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PRACTICAL WIRELESS

DECEMBER 2022 THE UK'S NUMBER ONE AMATEUR RADIO MAGAZINE SINCE 1932

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The B2 Spy Set, its use, users, and the dangers they faced in secret operations

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2022 INDEX

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Contents

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

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58

Keylines

It's been a busy month, what with the RSGB Convention at Milton Keynes and the National Hamfest at Newark falling on consecutive weekends. However, it was great to be out and about again meeting old friends – you can read my reports on both events in this issue. The social side was as enjoyable as the lectures, the trade shows, etc – for example, on the Friday evening of the Hamfest I walked into the dining room of my hotel, expecting to have to eat alone, but was promptly collared by the *ICQ Podcast* team and invited to join them for dinner. Thanks guys – a great evening.

I haven't been so active on the bands, since my GB90PW effort, but conditions have certainly been on the up, with the solar indices above those predicted by the majority of the pundits although following the more optimistic forecasts of **Howell** and **McIntosh** (see last month's *HF Highlights*). I and others have even been seeing relatively frequent trans-equatorial propagation on the 6m band, as reported in **Tim Kirby's** VHF column. Indeed, even while I was writing this, 3B8FA appeared and worked a number of UK stations. Fingers crossed!

Take 20

Our historical article this month is from the popular *Take 20* series. The underlying philosophy was 'A series of simple transistor projects, each using less than twenty components and costing under twenty shillings to build'. A worthy aim. What's interesting is that several readers recently, including at Newark, have suggested we resurrect the series, albeit nowadays I think it would have to be £20 rather than 20 shillings! As it happens, a reader wrote about a year ago offering to write such a series, but unfortunately I have not heard from him of late. However, I will look out for someone prepared to take up the challenge – watch this space!

The B2 Spy Set

Our *Valve & Vintage* column this month reflects on the B2 Spy Set and the uses to which it was put. It's become a very well-known and collectable item from the war years, with all its associations of covert activity and imminent danger. What I hadn't realised is how much they apparently sell for nowadays. What I do remember is a Norwegian friend buying one from the UK and asking me to hand carry it to Norway (where I was scheduled to give a presentation at the LADX Convention). I felt a tad conspicuous walking through customs

with what looked like a battered old leather suitcase but I certainly wasn't going to check it as hold luggage. What I didn't, though, appreciate is how much it was worth (and I never found out what my friend paid for it although I do know he was a keen collector of such sort of WW2 memorabilia, as his father had been in the Norwegian resistance).

Phased Verticals

Apart from what I have already mentioned, we have another packed issue for you, with a review, several constructional articles and latest *Lab Tutorial*. I particularly want to comment **Billy McFarland's** article on Phased Vertical antennas. I am a strong proponent of phasing verticals – no tower or rotator required and yet you can get directionality in a relatively small space. On various DXpeditions I have been involved with we have used a four-square array on 40m, which is absolutely magical and with the added advantage of being able to switch directions instantly – no waiting for a rotator to turn. Of course, that's somewhat more ambitious but from the UK a two-element array is generally more than adequate because mostly we only need gain to the east (Japan, Far East) and the west (North America).

Christmas Greetings

Finally, although this will arrive some time before Christmas, it is the December issue after all! So let me take the opportunity to extend Seasons Greetings to all our readers, advertisers, etc. without whom there would be no magazine.

Don Field G3XTT
Editor, *Practical Wireless* Magazine

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Newsdesk

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

JOTA FROM ESSEX: The Essex Ham team was active over the JOTA weekend (15/16 October 2022) at the Belchamps Scout Activity Centre in Hockley, Essex. Close to 200 Cubs, Scouts and Explorers from across the region signed up to take part in this special event, allowing them to work towards their communication badges through a range of fun 'hands-on' activities.

As well as the traditional JOTA 'greetings messages' (not helped by HF contesters on JOTA frequencies), the event offered the chance to send coded Morse messages, radio direction-finding, one-time pad code-breaking, recordings of Numbers Stations, PMR radio chases, demonstrations of military radio systems, as well as live video calls with other Scouting groups around the world.

