a selection of mats to obtain the required height, held a pencil point against the masking tape and rotated the tube through 360° to provide my cutting line. The tube was then cut with a small tenon saw. I then test assembled the two ends and support rods, Fig. 4, with each end looking as shown in the photo, Fig. 5.

Next, I wound the main coil. I used a couple of nylon nuts and bolts to hold the coil in place and cable ties to secure it, Fig. 6.

In the final assembly the ends of the coil were secured to the threaded rods using solder tags. The antenna is fed via two further turns of wire that sit immediately below the main coils. These are then connected, via a short length of coaxial cable to the SO259 socket. The final assembly with simple support bars looked as shown in Fig. 7.

Tuning

To tune the antenna, I mounted it on my



Fig. 6: The main coil.

workbench in the middle of the garden. I understood from related literature that it needed a good earth, so I connected the end of the bottom rod to a substation, domestic type, earth rod. Then, with the aid of an antenna analyser, proceeded to measure and adjust, which basically meant removing one turn of wire at a time from the main loop and re-measuring. This was a little fiddly but wasn't too difficult if done with patience. The original design suggested starting with 18 turns. I'm guessing that this is meant to be too many because it's easier to remove turns than add them! It didn't take long before I managed to get a nice dip just where I wanted it, Fig. 8.

Once I was happy with the number of turns I secured the coil windings with



Fig. 7: The assembled Isotron.

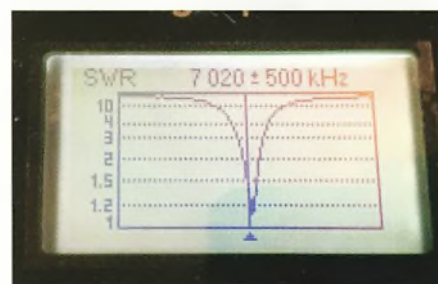


Fig. 8: A nice dip in SWR just where I wanted it.

more cable ties. The feeding coil was held in place with masking tape just in case I needed further fine adjustment.

Did it Work?

I have to admit to being a little sceptical about the whole design but I connected up

my transceiver and, to my joy, there were many stations to be heard with very little noise. Putting out a CQ, the Reverse Beacon Network quickly confirmed that my signal was getting out too, Fig. 9.

Since then I've using it to work around Europe with as little as 10W and I've been very pleased with it. The article I read before the build suggested that the received signal strength will be a few S-points down and I certainly found this to be true when compared to my Dutch design end-fed antenna. But overall, if you are pushed for space, then the Isotron is a workable solution.

Final Thoughts

Construction was straightforward but, on reflection, if I were to build a second, I'd use thicker aluminium sheet because the weight of the feeder coaxial cable was, at times, enough to slightly bend the bottom plate. I'm also a little concerned about wind damage because it does have quite a large cross-sectional area and I can imagine a decent blow possibly causing some damage. Again, this problem could be solved by using thicker aluminium sheet.

Further References

www.dc4fs.de/microvert.pdf
<https://tinyurl.com/yw6d7ab>
<https://tinyurl.com/y6wk2tao>

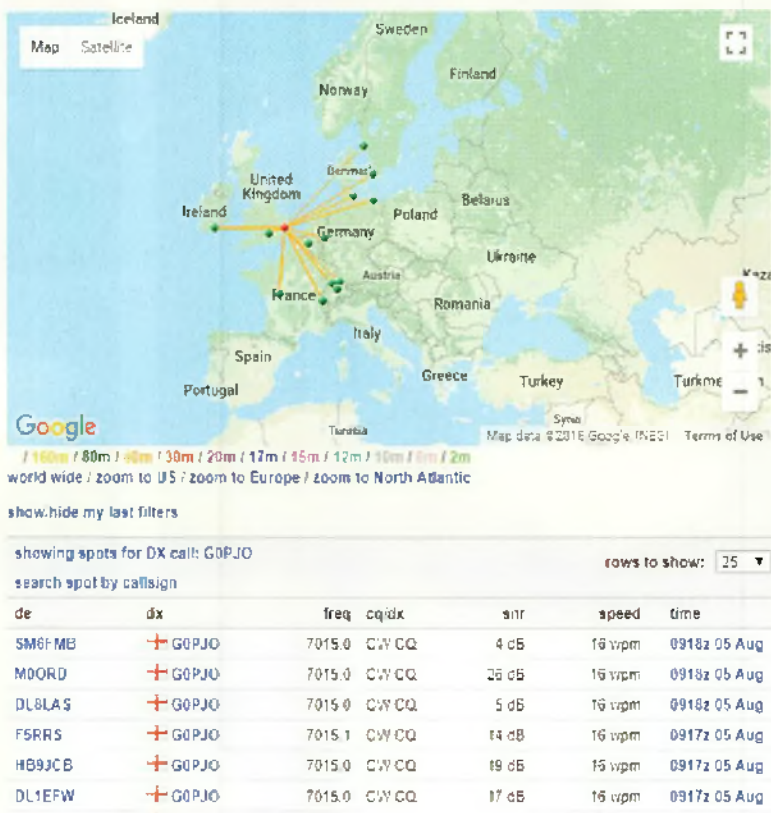


Fig. 9: My signal spotted on the RBN.

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Continuing on from my last chapter (two months ago) where I covered the Pye-made PMR (Private Mobile Radio) sets Ranger, Cambridge and Vanguard, I would like this time to cover a further selection of these popular radios available to the radio amateur during the 1960s to 80s. These PMR radios were abundant at rallies and the like and were at least a great source of parts if you did not want to actually re-align them onto an amateur band.

Many radio amateurs in the 1960s, 70s and 80s, myself included, used nearly all of these types at one time or another, some on the 2m band, some on 70cm and even on 4m. We didn't have the 6m band back then so that band was not catered for in published modifications and the like.

The Westminster

The Pye Westminster was the fifth-generation mobile technology platform since 1947 and a major family of all-transistor PMR mobiles (except the PA valve of the W30). First introduced in 1967, the Westminster, **Fig. 1**, was claimed to be the world's first all-semiconductor PMR mobile, and more than 120,000 were produced.

The standard range covered AM and FM VHF models in front mount, remote mount, transportable, marine, motor-cycle and universal mounting versions, plus various ancillaries such as battery chargers, power supplies, carrying cases, etc. The equipment construction although hard-wired, was essentially modular, **Fig. 2**, using small PCBs for each of the main circuit functions mounted on a double-sided aluminium platform chassis.

Many common PCB and circuits were shared with the fixed stations of the time. The product also marked the change in product colour scheme from Dimenso blue hammer finish paint to a blue/grey textured acrylic.

In addition to the range of standard VHF 6-15W front and remote mounting equipments mentioned above, other higher power or specialist versions also evolved, including the W25FM, W30AM, LW15FM radiophone, W15U and W20U UHF. These models all utilised a longer chassis and mounting cradle than the standard short VHF models. The product was replaced by the M200 Olympic series

Pye PMR Sets

Bernard Nock G4BXD continues his overview of those Pye PMR sets that were once so popular with radio amateurs as a way of getting going on the VHF bands.



Fig. 1: The Westminster dash mount.

of AM and FM front and remote mounts, which overlapped in production dates.

Facts; 1967 to 1978. 25 to 174MHz, (Pye A, B, C, P, E, G, H bands), 402 to 435MHz (T3), 450 to 470MHz (U) A, B, W15FM 15Wa.

The Westminster was a really modern design with sleek clean lines and found favour in many a shack and mobile setup. It was easy to tune up on the amateur bands and with either a six or ten (or maybe 12, I forget) channel oscillator board fitted, the local repeaters and several simplex frequencies were easily catered for although, of course, each channel required the purchase of two crystals. These were the days long before synthesised sets and DDS VFO boards.

As mentioned, there was a 'high' power version of the Westminster, **Fig. 3**, which had an extra-long case that housed the valve PA stage and inverter power supply. The output valve, **Fig. 4**, was a quick-heat type. In other words, when the PTT was pressed, the heaters of the valve, 2.1V at 4.5A, were connected and full output was achieved in about half a second. This meant that the set was only

pulling minimal current during the receive periods, a bonus in the cold days of winter and poor batteries.

A special version of a boot-mounted Westminster, **Fig. 5**, saw service in the Police and such for use on motorbikes. Special in so much as it sported a nice shiny white paint scheme and the connectors were changed to large screw-on types, making them more robust and vibration-proof for bike use.

The set was usually mounted behind the rider above the rear wheel with the control box sitting on top of the set, as in the picture, or sometimes on top of the fuel tank and an extension PA-type speaker mounted in front of the rider either atop the handlebars or behind the leg fairing, depending on the bike. A 'green' version, **Fig. 6**, was made for a similar role in the military.

The Whitehall

Looking very much like a boot-mount Westminster, the Whitehall was a fascinating set and had an interesting history. The W20AM/FM Whitehall was an AM/FM remote-mount mobile initially created

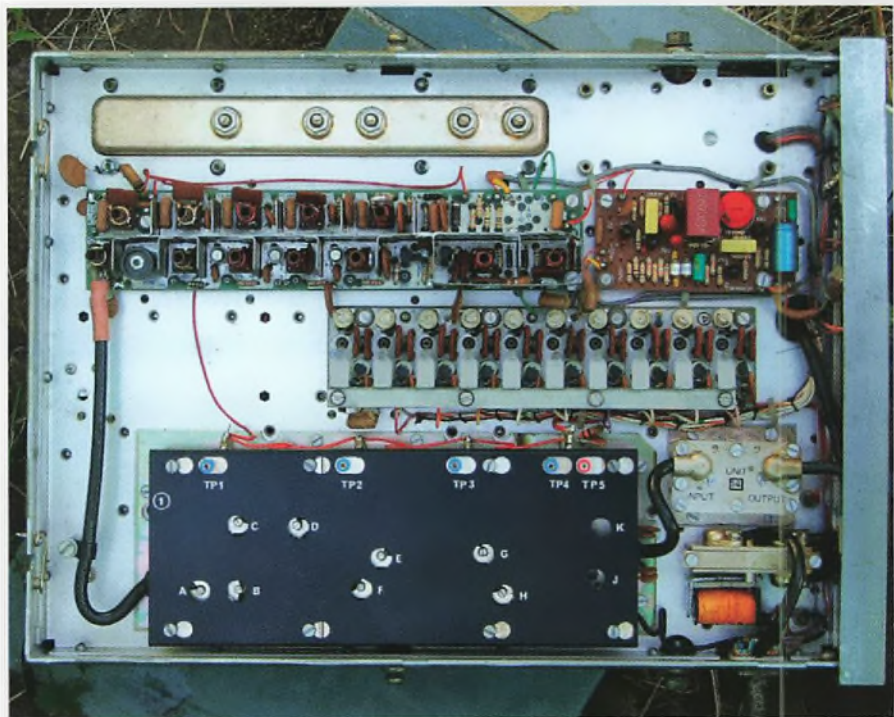


Fig. 2: Inside the Westminster.

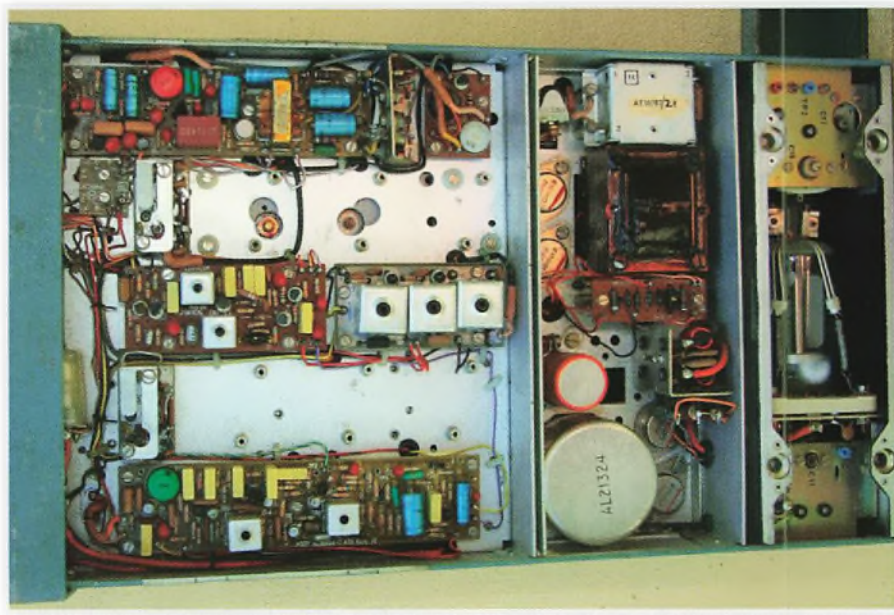


Fig. 3: The High Power Westminster.

for the British Home Office at a time when some British County Police Forces used AM transmission and others used FM transmission.

The Whitehall allowed UK police vehicles to communicate with the local network infrastructure in any county when operating away from their home area. The W20 equipment was subsequently purchased by the Ministry of Defence for use by the RAF and for various other projects such as nuclear weapons convoys, etc.

The equipment was based on the

Westminster design printed circuit boards but used a different and larger chassis, lids and mounting cradle and generated slightly higher transmit power. The control box was also a dedicated design.

One interesting combination was designed to meet a UK Home Office requirement for Police communications and comprised two sets, a simplex VHF set and a duplex UHF set, together with a common control box and handset. With this system, four operating modes were available:



Fig. 4: The valve PA stage.



Fig. 5: The Police bike Westminster.

- 1: Automatic two-way talk-through between VHF and UHF.
- 2: Manually controlled UHF duplex.
- 3: Normal simplex on the VHF set, and
- 4: On-site automatic talk through using the duplex UHF set.

The first setup apparently used the W20AM/FM Whitehalls as the VHF link and a duplex W15U UHF set. Later systems used the W25DM on the VHF side.

The Motaphone

The MF5AM Motafone, Fig. 7, was a single product, lightweight, low cost, all-transistor AM mobile, designed primarily for the UK market, and was the forerunner to the FM Europa series. This sixth-generation technology mobile product introduced the use of integrated circuits and reduced the component count compared



Fig. 6: The Military Westminister.

to the Westminister.

It was designed to be a limited feature front-mount-only product, positioned below the AM Westminister, at a time when cheaper competing products were taking market share from Pye Telecom. The construction used an aluminium chassis with a separate vinyl-clad sleeve wrapper and front panel. An internal loudspeaker was fitted and the audio output power was limited. The product was replaced by the MF6AM AM dash mount set.

Facts: 1972. 68 to 88MHz (E band), 118 to 136MHz (C band), 138 to 141/105 to 108MHz (Mid band), 148 to 174MHz (A band). 2.5W.