New to the event this year was a 'blindfold navigation challenge', where teams of two had to navigate a maze using radio. One youngster was blindfolded and navigated through the maze by their partner, with an Essex Ham member monitoring to ensure nothing went wrong. The activity was made possible thanks to the loan of full duplex radio headsets supplied by dBD Communications, who manufacture professional radiocommunications equipment for the rail, air and construction industries.

Essex Ham's Chairman, Pete Sipple M0PSX said: *"Essex Ham is once again proud to support the 'Jamboree On The Air'. This event encourages youngsters to learn more about radio technology, and some may grow up to be the next generation of scientists and engineers. We saw some interest in taking up the hobby, and have been asked to run follow-on sessions for some of the local groups. One Scout leader was so impressed, he signed up to Essex Ham's free online training course on the spot, and sent a few greetings messages to get in some early practice. Our thanks to the team members to turned up to support the event, and to the locals who answered our on-air requests for contacts to chat to Cubs and Scouts".*

GB3MCB: On Sunday 25 September the Mid Cornwall Beacon and Repeater Group brought into service three new CW/FT8 Beacons at 28.215MHz, 40.050MHz and 60.300MHz, each using the callsign GB3MCB.

Located at IO70oj in mid-Cornwall on a 100ft tower at 1000ft above sea level, these beacons, constructed by Peter G8BCG, are ideally situated for trans-Atlantic Es/F2 and particularly for Trans Equatorial Propagation.

The new beacons are co-located with existing beacons on 50MHz (as part of the Synchronous Beacon Project), 70MHz, 144MHz, 432MHz, 1296MHz and 10GHz. GB3MCB is, de-facto, the UKs premier beacon cluster.

The new low VHF cluster at 28/40/50/60/70MHz will enable invaluable propagation monitoring and analysis as the MUF rises.

Reception reports are always welcome – please spot the beacons whenever/wherever heard.

The capital cost of the three new beacons is considerable and site electricity costs are already in excess of £1000 per annum. If you wish to support these capital and recurring costs, donations are of course very welcome via the website (below) or direct to MCBARG: **gb3nc.org.uk**

DAVENTRY CELEBRATES BBC CENTENARY: On 18 October 1922, the Marconi Company and other equipment manufacturers formed the British Broadcasting Company, which became the British Broadcasting Corporation six years later.

To mark this momentous date exactly 100 years on, members of the BBC Amateur Radio Group were invited by Arqiva to operate the BBC Centenary Amateur Radio station, 'GB100BBC', for the day at the Daventry transmitting station, which was the home of BBC radio transmission over many decades from the early part of the 20th Century.

Daventry is now one of 1,450 sites in Arqiva's UK-wide broadcast infrastructure carrying BBC and other broadcasts reaching 98.5% of the population.

Members of the BBC and Arqiva radio clubs operated a shortwave radio station on the date of the anniversary from the Empire Service Building at the Daventry site.

As well as GB100BBC, the heritage callsign G2LO was also on air. The Postmaster General first granted the BBC use of the callsign 2LO in 1922 for pioneering broadcasts from studios at Savoy Hill, London.

BATH BASED DISTANCE LEARNING 2023: The Bath Based Distance Learning team (BBDL) has helped over a thousand students to pass UK amateur radio exams with pass rates consistently above the national average.

The next BBDL Intermediate course will run from January to May 2023. Students will receive weekly work packages via a virtual classroom. There will be weekly online tutorials and revision quizzes. Students will also have access to one of the BBDL remote tutors who will provide feedback and additional guidance when required.

There will be lots of practical exercises to bring the theory to life. Students will be expected to do the exercises at home and report their results. At the end of the course there will be a number of mock exams.

There will be no charge for the training but students will need to provide their own textbook, scientific calculator, electronic parts and toolkit. Students will also have to arrange their own exam at the end of the course, but advice will be provided at the appropriate time.

As part of the application process, there will be some pre-course work to ensure students are able to use our online learning systems and to be sure they are ready to study in January.

Another BBDL course for the Full Licence will follow on from the Intermediate course, running from August to December. A further announcement will be made when that course is ready for enrolment. However, they are encouraging all those who intend to study for the Full Licence and passed the Intermediate exam before September 2019 to join the Intermediate course. This will provide good revision and bridge the gaps created by syllabus changes in 2019 and 2022.

To receive course application details, please email BBDL Team Leader, Steve G0FUW, via **g0fuw@bbdl.org.uk**

The deadline for completed course applications is Wednesday 7 December.

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

HARTLEPOOL AMATEUR RADIO CLUB JOTA 2022: Hartlepool Amateur Radio (HARC) club took part in Jamboree on the Air (JOTA) 2022 with the Tees Valley North Scouts over the weekend of 15/16 October. It's been a couple of years since the club held the JOTA event due to the Covid 19 outbreak but this year was certainly the best to date. The callsign used was GB0TVS. The setup included a Yaesu FT-2000 and for the first time they used a Scam 12 trailer mast, loaned by Lenny M0KOM and supporting a 3-element beam for 10/15/20m at around 50ft, along with an HF-10 wire antenna for 80/40m. Also Carl 2E0HPI's Yaesu FT-991A with the UK Antenna's End-fed 40m to 10m for FT8 & SSTV modes.

Tees Valley North Scouts welcomed Cubs/Beavers from around the local area where there learnt Morse Code and Q codes and also sent greetings messages.

FREE WINDOWS RF CALCULATOR: WInRFCalc offers a free of charge, downloadable RF toolbox with many interesting RF calculators and analysers. It offers the following capabilities:

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- Butterworth filters
- Impedance matching
- Interdigital filter calculator

Download WinRFCalc from:
https://tinyurl.com/yc5b5fw9


British Railways Amateur Radio Society

RAILS and RADIO

October 2022

Barry, Coral and Geoff at NARSA Rally, April 2022
©NARSA 2022, Heth M6HNS from Gilmore Radio Club

In this issue:
Editorial - Chairman's Chat - A Piece of BRARS History
Membership Secretary's Topics - AGM 2022 Notice
Publicity and Social Media Report
Treasurer and Membership Secretary's Report to the AGM
Subscription for 2023 - Stuart Swain G0FYX SK
Society Information - Who to Contact

AGM: Tuesday 8th November by Zoom, see pages 7 & 19

BRARS PUBLISHES RAILS AND RADIO OCTOBER 2022: The British Railways Amateur Radio Society (BRARS) is delighted to report that the October 2022 issue of its *Rails and Radio* magazine has now been published and posted to every BRARS member.

Membership of BRARS is open to anyone interested in any aspect of railways (by which is meant any rail transport including trams, miniature railways, model railways and suchlike) and in any aspect of amateur radio (whether licensed or listener).

For more information about BRARS please contact the membership secretary Richard Waterman G4KRW, 170 Station Road, Mickleover, Derby, DE3 9FJ, membership@brars.info or visit:
www.BRARS.info

Solder Go Launches on Kickstarter

SolderGO launches comfortable ergonomic smart soldering iron to raise funding for the first production run exclusively on the platform kickstarter known to bring projects to life.

The SolderGO iron features an easy-to-use, intuitive user interface and OLED display, compact ergonomic size with a full-size tip, which is portable and can minimise workbench footprint. The SolderGO provides 72W of power for rapid heat-up time, temperature stability and thermal recovery with a user adjustable soldering temperature range up to 450ºC. The iron is DC powered for portability and can be connected to a mains power supply or various batteries which the iron can detect and protect. Sleep and wake-up modes are employed to increase tip life and efficiency. The screen can be flipped for left or right-handed use. There is a large variety of interchangeable tips that can handle a range of soldering tasks from standard size to micro components.

The company, which has been running for seven years designing and manufacturing drone parts under the brand name MenaceRC, has already invested into the SolderGO soldering iron design, production mould tooling and production line setup to limit the risks to kickstarter backers and to provide the soldering iron on time.
https://tinyurl.com/bdzbpkpb

RIVIERA AMATEUR RADIO CLUB: Steve Crask G7AHP writes that he is now secretary of the Riviera Amateur Radio Club. Club meetings are at the Precint Centre, St Marychurch, Torquay on the first and third Thursdays at 7:30pm. Club nets are as follows: 70.475 Wed 19:20, 145.425 Wed 20:00, 29.600 Sun 11:00, 51.490 Sun 11: 35 after 10m net, DMR 23500 19:20 Sunday. C4fm or alternatively FM via GB3TQ at 20:00.