The AM Motaphone found favour with many amateurs for use on the 4m band. 70.26MHz was the calling, and working in most cases, frequency in those days, albeit AM in the main although with some FM as well later on. Being lightweight, small and compact, the set did not take up that much room in the shack or under the car dashboard for that matter.

The Motaphone was also supplied in Airband frequency coverage and branded as the Pye Pilot, primarily for use in gliders, I believe. The Motaphones could also be supplied in a portable housing, with built-in battery and mounted whip antenna and in this guise they were called the Pye Portaphones.

Control Boxes

All of the sets mounted in the boots of vehicles needed a small control box, a box with switches and potentiometers, Fig. 8, for On/Off, Channel change, Volume and Squelch at least. Other boxes allowed two radios to be connected so as to act as a repeater, receiving on VHF and retransmitting on UHF, for example, as mentioned.

The early boxes for Vanguard and Cambridge were rectangular in shape while the later Westminister boxes, Fig. 9, were a little more stylish. The bigger units pictured were originally used with the Westminister family and were apparently first designed for use in Canada in the late 1960s early 1970s. There were several versions and some did not have the channel control because some were add-on units connected via the Canon 'D' facility socket on the back of the later dash-mount Westminsters. Some included selective calling as well as a search-and-lock feature. There were even control boxes disguised as standard car radios, presumable for undercover police cars, **Bodie and Doyle's** CI5 (how many remember *The Professionals*? Still being shown on some TV channels! – ed.) and the like.

Next Time

Over the years ex PMR equipment has furnished the hobby with tremendous



Fig. 7: The Motaphone.



Fig. 8: Early control boxes.



Fig. 9: Westminster control boxes.

amounts of equipment and provided a great technical and cheap training base for builders and operators alike. The lack of such equipment today does mean that few amateurs have the opportunity to easily build or adapt anything, which I feel is a great loss to the hobby. Speaking for myself, I feel I learned a lot while playing with this type of equipment. I gained a good technical knowledge and experience of RF techniques in particular, which otherwise I wouldn't have had. In Part 3 I'll bring you some cute little baby hand-held sets of the period. Cheerio.

Note: As in the previous instalment, all history, development information and facts in italics are taken from, and with the permission of, the Pye History Trust's super website:

www.pyemuseum.org



Valve Amplifying Stages

I recently received an e-mail advising me that to protect his PA valves, the writer had removed the top cap anode connectors while adjusting his rig. Sadly, I had to advise him that he had almost certainly blown them because the low power screen grids would have taken a lot of the power that should have gone to the higher powered anodes.

There are still a lot of Yaesu and Trio/Kenwood rigs around that use valves in the final stages. Therefore, perhaps it is time to turn the clock back and have a little recap on valve technology, as applicable to amateur radio equipment.

First a warning. The valves in PA stages operate using dangerous voltages. If you have to make tests with the equipment live, don't hold onto the chassis with one hand while poking around with the other. Don't work on your own, and make sure someone knows how to switch off the power in your workshop. Fit parts with the mains plug removed, not just switched off. Remember that on transmitters the 600/1000V HT line capacitors can remain charged up for ages. I once got a nasty belt off a rig that had not been used for two weeks. Either check with a meter that there is no voltage on the top cap connectors of the PA valves or leave the rig for a minute and then short them too chassis just to be sure.

A simple triode valve audio amplifying circuit operating in Class A is shown in Fig. 1. The cathode is heated, emits electrons, and these are attracted to the anode. To stop the valve flowing too much current and to 'bias' it onto the linear part of its characteristic, the control grid (often referred to as simply the 'grid') is made negative with respect to the cathode. To simplify the circuit arrangement, in most practical low power stages, a small positive voltage is developed across the cathode bias resistor R1. Note that making the cathode positive with respect to the grid achieves the same result as making the grid negative (the same potential difference!). The beauty of the 'cathode bias' arrangement is that the circuit is self-regulating. If the valve 'tries' to pass more current, the positive voltage across R1 will increase. This causes the cathode

In an extended column, Harry Leeming G3LLL offers a masterclass in valve amplifiers, especially useful for those who grew up on transistors but, for example, now want to tinker with classic radios.

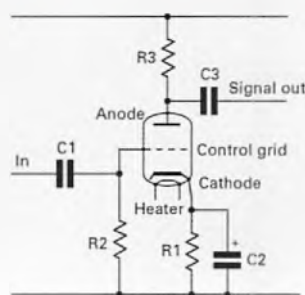


Fig. 1: Simple Class A audio voltage amplifier.

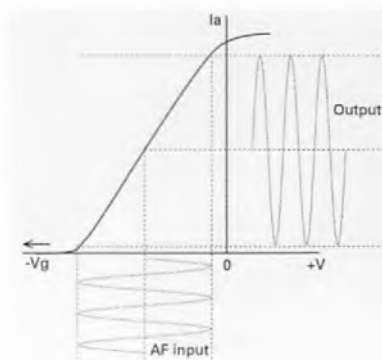


Fig. 2: Class A operation.

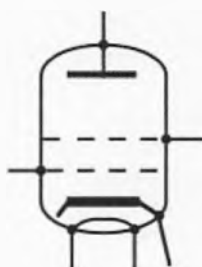


Fig. 3: Tetrode valve.

to become more positive with respect to the grid, which then reduces the current increase.

When an audio signal voltage is applied to the control grid, this causes the anode current to vary in sympathy with it. The current in R3 then produces a varying voltage that is an amplified version of the input signal voltage Fig. 2. Capacitor C2 is fitted to stop the voltage across R1 following the signal applied to the grid. The omission of this capacitor would generate negative feedback and greatly reduce the gain.

RF Operation

A triode valve works fine as an amplifier for signals in the audio range but to use

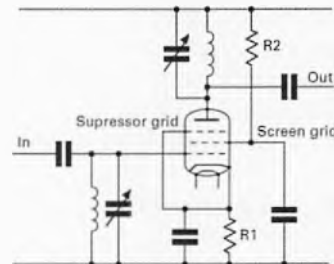


Fig. 4: Pentode valve used as RF amplifier.

it as a radio frequency amplifier is difficult because RF amplification usually requires the incorporation of tuned circuits in the input and output circuits. The problem here is that the control grid is near to the anode and there is a capacity of a few picofarads between them (anode/grid capacity). When the signal voltage on the grid goes up on the positive half cycle, the current through the anode tuned circuit increases, making the anode voltage reduce, to form a negative half cycle in the output, or so you might think!

If this were the case, any signal fed back to the grid via the anode-to-grid capacity would consist of negative feedback, which would reduce the gain and make the stage more stable but in

practice the stage tends to become very unstable and burst into oscillation – why?

For the stage to be stable, the two tuned circuits have to be resonant at exactly the same frequency. At resonance a tuned circuit presents a resistive load, so that current and voltage are in phase. In this case, any feedback would be negative. If the anode or grid circuit is slightly off resonance, there is a phase shift, the feedback via the anode/grid capacity can then become positive and the stage oscillates. Trying to adjust the stage so that the input and output circuits are exactly on tune, and remain in tune at exactly the same frequency as the equipment is tuned, is rather like trying to stand an egg on end, theoretically possible but extremely difficult in practice.

To get over these difficulties, at first neutralising was used (see later) but proved difficult to operate. Instead, an extra grid was added to make the Tetrode valve as per Fig. 3 and this then developed into the Pentode and the Beam Tetrode as in Figs. 4 and 5. The screen grid sits between the anode and the control grid and acts as an RF screen, to stop signals from the anode being fed back to the control grid via the anode-to-grid capacity. The extra beam plates or the suppressor grid, which are located nearer to the anode, form the Pentode or the Beam Tetrode. These stop electrons bouncing off the anode and overcome quirks in the Tetrode's characteristics.

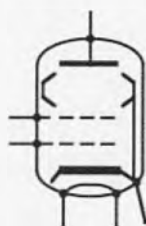
The screen grid has, however, another function besides reducing the anode to control grid feedback – it increases the output impedance of the valve.

The anode circuit of a triode valve acts as a fairly low value resistor and if this is in parallel with an anode tuned circuit, it damps it and reduces the sharpness of the tuning. Because the anode current of a pentode valve is to a large extent dependent on the positive screen voltage, it has rather different characteristics to the triode and because of this, has a much higher output impedance at its anode. This reduces the damping on the tuned circuit and increases the stage gain.

Pentodes and Beam Tetrodes with their higher output impedance, gain and reduced internal feedback, were also used as audio output valves and as line output valves in television time bases.

Grounded Grid Operation

For some special purposes, such as high-power linear amplifiers, it is possible to



Beam plates

Fig. 5: Beam Tetrode.

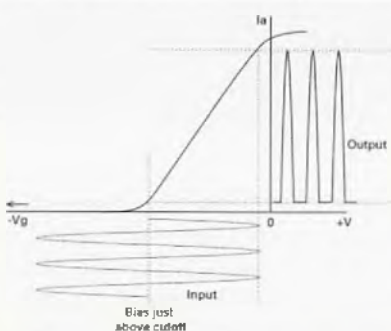


Fig. 7: Class B operation.

operate triode valves so that the control grid is grounded, and the input signal is applied to their cathodes, but that is outside the scope of this article.

Class A or B?

The examples in Figs. 1, 2 and 4 show a valve operating in class A, where the output waveform is amplified but otherwise exactly the same as the input waveform. This mode of operation is suitable for low powered stages but has the snag that the valve is operating at full power, even when no signal is applied. To use this mode in the output stages of high-powered public address, hi-fi or linear RF amplifiers would be very inefficient and would result in the consumption of larger amounts of electricity along with the generation of excessive heat. Class B or class A/B operation is the answer to this problem.

Fig. 6 shows a class B 'Push-Pull' output stage of an audio amplifier. In this the valves have a fixed negative voltage applied to their control grids. This is set so that the two valves are passing hardly any current at all when there is no signal, as per Fig. 7. Because the control grids are separately driven 180° out of phase by a phase-splitting transformer or a valve phase splitter, they are each driven positive on alternative halves of the input signal,

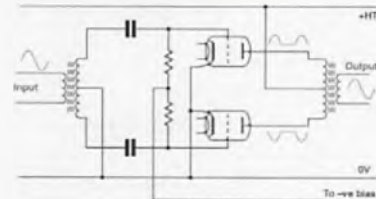


Fig. 6: Push-Pull Class B audio power amplifier.

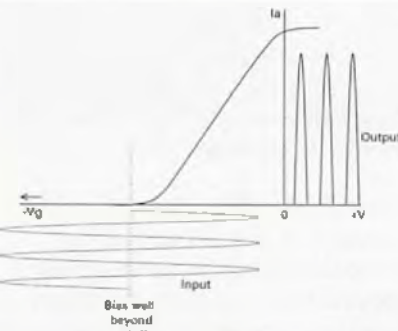


Fig. 8: Class C operation (note that in practice the negative bias may be much more than shown).

so each contributes half of the output signal waveform. Because the valves only operate at full power on the signal peaks, this greatly reduces heat and power consumption and also enables the valves to be pushed to their limits on signal peaks without damage.

You cannot bias valves into the class B mode (very low current) using cathode bias because with near zero current through the cathode bias resistor, there would be hardly any bias. Class B operation has to be set up by adjusting the bias supply voltage, usually via a preset potentiometer, until the required current is passing. The absence of this requirement is why class A/B, used in many hi-fi amplifiers, has advantages.

If you fit cathode bias resistors of two or three times the value needed for class A operation, this greatly reduces the current through the valves. On low-level signals the valves will still operate in class A but on large signals with a 'push-pull' pair, one valve will handle the positive peaks and the other the negative ones. Class A/B using cathode bias is much more efficient than class A and while not quite as efficient as class B, the bias is not as critical and doesn't need to be reset using test equipment if the valves are replaced. It also tends to produce less distortion.

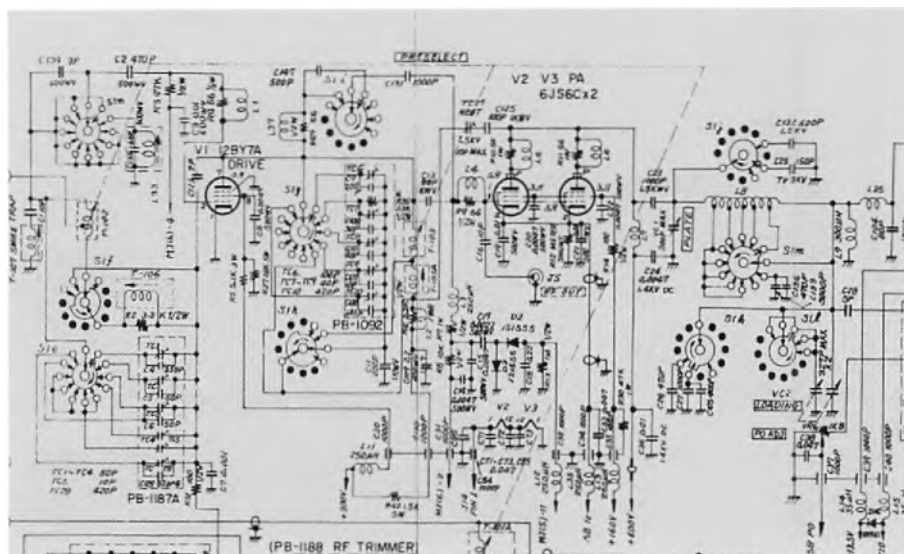


Fig. 9: FT-101 PA stage.

Class C

Classes A, B, and A/B maintain any amplitude information on the RF waveform, such as voice or music but class C, illustrated in Fig. 8, only passes the peaks of the RF waveform so it is not used in multimode rigs because it cannot amplify a signal such as AM or SSB that has already been amplitude modulated. It is, however, very efficient at amplifying just the carrier, so it can be used in continuous modes such as CW and FM and if used in the final stage of an AM transmitter, can itself be amplitude modulated.

The high frequency performance of valves, and of many other components, is determined to a large extent by unwanted stray capacitance and inductance. To reduce the strays, and possibly save money, all-glass construction was developed, where the connecting pins are sealed into the glass bulb.

There was not the same need to minimise the internal inductance and capacity of valves for use in the audio and line output stages of TVs but because they were made in the same plant, economics ensured that a similar all-glass construction was used on many of these and a lot of valves became useable for purposes other than those that the maker had intended.

An Aside

As an aside, I joined the radio and TV trade as an apprentice in the early 1950s. Television in the UK at that time was only broadcast by the BBC so all TV sets were one-channel devices. We tuned these in to the nearest Band I station when we installed them. In our case this was Holme Moss on 52MHz. Millions of single

channel sets were in use and when ITV appeared in Band III in 1956 from the Winter Hill transmitter, at just under 200MHz, something had to be done quickly about all the old sets. Most TV manufacturers produced an upgrade kit that consisted of a two-valve turret tuner, with associated components. We had to cut a hole in the side of the customer's (often lovingly polished) cabinet and mount the channel switch for the tuner there but the clever bit was how it was connected.