Don Field G3XTT
practicalwireless@warnersgroup.co.uk


1

The 2022 RSGB Convention

Don G3XTT was pleased to be at the RSGB Convention after a three year hiatus. Here is his report.

Where have the years gone? For the past two years the RSGB Convention has happened, but online. And, I gather, very successfully too although I must admit to not having participated – for me the Convention is all about meeting friends and catching up with the gossip. In fact, other than for lockdowns, etc, I have missed only one RSGB Convention (formerly the HF Convention) in over 40 years and that was because I was on a DXpedition on Christmas Island!

Anyway, last year, I am told, something like 5,000 folk watched one or more of the online lectures. As a result, this year the RSGB opted for a combined in-person/online event as they didn't want to lose that large number of attendees, both here in the UK and, of course, overseas. This took some organising, with five simultaneous lecture streams to be video-streamed, along with a number of interviews that were recorded and streamed over the course of the weekend. Well done to RSGB and the team from Camb-Hams who made this possible – quite a feat! And, of course, the resulting videos will be of interest even to those who attended, because we could only be in one lecture stream at a time. They will be uploaded initially to the Members Only section of the RSGB website but, later, to all and sundry.

The Event

So, what did you miss if you weren't there? Personally, I thought it was wonderful to be able to meet old friends once again in person. There were something like 300 people booked in for the weekend and then there were the day visitors too. Certainly, the crowds (at the same location as in previous years – the Kents Hill Conference Centre in Milton Keynes) seemed to be almost as large as I remember them, even though some folk would no doubt be staying away, either through remaining concerns about Covid or simply because they could watch from home. What was a little worrying was to see that, to a large extent, the faces were very familiar but three years older! That said, I feel sure there were a number of first-time attendees. Many stayed on site, others at local hotels. And when I arrived late on the Friday afternoon, the bar was already bustling, with long queues for drinks. There was dinner available that evening at the venue, although I joined a group of friends for a meal off site at a local restaurant, of which there are plenty to choose from within a mile or two of the event.

The Programme

Kudos to the RSGB for putting together an extremely comprehensive programme for beginners and old hands alike. As well as the five lecture streams I've already mentioned, there was an EMC compliance clinic, VHF and HF Contest forums, UK Licence Examinations, DXCC card checking and a Partners Lounge for those not participating in the Convention activities. And, of course, the formal dinner on the Saturday evening and the raffle, with the main prizes donated by Yaesu, Icom, event sponsor Martin Lynch & Sons and bhi, as well as books from the RSGB.

Given that it was so nice to see old friends again after a three-year hiatus, I didn't get to many of the lectures so you may have to look them up yourselves if you want to know more! Let me just comment, though, on a few that I did get to.

First, after the Convention was opened by RSGB President **Stewart Bryant G3YSX**, was a presentation by IARU (International Amateur Radio Union) President **Tim Ellam VE6SH/G4HUA**. The title for Tim's presentation was *'Changes and Challenges to the Amateur Service. What does the Future Hold?'* Tim started by noting how many of the technological changes in the hobby (such as the introduction of SSB to replace AM) had been resisted over a number of years before being accepted. Given that the ITU definition of the 'Amateur Service' refers to 'technical investigations', he implored the audience to accept, indeed to encourage innovation and change, whether it be DMR, FT8 or whatever. He also noted the pressure on much of our spectrum, especially above 144MHz, by commercial interests and implored us to make greater use of the spectrum we have (amateurs currently have allocations across 9% of the available spectrum above 144MHz, which is extremely generous when other, paying users would like to get their hands on it). As such, he emphasised the importance of the work done by IARU and, therefore, the importance of being members of your national society, without the support of which the IARU would not exist.

Although I was out to dinner again on the Saturday evening and therefore missed the Convention dinner, Tim gave the keynote address, which I understand looked back in an entertaining way on his own early days in the hobby and lessons learned over the years.

As I said, with five streams running, it was impossible to cover all talks. But to give some idea, the streams covered Breadth of Amateur Radio, HF & VHF Operating, General & Introductory, Technical/Construction and AMSAT. I chaired a session by **Steve Nichols G0KYA** on 'What do the Numbers Mean' covering the various indices that we see relating to propagation (Sunspot Number, Solar Flux, A and K indices and so on). I attended a presentation about 122GHz (yes, that's not a typo!) by **Noel Matthews G8GHZ**, who recently set a new UK distance record on the band. No great distance because atmospheric absorption is high at those esoteric frequencies, but the challenge is the very real engineering that is needed to make any QSOs at all. And I particularly enjoyed a presentation by

2


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Hans Summers G0UPL about the development of the QCX transceiver kits, several versions of which have been reviewed here in *PW*. It all started with a request in 2017 by the RSGB for a kit that could be built at the Youth on the Air event for no more than £13. A ridiculous request that caused Hans to put the email straight into his 'deleted' folder, only to recover it later after giving the matter some thought. The rest is history, with some 13,000 (if I remember correctly) of the QCX kits having been sold and still at a very competitive price given that the resulting (single-band) transceiver is of a high specification. A great story. I also attended a lecture by **Chris Deacon G4IFX** about 6m Sporadic E, but this was a little different in that Chris has been undertaking studies in conjunction with Bath University en route to a PhD, demonstrating that radio amateurs continue to do innovative work of interest to the broader community.

Clubs

As always, there was a room dedicated to various clubs and organisations. These included the UK Microwave Group, the Radio Officers Association, the RSGB Contest Committee, CDXC (the UK DX Foundation), CWops, RAIBC, ARDF (Direction Finding), AMSAT, Worked All Britain, BYLARA and the British Amateur Television Club. Something for pretty much everyone.

New Products

The Convention is essentially a social event, with lectures, etc. but not a trade show, which is what distinguishes it from the Hamfest at Newark (see my report on page 30). However, it is attended by sponsors Martin Lynch and Sons, along with Yaesu and Icom, as I mentioned earlier.

So, as it happens, this was my first opportunity to see the new Yaesu FT-710 AESS, the Icom IC-905 UHF/Microwave transceiver and their IC-PW2 HF/50MHz linear amplifier. All have been mentioned in our *News* pages but it was good to see them in the flesh, so to speak.

The FT-710 has a similar set of features to the FTdx10 in terms of power, bands covered, etc. but lacks the hybrid architecture that enables the FTdx10 to achieve very high ratings on receive performance. That said, for many users, the FT-710 will be more than adequate and will sell at a lower price than the FTdx10. However, given that many of the Convention attendees were what might be described as 'serious' DXers and contesters, it was interesting to see several FTdx10s sold over the weekend.

As for the two new Icom products, both are specialist in nature and certainly won't sell in anything like the sort of numbers achieved by the IC-7300, which I believe is the best-selling amateur radio transceiver of all time.

Photo 1: The Norfolk club were there in force. Photo 2: IARU President Tim Ellam gives the opening address. Photo 3: Mission control: video streaming five lecture streams around the world. Photo 4: Martin Lynch G4HKS looking dapper, as always. Photo 5: The new Icom IC-PW2 linear amplifier. Photo 6: The Yaesu FT-710 AESS. Photo 7: The RSGB Bookstall.

However, they do add neatly to the excellent range of products that Icom have launched in recent years.

As for the ML&S stand, there were some new products too, with Martin himself taking pains to point out to me the JNCRADIO VNA 3G portable vector network analyser. Priced at £199.96 it won't compete with the cheap and cheerful miniVNAs but has a bigger screen, more features and nicely complements the wide range of VNAs that ML&S offer.

And the Social Side

As I said at the start, the attraction of the Convention to many of us is to be able to socialise once again and the bar area was continually busy, especially in the late evenings. I suspect many attendees spent the next few days catching up on their sleep! But I feel sure a good time was had by all. Here's to next year! **PW**

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

Rallies & Events

All information published here reflects the situation up to and including **25th October 2022**. Readers are advised to check with the organisers of any rally or event before setting out for a visit. The Radio Enthusiast website **www.radioenthusiast.co.uk** has the latest updates, please check it regularly. To get your event on this list, e-mail the full details as early as possible: **wiessala@hotmail.com**