Most Band I TVs used several EF80 pentodes as RF and IF amplifiers and as a combined local oscillator and mixer. The multi-channel turret tuner came with a lead and a 9-pin plug, which fitted into the EF80's valve holder. All we had to do was to remove the mixer/oscillator valve, fit and plug in the tuner and a Band III antenna, and the TV became a multi-channel set.

Very soon there were hundreds of unwanted EF80s. It seemed a shame to throw them away so I took a load home. Valves, like transistors, may be designed for a specific purpose but often they can be used way outside their intended purpose. I used EF80s in most stages of my first homebrewed rigs from the low-level audio and speech clipping stages of the modulator to the VFO and the frequency multiplier stages, and even in a homebrew ITV converter that sat on top of the TV. 60 years later I have just got rid of the last of them prior to moving house!

Amateur Radio Use

Being produced by the million resulted in colour TV line output valves such as the 6JS6 and the 6KD6 being sold extremely cheaply to TV manufacturers. While these

and other audio and line output valves were not intended to be used as RF power amplifiers, radio amateurs, and amateur radio manufacturers such as Yaesu, soon spotted that they had similar characteristics to more expensive valves that were designed specifically for use in the PA stages of transmitters.

While the use of pentode valves with a screen grid minimises the anode-to-grid capacity, the larger size of power amplifier valves means that valves such as the 6SJ6C and even valves that are intended for RF power amplifier use, such as the 6146B, still have appreciable internal feedback via the anode/grid capacity. It would be quite possible to construct a 160m SSB rig with line output valves in the final amplifier without too many problems but getting them to work on the higher HF bands requires, as we shall see, neutralisation.

Fig. 9 shows the PA and driver stages of the FT-101E, which are very similar to that of many other rigs made at around the same time. (The 6JS6 and the 6JS6C are basically the same valve, the 6JS6C being slightly more powerful. Likewise, the 6146B is a slightly more sturdy version of the 6146.)

The PA valves are connected in parallel and are biased by adjusting a preset bias potentiometer so that with no drive they pass a total cathode current of 50-60mA. The 6JS6C is rated at 30W anode dissipation, hence two in parallel should be able to handle 60W maximum. How come then that the FT-101, FT-200 and other similar rigs are rated at 240 to 260W input? Are Yaesu vastly over-running them?

Valve PA Ratings

The anode dissipation of a valve is the amount of heat that the anode can continuously get rid of (radiate as heat). If the pair of 6JS6C valves were to be taking 400mA at 600V, the power input would be $0.4 \times 600 = 240W$. If, however, the rig was correctly tuned up, it would be giving out around 150W of RF. Hence, the anodes would only have to dissipate $240 - 150 = 90W$ of heat, which is only a 50% overload. When the rig is being used to send Morse, it is transmitting for less than half of the time, hence the average heat dissipation of the valves should be well under 60W. Likewise, when transmitting SSB, the PA stage should not get too hot, although a fan certainly helps to keep things cool. For AM, RTTY, FM or any other continuous mode, however, the power has to be well throttled back and



Fig. 10: This happens if you tune up too long.

Yaesu recommend a maximum PA current of 150mA, which gives an output of around 25W in these modes.

Tuning Up

Valves are often overloaded and destroyed by impatient operators who will insist on tuning up at high power. Take the above example. If 240W is applied to the rig before the ATU and the PA stages are correctly tuned, there will be no RF output and hence the full 240W will heat up the PA valves and within a few seconds this will have wrecked them, possibly even melting the glass, **Fig. 10**. I didn't want customers destroying their rigs and then trying to claim that they were 'under guarantee' and, in self-defence, I issued them with my *Tuning Up A PA Stage* leaflet. For reference, the text of this is reproduced here in the sidebar.

Let's now have a look at Yaesu's PA and driver circuit, which is pretty typical for valve rigs made in the 1970s and 80s and which used 6146B, 6JS6C or 6KD6 valves in the final stage.

V1 is a 12BY7A and once again this is not a purpose-made transmitter valve but was designed for the video driver stage of TV sets. It was, however, widely used as an RF driver valve in HF transmitters. Its control grid has a negative bias of -3.5V applied in the transmit mode via R3 and on receive this is increased to -20V to turn it

off completely and stop it injecting noise into the receiver. Its anode-to-control-grid capacity is rather too high for use on the higher frequencies so this is cancelled out or 'Neutralised' by a small amount of RF being fed back via the 2pF capacitor C123 to the earthy end of the input tuned circuit. This works perfectly well when original Japanese 12BY7As are used but substituting another make of valve can cause problems, such as it being impossible to set the alignment so that the preselector will peak at the same point on transmit and receive, or the rig starting to oscillate as you try to peak up the drive. If you are trying to follow through the alignment procedure in the service manual, haven't got an original NEC or Toshiba 12BY7A and just can't get transmit and receive to coincide, or the stage bursts into oscillation, the answer is to replace C123 with a home-made variable capacitor, made with two 1in lengths of insulated wire. **Fig. 11**, and then adjust its capacity by twisting or untwisting them until correct alignment can be achieved.

But, Have You Noticed Something Strange?

The PA valves themselves are biased in class B but are connected in parallel. Surely, you may ask, because they will only operate on the positive half of the input wave, won't the output be terribly distorted?

If it was an audio amplifier this would be the case but when dealing with radio frequencies, the tuned circuit in the anode acts rather like the flywheel on a single cylinder petrol engine and 'fills in' the missing half of the waveform, so there is no problem.

The bias for the PA valves of about -50V is taken from a preset bias potentiometer, which has to be set so that with 6JS6C valves the total cathode current of the PA valves 'IC', when they are not being driven, reads 50-60mA on the panel meter. This bias is fed by L3 to the control grids of the valves. This bias is increased to about -70V to stop them conducting in the receive mode.

As is common among most rigs with valve PAs, an automatic level control voltage is fed back to previous stages to try to stop the PA stage being overloaded. The PA valves are biased in Class B, at rather higher than usual current on the border line of Class A/B, and if the microphone gain is increased too much by the operator, the positive peaks will overload the PA stage, causing splatter on adjacent channels.

When this starts to happen, the PA valves pass pulses of grid current that are rectified by D2 and D3 and produce a negative ALC voltage, which is fed back to previous stages to turn down the gain of earlier stages and to operate the front panel ALC meter. In theory, if the ALC meter moves at all, the PA stage is being overloaded and it would seem that the system is rather akin to 'bolting the stable door when the horse is halfway down the drive'. In practice, however, it works quite well because valves are not too sensitive to slight overload and as long as you don't get too enthusiastic, shout into the microphone and drive the ALC meter hard over, you shouldn't splatter over adjacent channels.

Burnt Out PA Valves

PA valves don't usually die of old age. In most cases they are destroyed either by tuning up for too long or due to a fault such as the capacitor C13 or its equivalent becoming leaky.

I had a query from fellow *PW* writer Ross Bradshaw G4DTD about his FL-50B that had a spasmodic flickering IC reading, even when it was just sat there un-keyed. The capacitor between the driver and PA valves grid was breaking down so he replaced it and found that the removed capacitor was an original Yaesu item some 48 years old and was slightly leaky. Old rigs (like yours truly) have components that do age. In this case, had Ross not changed that capacitor, anode voltage from the previous valve would have been applied to the grid of the PA, destroying the PA valve and possibly the mains transformer as well. Moral? Beware aging components and if you have, or are given, a valve Yaesu rig, replace this capacitor because, especially if you put an old rig back into service, there is a very good chance of it breaking down. In my experience it's not a case of 'if' but 'when'.

Replacing PA Valves.

Before fitting the new valves, check that when the rig is in the transmit mode there is approximately -50V of bias on the PA valve control grid pins (or whatever is stated in the manual if valves other than 6JS6 or 6146 type are used), with the rig in the transmit mode, and considerably more when you switch to receive. If you cannot get a steady reading of around -50V with the bias preset in the centre of its range, don't fit new valves but check out the capacitor as above and the bias supply.



Fig. 11: 'Gimmick' Neutralising capacitor.

Setting up and Neutralising New PA Valves

After you have replaced the PA valves in your rig, replace the screening covers to the PA and driver stages. Don't try your rig out first on the highest frequency bands because if the replacement valves are not absolutely identical to the originals, it could burst into oscillation. Before you switch on, select 80m and connect a dummy load and output meter. Power it up for the first time with the SSB mode selected and the rig's panel meter in the IC position, then press PTT on the microphone. (Don't use the rig's manual transmit switch. If anything goes wrong, you may not be able to switch back to receive quickly enough.)

As the rig warms up the PA meter should creep up to around 50 to 60mA. Set this with the bias preset if necessary, as detailed in your manual.

Now you are ready to transmit. Load up as per the manual and my *Tuning Up A Valve PA* notes. If everything is working

correctly, you should get well over 100W output. Neutralisation is not too critical on the 80m band but before you try the higher frequency bands it may need resetting. Back off the drive to about 150mA and check that the PA plate tuning as shown on the IC meter is symmetrical and that maximum RF output occurs at point X at the bottom of the dip as per Fig. 12. If it does not, adjust the neutralising capacitor (TC27 in the circuit shown) with an insulated trimming tool until it does.

Next, try 40m and gradually work your way higher in frequency, noting that the neutralising setting will be much more critical on 10 and 15m than it is on the lower frequencies. Once you have got the neutralising correct at the high frequency end of your rig's coverage, it should still be fine on the lower frequencies.

Now all you need to do is to work the DX but while you are operating, leave the front panel meter in the IC position and keep an eye on the PA current. Some rigs, such as the FT-102, have nasty habit of

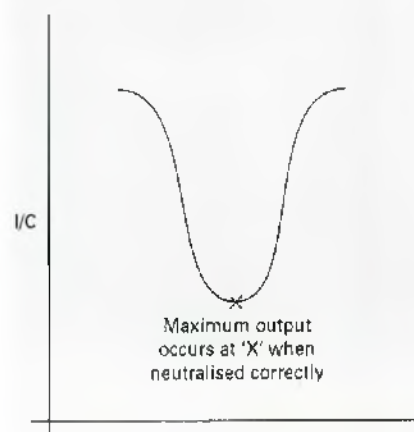


Fig. 12: Checking Neutralisation.

going into thermal run-away if they get too hot. If this happens and you don't notice it, the IC current will gradually creep up, the fuse will blow, and – you guessed it – you will need a new pair of PA valves.

The best of luck. Harry G3LLL.

Tuning Up a Typical 100W Valve PA Stage

With valve PA stages, following the maker's instructions to the letter is often far from a good idea.

When valve PA equipped rigs such as the FT-101 were designed, valves were cheap and of rather better quality than those available now. Some types are now difficult to obtain at any price and rarity has sent prices skywards. These days, the 'tune up at full power for 10 seconds for maximum smoke' approach is just foolhardy. Hence, let's have a look at where people go wrong.

Most valve PA equipped transceivers are fitted with a 3-way front panel meter switch to monitor the PA cathode current 'IC', the PA automatic level control feedback 'ALC' and the relative RF power output 'PO'. The last position 'PO' is a 'no-go area'. Only use it if you want your rig and its valves to be burnt out during tune-up. Why manufacturers ever fitted this position to the switch evades me. Its use only serves to line the pockets of service engineers and valve suppliers.

When tuning up a typical 100W rig, keep the switch in the 'IC' position, carefully monitor the current and don't allow it to exceed 100mA (0.1A) for more than about three seconds. Follow the manufacturer's instructions as far as possible but don't monitor the RF output by switching to 'PO' and don't manually switch to transmit on the rig. Use a PTT microphone or a Morse key for switching so that you can instantly return to receive if anything goes wrong. Monitor your RF output by using a separate SWR/Power meter or the meter in your ATU.

As the rig is peaked up, keep backing off the drive/carrier control to keep the current below the 100mA mark. When you have correctly set the Preselector/drive tune, PA tune, load and ATU controls for a maximum output of somewhere around 5-15W with low SWR and with the IC below 100mA, it's time to have a quick burst at full power.

Set the drive or carrier control at maximum and give a quick burst of one or two seconds in a full power mode such as CW. You should get around 100W on your power output meter, depending on the rig. If it's much less than this, retune the PA and load controls while transmitting in quick bursts of two seconds on and two off until full power is obtained. Finally, temporarily switch the meter to read ALC and speak into the microphone in the SSB mode. Adjust the preselector/drive tune for maximum ALC and then set the microphone gain so that the meter is just moving nicely. Switch back to 'IC'.

While you are operating, keep the meter switch in the 'IC' position and keep your eye on it at all times. On some rigs, such as the FT-102, the PA current can go into thermal run away, and you will have to switch to receive quickly to avoid damage if the current starts creeping up. You may need to improve the cooling.



The New Exam Syllabus

Colin Redwood G6MXL takes a first look at the new exam syllabus due to be introduced in August 2019 and considers some of the preparations that will be needed. He also has an interesting e-mail from a reader.



Fig. 1: A visible aurora borealis seen in the northern hemisphere. Photo reproduced with the kind permission of Dirk Obudzinski. Copyright 2010 www.borealis2000.com.

It's well over a decade since the current three-tier amateur radio licence exams were introduced in the UK. During that time amateur radio has evolved but the exam syllabus for the Foundation, Intermediate and Full (Advanced) Licence has remained largely unchanged.

With the introduction of the new syllabus in August 2019, there are numerous changes at all three levels that reflect the changes in amateur radio over the years. As an example, some key concepts around Software Defined Radios are introduced, while knowledge of packet radio is no longer required.

HAREC

A further driver for the new syllabus is to retain broad compliance with the HAREC (Harmonised Amateur Radio Examination Certificate) T/R 61-02 standard – an Ofcom requirement. HAREC is a common standard that radio amateur qualifications need to comply with in order to

gain a licence in another CEPT (European Conference of Postal and Telecommunications Administrations) participating country without having to sit and pass any further examination in that country. Essentially, a HAREC compatible licence, which the three new syllabuses between them are supposed to be, enables operation by Full licence holders in certain other countries under the CEPT T/R 61-01 Scheme, or by obtaining a locally issued licence abroad. Over the years, HAREC has evolved to reflect new topics in amateur radio such as Digital Signal Processing (DSP).

Incidentally, the CEPT is not a European Union organisation, so T/R 61-01 and HAREC will not be affected by whatever flavour of Brexit finally transpires.

The Changes

I'm not proposing to detail all the changes to the syllabus. They are documented on the RSGB website (below). However, I will, by way of example, point out a few of the differences. I think they will serve to illustrate that existing training materials in

all forms (including the practicals at Foundation and Intermediate levels) will need extensive review and updating, to ensure that they include new topics and remove old topics. The changes range from adding and removing whole topics to merely changes to the sequence, numbering or section of the syllabus. In other cases the changes are quite small, perhaps adding or removing some relatively small details or re-wording to clarify something.

<https://tinyurl.com/y7rn3ch2>

Foundation

There are numerous minor changes at Foundation Level. Most of these will provide successful candidates with useful information to help them make a better start in the hobby. For example, the concept of feeder loss is introduced, to help newcomers choose feeder suitable for the VHF and UHF bands. Antenna gain now incorporates decibels (dB) in a simple table to help newcomers understand antenna specifications in advertisements. In addition to BNC and PL259 connectors,

recognising N-type connectors and SMA connectors has been added. SMA connectors are found on almost all VHF and UHF handheld transceivers these days.

Looking at the practical side of the Foundation syllabus, the option of doing a data modes practical in addition to or as an alternative to the Morse assessment has been provided in the new syllabus. This reflects the way the hobby is evolving and also caters for clubs that wish to provide Foundation training but are finding it increasingly difficult to find a suitable Morse assessor.

Another new practical has been introduced using a simple battery, resistor and light emitting diode circuit to show correct polarity, make measurements and to see the effect of adding an additional resistor in parallel.

Under the new syllabus, Foundation candidates will also be made aware that there are a number of digital voice modes and that they are incompatible. This is to ensure that newly licensed amateurs don't, for example, end up buying a transceiver for one digital voice mode expecting to work through a local repeater that uses a different digital voice mode.

The number of questions in the Foundation exam remains at 26.

Intermediate

There was a feeling that under the current syllabus the jump from Intermediate to Advanced was too big. Consequently, some topics have been moved from the current Advanced syllabus to the new Intermediate syllabus. I understand that a formula sheet will also be provided for candidates to use in the new Intermediate exam (as has been the case for the current Advanced exam). The resistor colour code will also be provided in the exam so that identification of resistor values will just require the technique rather than knowledge of the colours.

Several topics have been added, including some basic concepts regarding the sampling of analogue signals to convert them to digital signals, which is fundamental to their use in Software Defined Radios (SDR). Some of the principles of SDR are also added, including an outline block diagram. This will help candidates have an appreciation of this relatively new and evolving aspect of the hobby.

There have also been a number of changes to the Intermediate practicals. These should help bring to life some of the technical aspects of the syllabus. Included



Fig. 2: A modern switch-mode power supply unit capable of powering a 100W HF transceiver.

here, for example, is comparing and contrasting the stability of crystal and variable frequency (LC) oscillators when subjected to temperature changes and mechanical shock – something that hitherto was just covered in the Intermediate book.

The number of questions in the Intermediate exam has increased by one from 45 to 46.

Full (Advanced)

What was previously known as the Advanced exam is henceforth known as the Full exam. Some topics have been removed from the exam syllabus, including the section on packet radio, which is far less popular today than it was in its heyday. Apart from pointing out some safety considerations, thermionic devices have also been removed from the syllabus.

Several topics have been added to the syllabus for the Full licence to maintain compliance with HAREC. In many cases they require just a basic grasp of a concept, such as moonbounce and auroral propagation, **Fig. 1**. The questions on the licence schedule will in future focus on bands available exclusively to Full Licence holders – 600m (472kHz) and 60m (5MHz). The reason for using split frequency operation has also been added.

With the increased use of switch mode power supplies, **Fig. 2**, their basic principles and operation at block diagram level have been added. The principles of SDRs are also covered in more depth than at Intermediate. In the propagation section, the use of Near Vertical Incidence Sky wave (NVIS) is covered, providing awareness of this useful propagation mode for the 5MHz

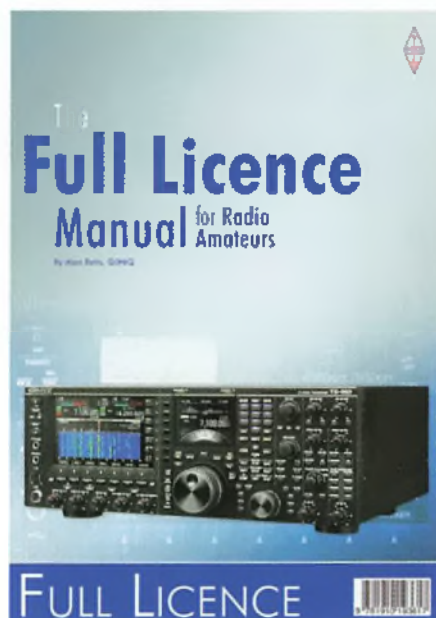


Fig. 3: The new Full Licence Manual, which provides material for the new Full syllabus (replacing the current Advanced Syllabus) from August 1st 2019.

band available to Full licence holders.

The number of questions in the Full exam has reduced by four from 62 in the current Advanced exam to 58 in the new Full exam.

Support Materials

The new syllabus, together with documents pointing out topics moving from one level to another or added or removed, can be found at the RSGB website at: <https://tinyurl.com/y7rn3ch2>

At the time of writing a number of items were still to be published, including the supporting tables, block diagrams and formula sheets. Hopefully, they will be

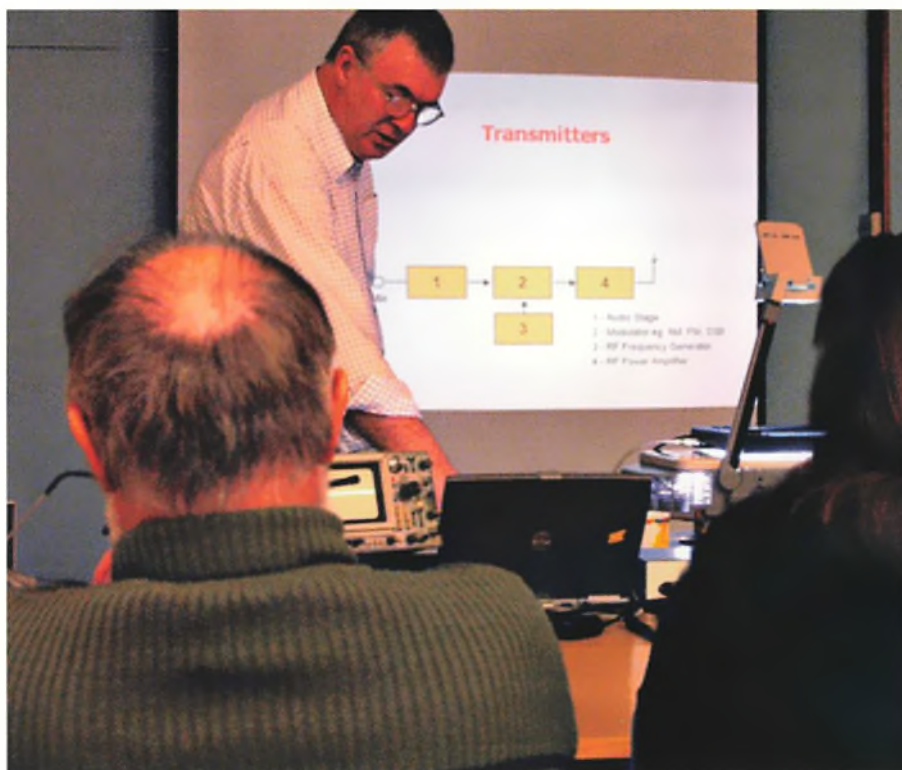


Fig. 4: Classroom training.

available by the time this article appears.

Books

The RSGB have already published the updated training book, Fig. 3, for the Full exam. No doubt, updated books for the Intermediate and Foundation exams will follow over the next few months. If you are taking or teaching an exam in the next year, you'll need to be careful to buy the correct edition of the relevant training book. The covers of the books for the new syllabus differ in appearance from those for the current syllabus. Clubs and tutors will need to plan their book purchases carefully so as not to be left with outdated books.

Transition Considerations

Those already studying for one of the exams can sit their exams under the current syllabus provided they do so before the end of October 2019 and book their exam with the RSGB before August 1st 2019. It will also be possible to book resits under the current syllabus up to the middle of October 2019, provided that the relevant notice is given and the exam taken by the end of October 2019. All new exams booked from August 1st 2019 will be for exams based on the new syllabus.

Supplementary Training

Those delivering training at Intermediate

and Full levels under the new syllabus may need to provide some supplementary training to those who sat their Foundation and Intermediate exams under the current syllabus so that they grasp the necessary concepts in the new areas of the syllabus before tackling the next level up under the new syllabus. In some cases, I don't think this will be a big deal – perhaps just a slightly more detailed introduction to the topic. No doubt tutors will tailor this to their students. To help, there are 'source' documents on the RSGB website showing topics that have moved from one level to another.

Training Materials

Those delivering training, no matter whether classroom-based, Fig. 4, one-to-one or online, will need to review what they deliver for each topic at each level. They may find that they can adapt some of their current Advanced material for use at Intermediate level with some adjustments to ensure they reflect the new requirements of the Intermediate syllabus. Likewise, some of the current Intermediate material may be able to be adapted to the new Foundation syllabus.

I've found that care is needed when moving training material between levels to ensure that when covering the topic at a lower level, it is not covered in too much detail. This may only require a summary

rather than the hitherto greater detail of the higher level. As always, it is vital to check that every point in the new syllabus is covered in the correct level of detail and not rely totally on the books.

It certainly makes sense to get the review of training materials underway at the earliest opportunity because there are plenty of changes to consider at all three levels before August 2019. It is only by actually making a start that I realised just how much needs to be done!

Mock Exams

Over the years a number of mock exam papers have been produced by various clubs and individuals. There are also some online mock exam questions. These will all need to be updated to reflect the new syllabus in order to retain their usefulness to candidates.

Switched-Mode Power Supplies

Changing the subject, some readers may be interested in the e-mail I received from reader **Ian Field** in which he makes some points regarding switched-mode power supply units (SMPSUs). *"It is probably worth a reminder that many early SMPSUs were 220V types with a selectable voltage-doubling rectifier. You often find two reservoir capacitors in series that aren't individually rated for the voltage (sometimes they double up full-rated reservoir capacitors for lower equivalent series resistance (ESR) and/or to confuse onlookers...).*

"A few have a 'non-user serviceable' link inside to bring the capacitor junction to an AC arm of the bridge for 110V. Most complete equipments have a marked voltage switch on the back but you may need to open some of them to check. Usually the manufacturer sticks the appropriate label on the back before it goes through final test but that's no guarantee that someone hasn't altered the setting at some point since. A local computer firm imported stock of open-frame SMPSUs and took long enough to figure out why they all went bang to give me a few months' work. My original brief was to generate a report pending legal action but I ended up being paid to repair a pile of SMPSU boards.

"Since a certain date, anything over 50W must have power factor correction (PFC). The active PFC front-end is more or less a flyback boost converter with no input reservoir capacitor. In many cases, they take care of anything from about 90 to 265V".

Team Viewer providing it has a network connection, which can be either wired or WiFi. The Rpi-3 has built in WiFi but also has an on-board antenna that it is possible but not easy to replace with an external antenna. This unfortunately means a fairly short range. If you have or can procure an RPi-2, then an external WiFi dongle with a decent antenna will give a much better range. That said, because the RPi can be accessed remotely and has an internet connection, it makes a good management node.

The Arduino requires a USB connection for program upload and debug. The USB connection also supplies power to the Arduino. Provided the RPi has a capable power supply (2.5A recommended) it can easily supply the required current to the Arduino.

Packaging an RPi with the Arduino makes it easy to manage the Arduino from any computer on the network. The way I do this is to put all my projects on GitHub and only update the Arduino firmware from my main computer. I commit the changes to GitHub and then via the RDP or VNC connection pull the changes down to the RPi. There is a version of the Arduino IDE (admittedly an older but perfectly adequate version) that can be installed on the RPi. Once the changes have been pulled down I load the file into the Arduino IDE and upload to the Arduino.

If there is a need to debug the Arduino code, then I find it easier to make a copy of the file on the RPi, add any debugging statements required and then upload the copy. Debugging is then carried out using

the IDE serial monitor and when fixed, the changes can be incorporated in main code and another cycle performed.

Adding Video

Sometimes, when the project has mechanical bits and pieces, motors, actuators and the like with lumps of metal in motion, it's comforting to be able to see what's going on from the remote operating position. Adding a camera to the RPi is pretty trivial and arranging to stream the video back to the operating position is equally trivial. I prefer to do this with one of the approved RPi cameras and VLC Media Player.

Getting it all Together

1. Get the latest version of Raspbian on your RPi and run the usual
`> sudo apt-get update`
`> sudo apt-get dist-upgrade`
2. Later versions of Raspbian come with RealVNC installed although it needs to be enabled via 'Raspberry Pi Configuration'. Earlier versions will need either RealVNC or xrdp installing. Recently I've found that RDP does not play well with the later Raspbian releases and it always seemed to have problems with UK keyboard mapping. VNC is now the preferred method and works extremely well. However, if you prefer RDP then:
`> sudo apt-get install xrdp`
3. I prefer to give my RPi's a static address because computer names don't always resolve and you don't want to be chasing DHCP addresses.

- `> sudo nano /etc/dhcpd.conf`
Add to the end of the file:

```
interface eth0
static ip_address=192.168.1.nnn/24
static router=192.168.1.254
(or whatever your router is)
static domain_name_
servers=192.168.1.254
```
4. You can then dispense with keyboard and mouse and connect from your main computer.
5. Install 'git' if you want to clone stuff from GitHub
`> sudo apt-get install git`
6. Install the Arduino IDE
`> sudo apt-get install arduino`
Install VLC if you will be using a camera
`> sudo apt-get install vlc`
See the URL below for setting up streaming using VLC. However, in brief, create a file vlc.sh containing the line below and make it executable.
`rspivid -o - -t 0 -hf 640 -h 360 -fps 25`
`| cvlc -vvv stream:///dev/stdin -sout`
`'rtp://sdp=rtsp://:8554/' :demux=h264`
Install VLC on your main computer and connect to the network stream at the IP address of your RPi. Don't forget to plug in your camera module the correct way around because the connector isn't keyed and also use 'Raspberry Pi Configuration' to enable the camera.
- The screen grab, Fig. 1, shows the remote desktop of an RPi running under Windows10 with the Arduino IDE running, git showing the project files are up to date and the VLC script has also been run and seen a connection from 192.168.1.106.
<https://tinyurl.com/i8yl7v6>

In this month's RadioUser

Some highlights from the November issue

- Tim Kirby offers a short, but thorough, review of the new Moonraker 7S PLUS network radio.
- Len Over investigates radio comms in public event management, marshalling and volunteering.
- Scott Caldwell revisits the astonishing apprehension of Dr Crippen.