6 November
BUSHVALLEY ARC RALLY: Limavady Football Club. Doors open at 11 am; entry is £3 with a door prize ticket.

6 November
HOLSWORTHY RADIO RALLY (HARC) : Holsworthy Leisure Centre, Well Park, Western Road, Holsworthy, Devon EX22 6DH. Traders from 8:00 am; doors open to the public at 10.00am. (BB | CR | D | TS). Traders & General Enquiries, Contact the Secretary via email.
m0omc@m0omc.co.uk
https://tinyurl.com/yckypn5v

19 November
THE ROCHDALE & DISTRICT AMATEUR RADIO WINTER RALLY: The Rochdale & District Amateur Radio Winter Rally will take place in St Vincent de Paul's Hall, Norden, Rochdale, OL12 7QR. Doors will be open at 10 am with the entry fee still only £3 (CR | FP | TS).
rozallin@gmail.com
dave@cardens.me.uk
01706 633 400
0781 367 1296

19 November
WILTSHIRE WINTER INDOOR RADIO RALLY: Kington Langley Village Hall & Fields, Church Road, Chippenham, Wiltshire SN15 5NJ. Doors are open from 9 am to 1.30 pm. £2 entry for buyers (under 16s free). £10 per table for sellers (CR | D). To reserve tables contact Brian G6HUI via e-mail:
rally@chippenhamradio.club
Chairman@g3vre.org.uk
https://wiltshirespc.org/wp/g3vre/rally

20 November
CATS 43RD RADIO AND ELECTRONICS BAZAAR: Oasis Academy Coulsdon, Homefield Road, Coulsdon, Surrey CR5 1ES. Doors are open from 10 am to 1 pm.
07729 866 600
bazaar@catsradio.org.uk

27 November
BISHOP AUCKLAND RAC RALLY : Spennymoor Leisure Centre, High St, Spennymoor DL16 6DB: Radio, old and new, computers & electronics. The rally takes place in a large ground-floor hall. Doors open at 10.30 am (10 am for disabled visitors). Admission is £2 - under 14s free of charge with an adult. (BB | CR | D | FP | TS).
07710 023 916
g4ttf@yahoo.co.uk

29 December
YEOVIL ARC CHRISTMAS RALLY: Davis Hall, Howell Hill, West Camel, Yeovil, Somerset BA22 7QX. Doors open from 9.30 am to 1:00 pm, and admission is £3 (BB | CR | FP | RSGB). 20 tables of traders.
01963 440 167
https://tinyurl.com/yrhcnjf6

29 January 2023
LINCOLN SHORTWAVE CLUB WINTER RADIO RALLY: The Festival Hall, Caistor Road, Market Rasen, LN8 3HT. Doors open at 10 am with disabled visitors gaining access at 9.30 am. Indoor event.
Bacon Butties and refreshments will be available on-site. Entry £2 Talk In is on 145.375MHz.
To book tables email:
contact@m1dhv.co.uk
07777 699 069
m5zzz@outlook.com

5 March 2023
EXETER RADIO & ELECTRONICS RALLY: The 2023 Exeter Radio & Electronic Rally will be held at America Hall, De la Rue Way, Pinhoe, Exeter EX4 8PW. The doors will open at 10.30 am (10.15 for disabled visitors). Admission is £3.00 (under 16's free). (BB [book in from 10.15 am] | TS).
07714 198374
g3zvi@yahoo.co.uk

12 March 2023
HAMZILLA RADIO FEST: Dover ARC. At the Julie Rose Stadium in Ashford, Kent TN24 9QX. Early bird tickets are available, entry from 9:30 am, and general admission from 10 am. Local and national traders welcome! Join SDR Play, Ceecom Antennas, Icom, and ICQ Podcast. Book your ticket and/or table online (BA | BB | CR | FP | D). TBC: (RSGB | L | RF | Wi-Fi).
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https://tinyurl.com/2vrabzr4

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https://rsgb.org/main/news/rallies
http://www.g4rga.org.uk/All.html
https://tinyurl.com/yr6j9rat
https://tinyurl.com/3ezb68d3
https://tinyurl.com/ytnnym3h
https://tinyurl.com/423udpmx

BA Buildathon **BB** Bring-and-Buy **CBS** Car Boot Sale **CR** Catering /Refreshments **D** Disabled visitors **FM** Flea Market **FP** Free Parking **LB** Licensed Bar **L** Lectures **MS** Meeting Spaces **RF** Raffle **RSGB** (RSGB) **Book Stall** RU/PW RadioUser/ PW in attendance **SIG** Special-Interest Groups **TI** Talk-In (Channel) **TS** Trade Stalls **Wi-Fi** (Free) Wi-Fi

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Morse Code in Your Pocket

Richard Constantine G3UGF reviews the PT20 Portable Morse Tutor from Kanga Products.