Plus all your favourite regular features and columns

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If I've done my sums correctly, this is the 100th edition of *Data Modes*, so thank you all for sticking with me and my ramblings, it's been fun.

100 Today!

FT8Call Update

Last month, I introduced FT8Call as an experimental mode designed to add a free-text chat facility to the FT8 data mode. The experiment has been very popular and the mode now has a new official name; JS8Call. The name is derived from the author's name, **Jordan Sherer (KN4CRD)**, and is still an 8-FSK mode using much of the code behind **Joe Taylor's (K1JT)** FT8 and WSJT-X suite of data modes software. Coincidentally, Joe's WSJT-X development team have been extending FT8 and MSK144 to increase the message payload but more on this later. I suspect FT8 will prevail in the longer term but Jordan is doing some excellent experimental work to try out some interesting new features. In **Fig. 1** I've shown a screenshot from PSK Reporter showing 30mins of JS8 activity. As you can see, there's plenty going on with most of the activity in Europe and North America.

Being the sole developer for JS8Call, Jordan has the flexibility to add and remove features quickly without having to worry about the impact on a large following of existing users. JS8Call software is also released with a limited-life licence (usually two weeks). This forces users to keep up-to-date with the latest version. For this reason, it's a good idea to keep an eye on the JS8Call user group (js8call@groups.io) to make sure you have the latest software and operating guidance.

At the time of writing, version 0.72 had just been released, and offers a big step forward over the previous releases. To help you get started, Jordan has provided a very good user guide for the new release that I suggest you read before operating. You can find the guide here: <https://goo.gl/seQinb>

Free text QSOs with the new version have been improved by adding a compression algorithm to reduce the amount of transmitted data for a given message. This is providing a typical message throughput of around 10 to 15WPM, which is quite respectable. While JS8Call uses the familiar 15 second frames of FT8, it also uses consecutive 15 second frames to send any longer messages. Most of my early QSOs took three transmit frames to complete and were sent consecutively

Mike Richards G4WNC celebrates 100 episodes of Data Modes with another comprehensive and insightful column.

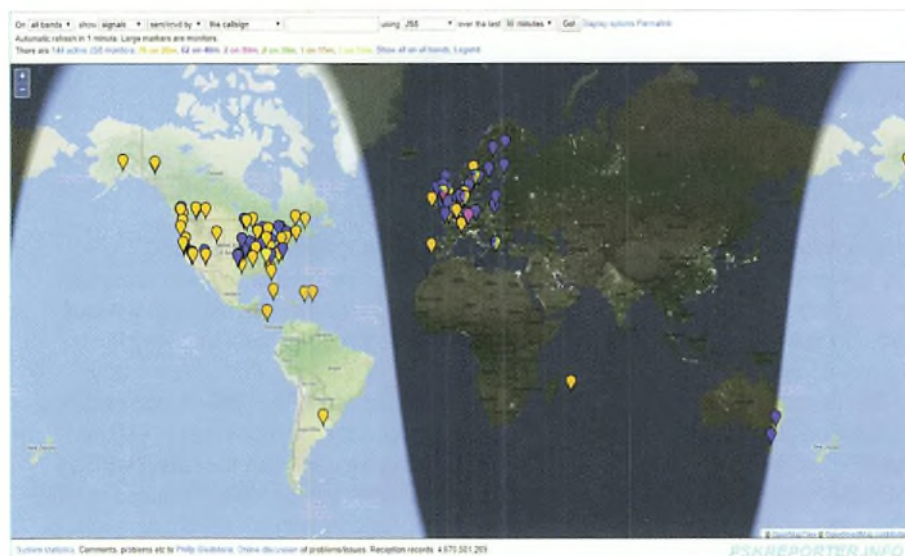


Fig. 1: PSK Reporter showing 30 mins of JS8Call activity.

over a period of around 45 seconds. With experience, and the use of CW abbreviations, this can easily be reduced. Although the overall process is still fairly slow, it does get through when all other free-text data modes fail. However, if the path is good, don't struggle with JS8Call, change to a faster mode such as PSK31.

Also new to the 0.7 release is an updated BEACON facility. When activated, this starts a periodic beacon transmission that's intended to let other operators know you're available for a contact. However, this has now been enhanced so that all stations with 'Auto' enabled will return an acknowledgement if they can hear you, **Fig. 2**. This is very helpful when searching for QSOs because the beacon exchange confirms that the path is good for a two-way QSO. One important point, please don't leave the beacon active if you're not in the shack. This will just irritate other operators when they try to call you and find you're not there!

Those of you that enjoy working in remote locations will welcome the new Time Drift feature. This is intended for use

when you don't have a local time source available. Time Drift can be activated to synchronise the program's timing to the start or end of a selected live transmission. Although not very precise, it's good enough to successfully operate this mode.

One of the advanced features of JS8Call is message relaying. As the name suggests, this lets you pass a message via intermediate stations. Before you can use this, you need to have target and intermediate stations in mind. To help find suitable candidates, you can use the special \$ command to retrieve a list of the stations that can be heard by a distant station. When used with a callsign (such as G4LFM\$) the selected station will automatically send you a list of all the stations heard in SNR (signal-to-noise ratio) order. Here's a recent example where I interrogated DF4WV on 40m to see who he could hear:

I sent: **DF4WV\$**

DF4WV replied: **G4VVP SNR +00**

G7TCW/P SNR -08 G4WNC SNR -13

UR4UM SNR -18 ~

This tells me that the callsigns listed

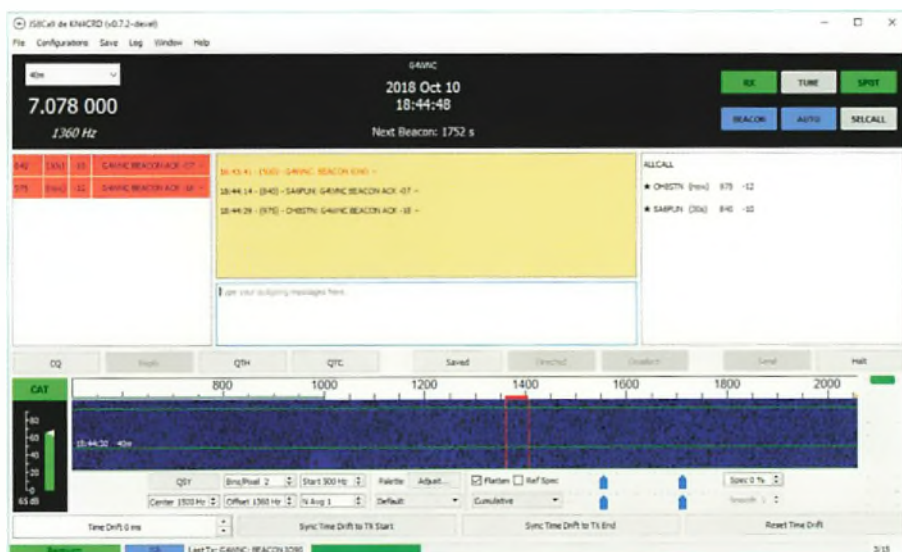


Fig. 2: JS8Call beacon acknowledgement in action.

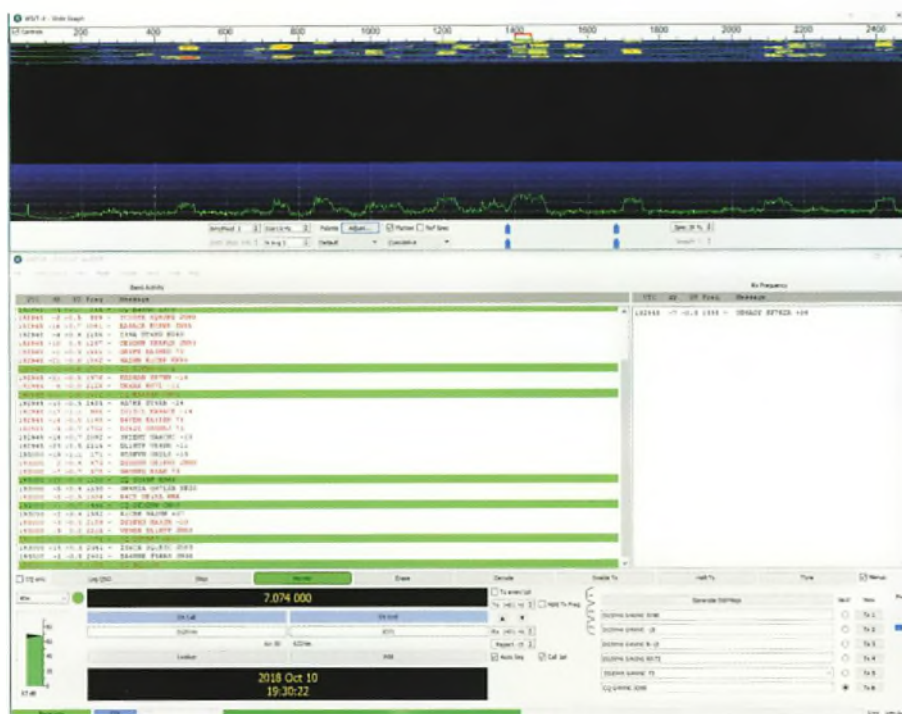


Fig. 3: The new FT8 version 2.0 interface.

could be contacted via DF4WV. Also note the lightning symbol ~ at the end of the line. This is used in all JS8Call messages to indicate the end of a message and is important when JS8Call messages span several of the 15 second FT8 frames. As I write this, there are a few stations using JS8Call to forward APRS position reports, which sounds interesting. I'll bring you more news on this fast-growing mode next time.

FT8 and MSK144 Updates

Both the FT8 and MSK144 modes within WSJT-X are in the process of a major update that will extend the information pay-

loads to 77 bits. This fundamental change to the message structure means that WSJT-X version 2.0 will be incompatible with the earlier releases. The change has been driven by a need to handle a wider range of special callsigns and to allow a full contest exchange for all the major contests. The new release also introduces a new 'telemetry' message type of up to 71 bits that can be used for arbitrary information. In addition to the message changes, the FT8 CRC (Cyclic Redundancy Checks) have been increased from 12 to 14 bits (13 bits for MSK144) to increase false decode protection. The net result is improved decoding sensitivity while using the same

bandwidth and symbol rates as the earlier versions.

Release candidates of the new WSJT-X v2.0 have been available for free download since September on the WSJT-X web page:

<https://tinyurl.com/hg6rnxm>

The team were planning to issue further release candidates on October 15th and November 12th, with the full version release due for December 10th, **Fig. 3**. Everyone is welcome to use the release versions to help iron out any bugs but it is essential that you read the *Quick-Start Guide to WSJT-X 2.0* before operating. To avoid the confusion of running two very similar but incompatible modes on the same frequency, the new FT8 message format should only be used on 7.078MHz and 14.078MHz. The frequency change is a temporary one but doesn't completely avoid confusion because JS8Call had already QSYed to those frequencies! Once the final version of FT8 is available in December, all FT8 operations will return to their original frequencies but operators will be required to upgrade to version 2 because the full release won't include version 1 compatibility. However, the development release candidates do include the ability to work other stations using v1.9 software. The switch between the two modes is automatic so you can use the new software to make standard contacts on the existing frequencies. However, when operating on the new temporary frequencies, the team request that you force the 77-bit message mode, **Fig. 4**.

Other benefits from the new software release include increased WSPR sensitivity by 1dB and colour highlighting to show if you've previously worked the callsign, grid or DXCC entity.

Windows Tips

Most operators that use computing as part of their station inevitably end up installing and uninstalling lots of software. I probably do this more than most because I'm always on the look-out for new ideas and software to include in my writings. In addition to growing your registry and leaving lots of unwanted files on your PC, the occasional rogue program will also mess up some of your system files. This can result in all manner of unpredictable performance problems leading to major slow-downs, boot failures and other time-wasters.

By far the best way to straighten everything up is to do a clean install of

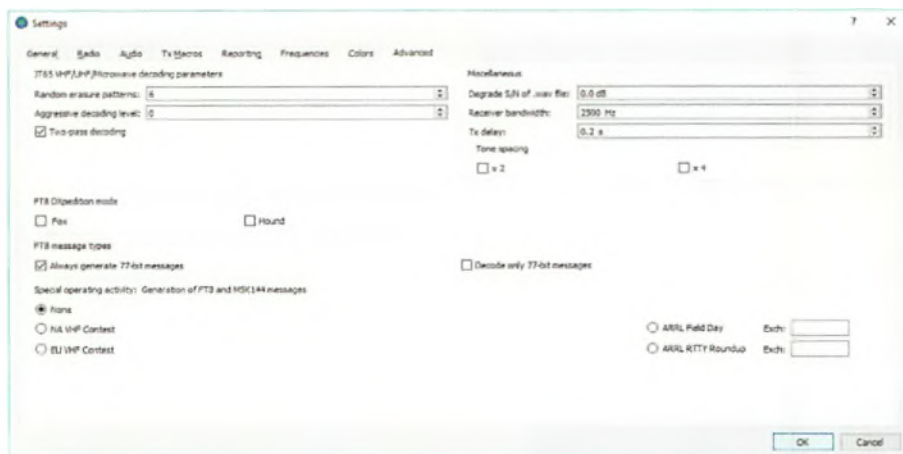


Fig. 4: Make sure you force 77-bit messages when operating with FT8 v2 on the revised frequencies.

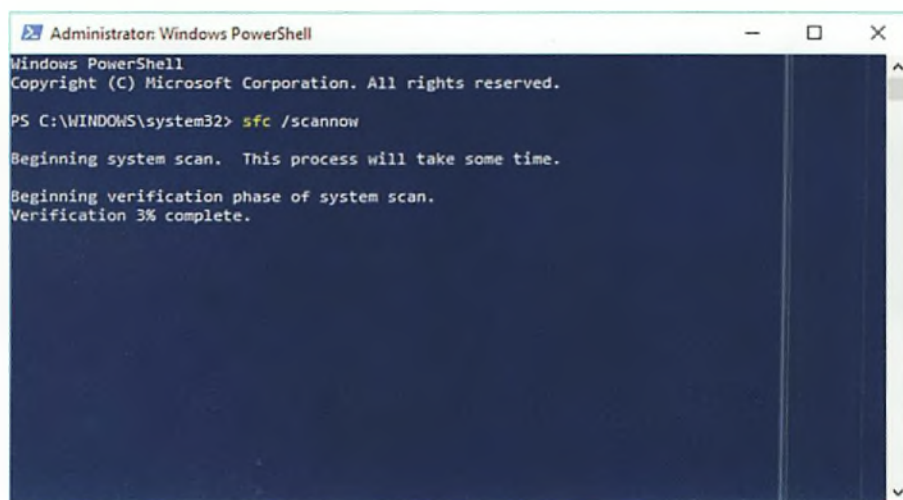


Fig. 5: Windows system file checker in operation.

Windows. However, this has a big downside because you must re-install all your favourite software. I'm often called in to help friends and family when they're stuck with a dead computer and, invariably, the biggest problem is finding the disks and licence keys for their software. One trick I use on my own system is to set aside a directory where I store all my software licences. Most of these are stored as saved e-mails with the purchase receipt and the licence code or key. I also use this folder to store the original downloaded installation file. I do this because software houses often upgrade their products and delete the older versions from their website. Without access to the original file you can be faced with buying an upgrade to get your software back! By saving the original downloaded installation file, I can always reinstall the original software I purchased. In addition to saving this licence and download folder on a spare drive, I also send a copy to Dropbox so I'm covered even if my station suffers a terminal disaster!

Getting back to the damaged windows installation, there are a couple of techniques I use to avoid reinstalling Windows. The first is to back up my system drive (usually C:) every day using an incremental backup. I usually keep a couple of weeks' worth of backups so I can use my backup software to restore my System drive to any day in the past couple of weeks. This works very well but you need to remember to change the location of all your default Windows folders (documents, pictures, music, etc). By default, Windows stores all these files on your system (C:) drive. This is bad news because if you use a backup to revert Windows to its state a few days previously, you will lose any documents you created during that period. It's also good practice to keep your important data off the C: drive for the following reasons:

1. The System drive is usually the busiest so will also be the first to fail. Note well: All hard drives fail; it's just a question of when!
2. Malware and viruses usually target your Windows system on the C: drive, so will almost certainly hinder access to your data

or destroy it!

Moving the default documents, music and other files is simple. Here's how:

1. Open Windows Explorer.
2. Right-click on the Windows folder you want to move, such as downloads, documents, pictures, videos or music.
3. Select the Location tab.
4. Click Move...
5. In the window that opens, navigate to the new location for this data and click Select Folder.
6. In the next panel check the correct folder has been selected and click OK.
7. You will see a warning panel that asks you to confirm the move. It's important to move the files so that programs needing access to this data can find their original files.
8. That completes the change. When the move has finished, you can tackle the other Windows default folders.

Finally, if you'd rather try and repair the damaged Windows files, that is also easy to do. You start by running the Windows built-in System File Checker, Fig. 5. Here's a step-by-step guide:

1. Right-click on the Windows button (bottom left of screen) and left-click to select Windows PowerShell (Admin).
 2. In the PowerShell window, enter: `sfc /scannow` Please note that there is a space after sfc.
 3. This will start the Windows system file checker, which will take a while to run, so get a coffee or do the washing-up!
 4. When the check completes, there are three potential outcomes:
 - a. The checker will report that all is fine. In that case you can relax, close the PowerShell and get on with life.
 - b. The checker will report that it found corrupt files and has repaired them. Again, you can relax and move on.
 - c. The final, all too common, result is that the checker finds corrupt files but can't fix them.
 5. In the case of option c, there is a command I use to automatically restore the damaged system files.
 6. With the PowerShell still open, enter the following:
 - a. `Dism /Online /Cleanup-Image /RestoreHealth` NB: There is a space before each /.
 7. When the Dism command completes, you can run `sfc /scannow` again to confirm that the fix is complete. If you still hit a sfc failure, run the Dism command again and it will usually clear.
- That's all for now.



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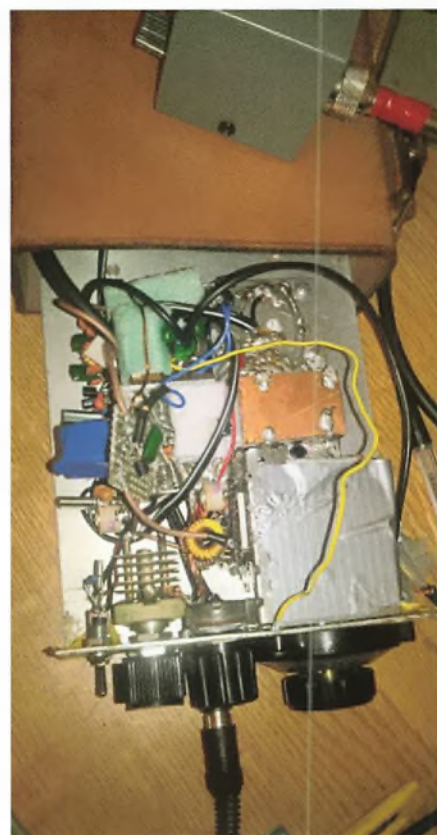
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First Contact

Lee Aldridge G4EJB makes that first QSO after 40 years away from the 20m band.



silliness. When adding circuitry, do things methodically, carry out one test at a time to check you haven't added that extra facility like 'where's the transmit power gone?'

Anyway, once sorted and checked with my SWR meter and dummy load, I connected up to my 20m dipole via my 20m lowpass filter. The netting facility brought the receiver onto frequency (that's the yellow wire in the photo) and signals could be heard. So, bear in mind the transmitter/receiver was still being put together and for added bonus, the sidetone wasn't fitted.

Testing, Testing

I thought I'd try a few test calls – no takers. Called a couple of stations – no replies. I went back to my shed that evening thinking 'I've still got work to do'.

You might have thought by now with the Howes 20m CW transceiver working, a dried-out antenna and a Morse key, that the first QSO beckoned. Why do things the easy way? I still wasn't confident with my Morse and I had reservations about using the Howes transceiver without semi-break-in keying and sidetone. I'd built a board from an old G4TRN circuit I found on the G-QRP *Sprat* DVD along with a G4RAW receive preamplifier but I knew it was going to take some time to modify the transceiver so – you've guessed it – I stopped at that point. The idea of modifying something that I'd just got working then likely to blow up if I got it wrong just didn't appeal. I thought I'd just look at the radio for a while it continued to gather dust.

An easier route came to mind. Make a crystal-controlled transmitter to work with the Howes 20m receiver rather than modify the transceiver. I had in mind that I could have a portable 20m transceiver up and running for the summer. (I should imagine by now that a few of you have worked out that I like building things, getting them to work or saving them for later, then building something else.)

As I mentioned last time, I again used the Manhattan style of building for my matching crystal-controlled transmitter. Did it all go according to plan? No. However, eventually I had a transmitter with about 500mW output but the board had taken a little beating while I'd wrestled with my ability (inability) of getting too clever for myself and with patience in short supply. We'll call that one practice and it was put in the drawer of many pending projects to be resumed.

Around that time, there was an announcement in the G-QRP *Sprat* journal of the GM3OXX Memorial Challenge, using no more than 1W transmit power. With that in mind, I decided the famous OXO design would become my first proper homebuilt CW transmitter. It was. It worked first time and had a very useful netting offset for use with my receiver. Now to get it to work with the receiver. Just remember what I said about adding semi-break-in keying to the Howes transceiver. That's what I did to the receiver and OXO transmitter. Did that all work first time? No, and this time I went on a sulk – all that work and still not making use of my licence. About three days later, a few grey cells joined up and I managed to unravel my own

Things like 'does my RF go all the way to the top of the dipole?' spring to mind. I switched the radio back on and after a while, up came a station calling CQ. What did I do? Reply! What happened next? The station replied to me. Now what? After 40 years away from CW and 20m, panic set in. What's the operator's name? What's mine? How many dots? That was about my level in the QSO but thankfully **Luca IZ2XAO** was a good CW operator and, somehow, we made it to the end. Now to me that was a real accomplishment and I even went back up the house and told my wife, who was suitably indifferent. But I won't ever forget it; this was really starting over.

I found Luca's details on the qrz.com database. Not that I knew much about that either but that just tells you how much I still have to find out about where amateur radio is now. There are just so many facets to this hobby that have added dimensions to where it was years ago and I'm glad I came back.

Meantime, I joined my local amateur radio club in Grantham, where I was welcomed and given a tour of the club facilities by the club secretary, **Kevin** – thank you. This again was something I hadn't done for well over 40 years and I can say that joining a local club gives you that feeling of something tangible. You meet others with similar interests in the hobby and you meet others with completely different interests and that makes it even more of a reason for finding your local club. You learn more amongst many other benefits, just as **John M0AAO** wrote in his letter in the August issue of *PW*.

So, the coax had proved usable. RF had made its way to the top of the dipole, you could say.

What new adventures and old did I have next on this journey? Why not have a go on another amateur band? Now there's an idea, how's that going to happen? See you next time.

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More Lessons Learned

Last month I talked about the Buddipole (BP) antenna system and about some lessons (reminders from the past)

about antenna heights and radio propagation. What else have I learned? The first challenge is mechanical stability. There are no shortcuts here – it's a safety issue, so just spend what it takes to be certain that what you put up is not going to come down if someone bumps it or trips over a tent peg. I took a short cut, with hilarious results. But no harm was done. Even if there is no wind, guy it down or attach it to something that ensures it won't come down. I threaded some strong line through the holes in the Versatee in order to clip guy ropes to it.

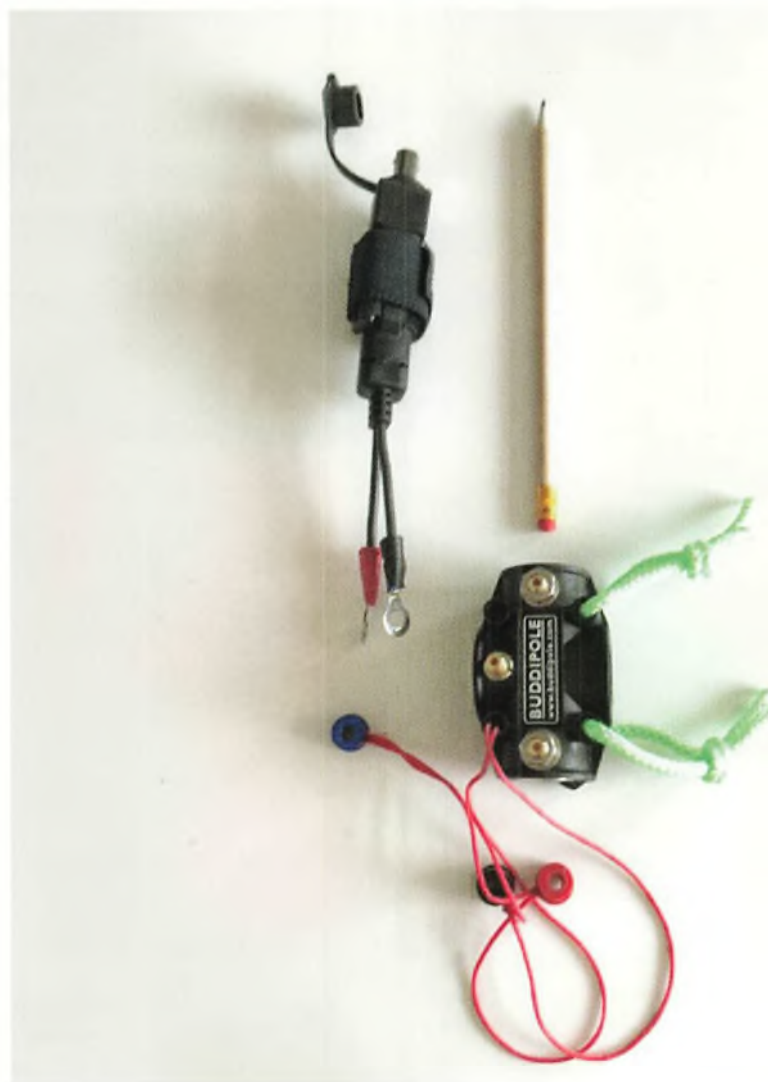
The second thing I did was to replace the banana plugs on the choke-balun (part of the BP system) with ring terminals, secured by stainless nuts. This was done after several days of poor connections and with advice from the B.U.G people. I put out a request for help and had nine replies an hour later – thanks again lads! There is a warning from the B.U.G people not to tighten the nuts too much because it might pull the terminals off but this arrangement seems more secure to me. The antenna analyser is now happier. And this is the third thing I learned. When playing with antennas, get an antenna analyser – mine is the Sark100 from EA4FRB.

Installation Routine

The routine with the BP is to put it up in the air with the recommended settings, then check the SWR across the band. Adjust the length of the whips or move the coil settings until you get the results you want on the analyser. Then plug in the radio and start operating. Now please realise that this is 3m, sometimes 5m up in the air. This means having to take it down every time to adjust it and put it back up. So, when you get something that works, measure and write everything down. This way, when you get out portable, you have a starting point close to the right setting. A few tweaks are all you should need.

Scott's book (see last month) describes many recommendations for BP setups for all bands of interest and a really interesting comparison of dipoles and verticals (with

Joe Chester MW1MWD makes some changes to the antenna setup and contemplates a new transceiver.



Buddipole modifications!

radials). Budd, the inventor, favours an L shape up about 2.5m, especially when operating close to the sea, because this provides a better ground effect than 'normal' garden or pavement. Changing the angle between the two arms also changes the impedance, producing a better match to the 50Ω expected by the radio.

Learning Lessons

My guess is that you think I'm now an expert on the BP, or an idiot for doing all

this work. My cynical friend M certainly thinks the latter! In the hot weather we had in the summer there is a limited amount I can do in any one day. But that's not how I see it. Amateur radio is as much about figuring out what works as it is about collecting squares. For me, this is where most of the fun is. So, after the last outing, I will be testing my configuration in the garden a few times more before the RWWR-4 trip. I won't, however, get obsessional about it – no one will notice if the SWR is a bit off or the radials are a

bit short. Setting up an adequate portable antenna is not hard (unless you're a hard-core contester or DX chaser). Making it hard kills the fun!

The Radio

The second major issue coming out of the RWWR project so far is the limitations, for me, of the Icom IC-706. Lovely radio, I've had two (I crazily sold the first one). I've owned the present one for over 20 years, even went maritime mobile with it! But, as I said previously, it's a hungry beast – 2A on receive and 20A on transmit. Which means I can't use the battery in the car – no point in getting stranded because the car won't start. And running the car engine while parked up just to run the radio seems wrong in this day and age.

More importantly, the IC-706 needs 13.8V to run properly. In fact, this is not actually about the radio at all. I see M is grinning at me now! He could have mentioned this earlier, but that's not his way. It's all about that 12V car battery. All 50kg of it. The name of it is a give-away – 12V battery. This means that it's unable to deliver the 13.8V that the IC-706 requires for full power operation. It also doesn't hold much of a charge when 20A is pulled out of it while I'm transmitting. The voltage, marginal at 12V at the start, quickly drops to unacceptable (to the IC-706). And

the weight of the thing, twice, out and then back in, every time I want to go portable. Of course, the answer has to be a Land Rover Defender, or equivalent, with a second 'services' battery permanently installed in a secure battery box and a battery-to-battery charger to charge it from the car alternator. And a battery conditioner to keep it delivering 13.8V. Sorry, are you getting exhausted? Well so am I.

In radio terms, my IC-7300 runs rings around the IC-706, especially in receive sensitivity. In a quiet spot, out portable, the background noise on the IC-706 is very high and I could clearly hear breakthrough from power line internet modem bursts while sitting on top of a cliff. This may defy logic but it's what I heard. I've also got used to the panadapter display of the IC-7300 at home. So, as well as finding a better battery solution, I also think, almost regrettably, that it's time to consider trading up the radio.

My Accountant, of course, has a view on this, as usual. *"I'm buying a new radio"* was not the best opening gambit at dinner one Friday night. This was closely followed by *"I have to buy a new battery too"*. To which the answer was *"you already have a battery"*. Yes indeed, but it doesn't really work. Convincing her took some doing because she really doesn't 'get' amateur radio as a hobby. I bored her silly at the Loughborough Radio

Show some years ago and she's never fully recovered. In my defence, I have to say that I don't get cross stitching or Archers addiction, although many others do. I finally brought her round by promising to sell some stuff online, as well as trading in the IC-706 (someone will get a bargain!). We'll see how this goes. But I'm looking forward to having a small, modern, low-powered battery-operated rig soon. And no more car battery lifting exercise.

Covering 2m

One of the issues all of this will create, once the IC-706 is gone, is about 2m SSB, or even FM in the car, which is presently covered by the IC-706. I've not got a solution yet. I spy a transverter that would go nicely with the IC-7300 at home for 2m SSB so I've put this on the list for approval by the Accountant. In practice, I drive the car, especially on longer trips. A mobile FM rig should be useful. But it's not that easy because I'm not too happy (and neither is the Accountant) with me driving down the M4/M6 while chatting on the radio. This is an area to be explored (I've hidden a small sum in the agreed budget to cover this, if needed!), but I've enough going on at the moment to worry about 2m SSB.

So, can you guess what's coming next in the continuing saga of the RWWR project?



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While talking together we had an interesting idea. We are sure that we all know how to make anagrams of words and play Scrabble but here we have come up with a new challenge to test our minds.

The idea is this, if we take a simple word such as 'cat' we need to consider the number of dits (.) and dahs (-) in it.

We have counted three dits and four dahs in it. Now if we rearrange these to make new Morse letters, we could have EETTTT or SH. What we need to do is to come up with some way of using up all the Morse dots and dashes to form new letters, which can then be arranged to form valid words. We found quickly that 'dog' and 'toad' are Morse anagrams, Fig. 1.

Using the opening lines from Animal Farm we was able to find another morse anagram ('but' and 'was'), Fig. 2.

Simple normal anagrams where only the letters need to be rearranged such as dog and God will be ignored as they are just too easy.

The challenge is for the readers of PW to come up with the Morse anagram which contains the most dits and dahs. Please keep them clean if possible, start with a source word and then try to create an anagram of it. We think we will take a relaxed attitude to it. You can place names, names of famous people, books, screen plays and even names of other things as long as they are words which are in regular use. So no using 'hguuygftvgvd' as that was me typing randomly.

If you want slightly less stressful challenge and one that could make a good game at a radio club, then consider Morse Scrabble. In Morse Scrabble a group of people should choose a random word, for example 'banana'. From this word we get a total of 6 dahs and 8 dits, Fig. 3.

Using these dits and dahs the person should make as many words as possible.

Morse Anagrams & Morse Scrabble

As well as our Christmas Quiz (on page 26) we bring you something a little different by way of amusement for the holiday season.

The winner is the person with the fewest dits and dahs left after they are unable to create more words. For example, if we were to make 'snake', then we would be left with one dit and two dahs at the end. There are two ways the game could be played. Either you have a round of Morse scrabble where a random word is chosen. The players then attack the problem for a fixed time, after which they compare words and residual key strokes. As an alternative, you could have a fixed number of rounds and the residual key strokes from each round would be carried forward from one round to the next. Aldo thinks that these Morse games may make a good way of introducing Morse as a fun activity to young people.

My friend Aldo was given his radio training required to get a ham licence in East Germany (DDR) as a reward for winning a high-speed Morse contest more than once. Those of you who are maybe not so good at Morse might consider the problem of how we could get a computer to create Morse anagrams, play Morse Scrabble or even create a Morse Scrabble computer game.

We invite you to have fun with these puzzles over the holiday period. However, we would love if it you would also send in your best answers, to practicalwireless@warnersgroup.co.uk

WORD	DITS	DAHs
CAT	3	4
DOG	3	6
FROG	6	7
TOAD	3	6

Fig. 1

Mark, working with Don (editor) will judge the entries and Don will publish the best we receive. Who knows, he may even be able to find a small prize for the winning ones! And if you enjoy our challenge, perhaps we will be motivated to come up with some more for 2019! Mark Foreman (G7LSZ, SA6BID) and Aldo Jesorka (DL1BWA, KD4YLU, Y23WE, Y54PE, Y39WE) are both chemistry academics at Chalmers University of Technology. Mark is occasionally active on 14MHz and other HF bands. He became involved in amateur radio as a result of a general love of electronics and, for the record, does not know Morse. Aldo is a former army Morse instructor who also has a great love of electronics. He designs and builds new devices for miniature chemistry experiments).

WORD	DITS	DAHs	WORD	DITS	DAHs	WORD	DITS	DAHs
MR	2	3	LOCKED	9	9	BUT	5	3
JONES	6	7	THE	5	1	WAS	5	3
OF	3	4	HEN	6	1	TOO	0	7
THE	5	1	HOUSES	13	4	DRUNK	8	6
MANOR	4	8	FOR	5	5	TO	0	4
FARM	6	5	THE	5	1	REMEMBER	10	7
HAD	7	2	NIGHT	8	4	TO	0	4

Fig. 2

LETTER	DITS	DAHs
B	3	1
A	1	1
N	1	1
A	1	1
N	1	1
A	1	1

Fig. 3



The Practical Wireless Christmas Quiz Answers

Answers to the Christmas Quiz on page 26. How did you get on?

- 1a. Australia and Kiribati. (2 points)
- 1b. VK9 and T32 respectively. (2 points)
2. "Online QSL Request Service". (1 point)
- 3a. ITU zone 27. (1 point)
- 3b. CQ zone 5. (1 point)
4. Class B UHF-and-above (later VHF-and-above) licences, with no requirement for a Morse code test, were introduced with G8 three-letter callsigns. (1 point)
5. English, French and German. (1 point – zero points for just English!)
6. A regional code consisting of a letter followed by two digits. The letter represents a specific region in Germany, the two digits represent a local club within that region. For example D = Berlin, D01 = the Charlottenburg club in Berlin. (1 point)
- 7a. Australia. (1 point)
- 8a. The Worked All Europe DX Contest. (1 point)
- 8b. A QTC includes the Time, Callsign and Serial number of a previous contact. (QTCs are sent to European stations from stations outside Europe and each QTC successfully sent and re-

- ceived is scored the same as a QSO.) (3 points)
9. 2019. (1 point)
 10. The station is on board a Canadian boat or ship (maritime mobile, even if there is no /MM suffix). (1 point)

Picture Round

- (a) Finland. Several countries claim to be the home of Santa Claus, including Greenland and Iceland, but it was OF9X (and not OX9X or TF9X) who sent out this QSL card.
- (b) Netherlands. The windmill in the snowy flat landscape could only really be in the Netherlands (or arguably perhaps Norfolk!) This is part of the four-sided QSL from Gerard PD2GCM which features some superb 'arty' photography.
- (c) Tonga. Only an 'A' from the callsign has been removed. The clue is the red cross on a white background, which makes up a part of the Tongan flag.
- (d) Chile. Chiloe Island is in Chile and this is the QSL of CE7PGO.
- (e) Bonaire. This is the QSL of PW HFH columnist Steve PJ4DX. If you have not seen the QSL before, the clue is the Bonaire flag and the

location information: CQ Zone 9, ITU Zone 11, locator FK52ud.

(f) Japan. Zorro, yes, but not from Mexico. This is the QSL of famous DXpeditioner 'Zorro' JH1AJT.

(g) USA. Courthouse Rock and Jail Rock are rock formations in Nebraska, featured on K0BLT's QSL.

(h) Italy. This may look like the Parthenon in Athens but it is the Greek temple at Selinunte, Sicily, on IT9BCC's QSL card. I wonder if some might have thought it was SV9BCC on Crete?

(i) Asiatic Russia. Bashkortostan, also known as Bashkiria, located between the Volga and the Urals, is one of the republics that make up the Russian Federation. The QSL is from RA9WU.

(j) Greece. With a Greek salad and a kilo of retsina, this could really only be Greece. German husband and wife team SV8/DL8MCA and SV8/DL4MHB, who operate from the Aegean island of Skiathos, share this QSL.

(1 point for each correct country)

Total possible: 27 points

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Rallies

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

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



NOVEMBER

23rd November 2018 (Friday)

LANGDON HILLS ARC

The Meeting of the Langdon Hills ARC is at the Women's Institute Hall, Samuel Road, Langdon Hills, Basildon SS16 6EX.

Future meetings are on the 2nd and 4th Friday of every month, from 8-10 pm.

Stuart Hayter G6RAQ

Tel: 07984 171 333

stuartwhayter@btinternet.com

November 25th (Sunday)

BISHOP AUCKLAND RADIO AMATEURS CLUB RALLY

The Bishop Auckland Radio Amateurs Club (BARAC) 2018 Rally will take place at Spennymoor Leisure Centre, 32 High Street, Spennymoor, County Durham, DL16 6DB. There will be the usual radio, computer and electronics stalls, bring-and-buy tables, catering and bar facilities. As you can imagine, there is a lot to do for all the family within the confines of the Leisure Centre, even for those of the family not interested in radio. Doors are open at 10.30am (10.15am for disabled visitors) Admission is £2, under 14s go free of charge, if accompanied by an adult.

John G4LRG; Tel: 01388 606 396

Brian G7OCK; Tel: 01388 762 678

www.barac.org.uk

November 26th (Monday)

ANGEL OF THE NORTH ARC

The final meeting for November 2018, of the Angel of the North ARC, in Partnership with Tyneside

Amateur Radio Society, takes place from 7-9 pm at Whitehall Road Methodist Church Hall, Bensham, Gateshead NE8 4LH. Foundation and Intermediate courses continue. Come along and take to the Air. All welcome. We have to close the outside door so please ring both bells. Free parking. Ten minutes' walk from Gateshead Interchange Metro and bus station. The venue is at the corner of Whitehall Road and Coatsworth Road. The entrance to the Radio Club Room is through the door at the side of the building next to the car park, with an entrance on Whitehall Road Public Transport Details: Go-Ahead routes 53 and 54 nearest metro Gateshead, OS X 425375 OS Y 562088 Lat (WGS84) N54:57:10 (54.952798) Long (WGS84) W1:36:19 (-1.605327). Future meetings will take place every Monday from 7-9pm, except Bank Holidays.

Nancy Bone G7UUR

Tel: 07990 760 920

nancybone2001@yahoo.co.uk

DECEMBER

December 1st (Saturday)

READING DX MEETING

The Reading International Radio Group will be meeting in Room 3 of the Reading International Solidarity Centre (RISC), 35-39 London Street, Reading RG1 4PS. The meeting will take place from 2.30 to 5pm.

Mike Barraclough

Tel 01462 643899

barraclough.mike@gmail.com

December 1st (Saturday)

SOUTH LANCASHIRE ARC WINTER RALLY

The rally takes place at the Bickershaw Village Community Club, Bickershaw Lane, Bickershaw, Wigan WN2 5TE. Attractions include trade stands, a bring-and-buy, special interest groups, car parking, disabled facilities, catering and a licensed bar. Admission is £2.50. Doors are open at 9am (traders – limited number of pitches – venue opens 7.30am).

Jason G0IZR

Tel: 01942 735 828

December 28th (Friday)

YEOVIL ARC Rally

The Second Yeovil ARC Table Top Rally will take place in the Sparkford Village Hall, Church Road, Sparkford Somerset BA22 7JN. This is on the A303, north of Yeovil. There are 10 tables, and light refreshments will be available. There will be adequate off-road parking, and the event is wheelchair-friendly. Admission is £2. The event is open from 10 am to 3 pm.

Bob Harris G8UED

Tel: 01963 440 167

wjh069@gmail.co.uk

December 29th to 30th

(Saturday and Sunday)

HAMFEST INDIA

Hamfest India takes place in conjunction with REVA University, Bangalore. This is the largest gathering and festival of amateur radio operators in India.

hamfestindia2018@gmail.com

or ham7388@gmail.com

www.hamfestindia2018.com

FEBRUARY

February 24th (Sunday)

RAINHAM RADIO RALLY

The Rainham Radio Rally 2019, of the Bredhurst Receiving and Transmitting Society, is taking place, from 10am until 4pm, at The Victory Academy, Magpie Hall Road, Chatham, Kent, ME4 5JB. Local and National Brands and Traders, BRATS Kitchen, BRATS Interactive Zone for Kids, BRATS Junk, Talk-In Station 145.550MHz Call Sign GB4RRR. £2.50 Adult Entry. Free Entry for Kids.

Hugh (Rally Coordinator)

Telephone: 07825 838 877

rally-coordinator@brats-qth.org

MARCH

March 3rd (Sunday)

EXETER RADIO & ELECTRONICS RALLY

The Exeter radio & Electronic Rally will be held at America Hall, De La Rue Way, Pinhoe, Exeter EX4 8PW. The doors will open at 10.30am (10.15 for disabled visitors). Admission is £2.00 (under 16's free) There will be trade stands, a bring-and-buy (book-in is from 10.15am), and catering will be available.

Pete G3ZVI

Tel: 07714 198 374

g3zvi@yahoo.co.uk

Help Needed

Dear Don,

I have a Kenpro Model KR-400RC controller unit that I am trying to rebuild that I got second-hand. The problem I have is that all the wires have been cut and because there are doubles of the same colour wire, I am having problems rebuilding it. I wonder if any readers having one of these units would be kind enough to open it to take a photo of the wiring or make a note of where the wires go? The wires causing the trouble are as you look at the circuit board: at the top near the back panel two thin Yellow wires with a thin Black wire in between them; bottom left-hand corner two thin Orange wires, the first being next to a White wire the second being on its own. The other wires are on the transformer and connect to the following pins: a thin Yellow wire to the first 14V pin nearest the back panel, a thin Red wire connected to the 0V pin, and lastly a thin Red wire connected to the second 14V pin. I have managed to solve the other connections; any help would be very helpful.

James White G7LFG
Herne Bay, Kent

(Editor's comment: If you can help James, send me an e-mail and I will forward it.)

Beach Finds

Dear Don,

With reference to the letter *Help Please* from **Eddie Lingard G3WNG** in the November issue in which he requested some information about his 'find' on the beach. May I please advise a warning about picking up unknown objects on the beach. The East Yorkshire and Lincolnshire coasts are renowned for objects being washed up on the beaches, specifically munitions from WW2

and the firing range off the coast.

I was a tad horrified that not only was it picked up it was dismantled; quite dangerous in my opinion. Bomb disposal crews are often seen along these coastal beaches looking for similar objects, collecting them and then carrying out a controlled explosion to dispose of them. This particular object could well be an electrical fuse device, detonator, or other munition (UXB) given his description of the innards.

It could also be something of insignificance. However, Eddie clearly does not know what it is, so please err on the side of caution and if anything else is found on any beach, inform the police on the non-emergency number with the time and location of the find and let them deal with it but do not under any circumstances pick it up and certainly do not attempt to dismantle it. The result of such folly could be devastating. As a former army officer, I know. I have seen the results of such actions.

Mike Briggs G4SMB
East Yorkshire

Sziklai and IGBTs

Dear Don,

The spelling correction from **Alper HA8KT** (September Letters) reminded me of a few tidbits.

The IGBT (Insulated Gate Bipolar Transistor) is more or less a hybrid Sziklai pair. Usually a modest current MOSFET with a Vds rating equal to that of the whole device, it basically has an emitter follower power transistor hanging from its drain. An N-channel MOSFET will have a PNP emitter follower.

Early MOSFETs had pretty poor RDSon specifications, which was much worse for high voltage devices. A leading concern was on time power

losses in SMPSUs. The IGBT was developed to remedy this situation but the emitter follower output section makes them a bit slow and modern MOSFETs with trench and/or hexagonal mosaic gate structures are beginning to make the IGBT advantage irrelevant.

An enduring ambition in SMPSU design is for ever higher switching speeds for smaller, cheaper magnetics and filters. The IGBT is too slow for this race, and quite a few designers just didn't get it! Plenty of 'bread and butter' work for me, though. In almost every case, the IGBT could be replaced with a regular MOSFET. Repairs only bounced if you replaced like for like with a new IGBT.

These days IGBTs have largely been relegated to motor drives where voltage and current are still important but switching speed is not so challenging. It should be able to serve a similar purpose to a Sziklai pair in an audio amplifier but the input section is still a MOSFET and some designers find biasing them correctly for linear operation a bit challenging. The regular all-bipolar Sziklai remains an important basic building block for audio power amplifiers.

Ian Field
Letchworth, Herts

The Transistor Revolution

Dear Don,

With regard to your feature on the Transistor revolution (October and November issues), in 1954, *FW* ran a 'Daylight Top Band Test' on June 6th. My logbook shows working **Jock G3JYX** in Wolverton at 1530 on CW (of course!). He was using a homebrew transistor transmitter at, I believe, about 40 or 60mW. Although I did not log it, I think

he was using a germanium transistor made, as you say, by adding the extra junction to a diode. We exchanged reports of 569, quite good for daylight on topband in the summer.

Robert Dancy G3JRD
Gillingham, Kent

Mentoring Morse Students

Dear Don,

Oh, dear yet again we are subjected to **Roger Cooke G3LDI's** rather misguided opinion on how to successfully mentor and tutor students in the art of learning CW (*Morse Mode*, October). For many years I was responsible for teaching surgical skills to postgraduate students.

Roger is correct in pointing out that repetition of Morse code is necessary to progress and acquire the necessary skills. Nevertheless, he should be mindful of the role of a tutor, which is to be a good listener offering support and encouragement to his students. His experience and willingness to share skills, knowledge and expertise is not questioned. However, a good Tutor must be open to educate and able to pass on their knowledge, insights and expertise clearly, encouragingly and helpfully. A tutor must also be an active listener, able to reflect the relevant issues while minimising their own personal assumptions and prejudices. Roger's declaration that his students can expect a good roasting, doesn't suffer fools gladly and lacks patience clearly indicates that he should undergo some mentoring skills to match his professed expertise in Morse code.

Dr Mark Holmes 2E0JFY
Wigan, Lancs.

(G3LDI responds: In his letter Mark has suggested that I am rather misguided in my approach to my teaching

Wireless Engineer

Dear Don,

Opening your November edition, the request by **Chris MOHLS** (Letters) for more information on the journal *Wireless Engineer* triggered that long-term memory bank that can so often surprise those of us of vintage years (but not sure what I had for lunch today!).

The *WE* was right out of my league! A very slim monthly journal, its pages were strictly for advanced technicians, designers and engineers. Erudite articles on the theory and practice of wireless, much of which was mathematical and heavy on the algebra! A successful title, it had been founded right back in October 1923 as *Experimental Wireless* before becoming *Wireless Engineer*. In 1949, I had started work at the UK's biggest trade and technical publishers, Iliffe and Sons Ltd, at Dorset House, Stamford Street SW1. Their many titles included the hugely popular and still amateur radio orientated *Wireless World* and the *Wireless Engineer*. I knew the Editors **Mr**

Deveraux and **Mr Barnard**, both of whom would slip me old review copies of radio books to go with the loads of surplus components that somehow graduated to my pockets from their laboratory, including plug-in basket coils bearing the immortal legend 'Hear what the Wild Waves are saying'.

My first job did require me to roam the eight floors of that huge building, delivering messages and post. Already two years into our hobby, I soon found my way to that laboratory, presided over by a very large, Meacham pipe smoking Dutchman, **Mr Van Neck**. It was he who hand built most of the designs that were tested and photographed for the magazines, including the metal bashing. I seem to recall the famous *Williamson Amplifier* being one such 'reviewed' design before it appeared in kit form over in Fleet Street at Stern's Radio.

At eighteen, I was promoted to assist the *WW/WE* advertising production man **Mr Ernie Bonson** (later **G3JHY**) who taught me Morse and helped with the RAE (Radio

Amateurs' Examination). I was introduced to the world of amateur radio by a gentleman in the next office **Mr Bill Williams G4BW**. He operated from his flat in Putney, using an indoor 40m dipole strung through the rooms. His rig was a 6V6 crystal oscillator modulated by another 6V6 and carbon microphone. I don't think either of my mentors could fathom *WE*.

For those anxious to regale themselves with ancient laws and the early days of radio, a useful site is:

<https://tinyurl.com/h4wr3s6>

There you can read the *WE* editorials right from the first edition of 1923 to 1955/56 when the publication ceased. Amazing stuff and, I suppose, the QEX of its day?

You cannot imagine the technical press world of those days. Hand-written manuscripts to be set in type by skilled compositors, halftone plates etched and engraved on thin copper from photos, hand-drawn circuits and then made into line blocks (zincos) and then there was the ubiquitous 'flong', a lightweight mould from which the foundry had to press printing blocks for the huge flatbed printing presses.

I remember the myriads of galley proofs that had to be read and the hand-pulled proofs of advertising pages we checked before the make-up was completed. Finally, the editors would go round to the printer's composing rooms to see and pass their pages laid out in shining metal 'on the stone'. Manpower intensive, our press day was manic!

Now, I see journalists type, move a mouse and just press a button to see their page. Progress, indeed, but when unwrapping my *PW* each month I always get a brief reminder of those days when the wonderful aroma of printing ink floats up from the cover paper.

I have been a regular *PW* reader now for 70 years and I assure you that I can understand most of it!
Victor Brand G3JNB
Campton, Shefford

*(Editor's comment: Thank you Victor. A couple of other readers also pointed me to that website but your reminiscences add much more. Many thanks for your ongoing enthusiasm for *PW* and for the hobby and congratulations on winning that nice prize at the RSGB Convention!)*

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

techniques. In my defence, I would say that I am not quite the ogre he suggests! If he reads my piece again, I have said that I only give a 'roasting' to the students who have been with me a while. I say roasting but in essence it only means emphasis on difficulties with certain letters. I will give them loads of *E I S H* and *5* in irregular groups, difficult letters such as *V X Y Z P* in lots of groups. I always keep ahead of their actual speed capability. Plain language will be as complex as I can make it. Challenges like these are essential if progress is to be made and the 'regular' students

love it.

If a new student comes along, I treat them very kindly with encouragement and I do listen to their problem areas and design the practice sessions to suit. I always have patience with them. I had one person e-mail me to say that they did not need tuition because the licence said they can use CW, despite not having learned it. This is where my patience is very thin.

I feel sure if Mark spoke to a few of my students (and I have taught Morse since 1956), they would say that my sessions are always appreciated, albeit quite tiring!)

Live Chassis

Dear Don,

I am a regular reader of *PW* and always enjoy the variety of subjects covered and, in particular, look forward to the articles written by **Harry Leeming G3LLL**. He combines simple facts about theory and practice with the human side, which makes easy reading, and he has many years of experience to draw on.

In the October edition he warns of the dangers of a live chassis and also has experienced socket wiring being reversed. This reminded me of

the time in the early 1970s when our first marital home required everything to be renewed. One day we came home to see our only new striplight in the kitchen flashing although it was switched off. Fortunately, our electrician came quickly and found that while we were out, the electrical supply company had replaced the outside wiring to the house and got them the wrong way round! When we phoned them, they were very laid back, not believing us, but did come and had to reverse them. We did not even get a proper apology. I think today it would be very different! If

we had not had the striplight, who knows what might have happened.

John Sones M0AAO
Ipswich

Radio Club Welcomes

Dear Don,

It was good to meet you at the Hamfest. Also, I had a chance to meet a few operators I have not seen for a few years.

What made my UK visit most enjoyable were the two visits to the Chippenham Amateur Radio Club. The welcome and enthusiasm of the members is what visiting amateurs and potential operators need. My daughter has just relocated to Wiltshire and Chippenham is the nearest amateur radio club.

I know I will visit the club during my next annual trip to Blighty. Hopefully it will be in July when the club has its rally. I will be writing to thank them but it would be nice to let other radio amateurs in the area know.
Tom Morgan ZS1AFS/ZT1T
Robertson, South Africa

1911 ITU Conference

Dear Don,

I don't usually spot howlers in *PW* but as soon as I looked at the photograph on page 59 of the November issue (*Valve & Vintage*) I recognised **Marie Curie** (seated, with her head on her hand) and surely the man standing on the extreme right is a very youthful **Albert Einstein**? I was not aware that either of these eminent scientists was involved in the administration of wireless.

No, this photograph was taken at the first Solvay Conference on physics, held in Brussels in 1911. The subject was *Radiation and the Quanta*. Radiation,



Wingleder der internationalen Konferenz für drahtlose Kommunikation - 1903

not radio. Or shall we say radioactivity, rather than radio activity!

If any reader wishes to identify the other physicists in the picture, go to:

<https://tinyurl.com/h66l6rg>

where further details are given. Details of all Solvay Conferences are at:

<https://tinyurl.com/h66l6rg>

John Francis G4XVE
Saxmundham, Suffolk

(Editor's comment: Thanks to John and to Roger Allen G4WOI who also spotted this error. My apologies – would that scientists of this stature had indeed been radio amateurs! The author Michael WN1M has this to say: "This is a serious matter to a scholarly trained historian. Accuracy and authenticity are principal objectives when restating history as we often do.

"It is interesting to note that there are other group images for the period that are accurate but boring. The objective was to present an image of a committee formed to prepare the first wireless Rules, of 1912. But I cannot find how this unusual image of Chemists & Physicists got into my ITU files accumulated from various sources. The search of my

ARRL archive material and Google web images does reveal the image in question but not in the proper context". Anyway, to set the record straight, Michael has found the attached photo of the 1903 ITU Radio Conference, which should give a flavour of what our radio leaders looked like in those bygone days!)

Licence Exams

Dear Don,

I must take issue with **Ray Howes G4OWY** in November *PW* (Letters) in which he states that getting a licence 50-odd years ago was "difficult and almost insurmountable". I obtained my G8 licence in 1968 by answering eight relatively simple questions out of a choice of ten for the exam and sending £3 to the Post Office Radio Dept. I still have all the paperwork. How difficult was that compared with today with three more advanced exams having to be passed?

I could then have obtained a full G3 licence by passing the Morse test, which I never got round to. I built a few bits and pieces at the time but was never actually 'active' and drifted on to other interests after a few years. A few months ago I visited a vintage radio

fair, which brought back a lot of old memories. Just out of interest I found out that in order to obtain the full licence now, three exams had to be passed, although no Morse test was now required. Also, just out of interest I enquired of the RSGB whether my passing the exam 50 years ago would count towards a Foundation licence today and was amazed to be told that it would entitle me to a Full licence! So, I sent off my old pass certificate to Ofcom and have now reactivated my licence and it didn't cost me a penny, being over 75.

Personally (although I'm not complaining), I think it's a ridiculous situation that by answering a few questions 50 years ago and with all the advances in technology since of which I could well be ignorant, I'm now at liberty to create havoc across any amateur band of my choosing should I be that way inclined.

David Hall G8CLI C.Eng, MIET
Warwick

(Editor's comment: Thanks David. Personally, I don't feel that the Full Licence exams are any easier than the old RAE. The good news nowadays (at least, I believe it to be good news) is that you can work your way towards a Full Licence, rather than have to do it all in one go, which could well put off some aspiring radio amateurs. I certainly didn't have any trouble passing the old RAE but, in fairness, I was in the Lower Sixth form at school at the time, studying for A levels in Maths & Physics. For those embarked on other paths, it would not have been so straightforward. But for readers who may wish to compare, past RAE papers can be found at the website below)
www.g4dmp.co.uk/rae

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YAESU C4FM SYSTEM FUSION Tim Kirby G4VXE starts a short series about developments with Yaesu's C4FM digital voice system, reviewing some of the latest transceivers along the way.

METEOR WATCHING Meteors are of interest to radio amateurs, particularly those wanting to use meteor scatter propagation. Tony Jones G7ETW explains how you can detect them using radio echoes.

DOING IT BY DESIGN Ron Taylor G4GXO describes a Spectrum Reversal Module for Opposite Sideband Operation.

CARRYING ON THE PRACTICAL WAY Chris Bearman has an unusual but straightforward project for a two-valve VHF super-regenerative receiver.

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