When I was 15, no Morse meant no Licence as back then it was an international requirement. I don't mind admitting that I struggled with it, failing my test a couple of times. Ironically, later the code served me well as a radio officer at sea and even later as an RSGB Morse examiner.

The original receiving test was a written exam with plain language and numbers tested separately. This simply didn't prepare you for the real world. Procedural signals such as start, stop, comma and break signs didn't figure in the amateur radio test, neither did short cut expressions such as 73, 88, 'es' for and, or 'bcnu' (be seeing you). The original and still superior form of text messaging (I'm biased).

Before computers, BC that is, when reel-to-reel tape recorders were a luxury and the idea of an electronic machine to generate Morse code was simply science fiction, the only solution was to persuade someone to commit a substantial amount of their time to teach you face to face.

In the 1980s **Dr David Tong**, who I knew well, produced many 'firsts' in amateur radio. The hobby has much to thank him for and especially for the D70 electronic Morse tutor, still prized today. Datong Electronics Ltd couldn't make them fast enough and as his agent, I sold out at every rally and show I attended.

For the first time you could almost learn Morse by yourself. Unlike me, you no longer had to try to translate car registrations into dots and dashes, with crib card in hand. No wonder it took me so long!

CW the Big Secret

No one ever told me that writing it down comes last. The big secret is that it's all about instant recognition of the sound and allowing your brain to make the connection and decode the 'dah-di-dah' (K) progressively quicker, with practice. This is what the D70 made possible for the first time.

Co-ordinating your brain to your hand can wait. It's the last part of the equation and is the easiest bit of the sequence. In this respect, printing letters and numbers on paper takes longer than using joined up, cursive handwriting. In my experience, most people, as I did, seem to run out of steam and get frustrated at around 7 or 8 words a minute. The brain is either ahead of the hand or requires more thinking time to decode. Each to their own but my advice to learners is, never print. Also, sending badly in the early stages teaches little or nothing about receiving. You can always learn to deal with a keyboard long after you've learned to write Morse down.

Over the years I've helped many people to know the secrets of the art, that I had to discover very much the hard way. Of course, much has changed for the better. There are computer programs for learning Samuel's code and it's no longer a statutory requirement on HF. The hobby has become much more plug-and-play. You can now go all the way to the Advanced (Full) licence without knowing much about CW, or for that matter, which end of a soldering iron is which these days. In some respects a shame, but not entirely.

I know people who learned the code simply for the test and now claim to have forgotten it. I don't get that, surely it's like riding a bike? Can you ever truly forget? It's more likely that you just slow down and the basics are safely filed away, like old memories.

Having a Kanga Products PT20 in your pocket means you can re-boot your brain's amazing hard drive almost anywhere, any time and reclaim or most likely improve on what you used to know. Being able to decode Morse and send it opens up a world of possibilities and dare I say it, a third of extra band space.

Enter, the Kanga Mini Tutor

That's why I was pleased when **Paul M0BMN**, the current owner of the much-cherished Kanga Products brand, suggested I take a look at his mini-tutor. It's a fraction of the size of the good old D70 and much less greedy on batteries. Available as ready built or in kit form, my immediate reaction was, 'what a great little first time and fun build project,' especially for a club or group and at an affordable price.'

It can easily be put together in one club session, two at the most and the end result is a very professional looking item. For the first-time builder having others around to help and encourage can be a real bonus, in case of difficulty or nerves.

There are only 17 components to be fitted to the circuit board and no surface mount items. Two capacitors of the same value are included so you can't get them in the wrong place. Paul supplies the kit with a resistor colour code chart. No excuse for getting the wrong values in the wrong holes.

The heart of the device is an AT-tiny 85, pre-programmed microcontroller IC. For the faint-hearted soldering iron user, Kanga kindly provides a plug-in IC socket.

The kit is well thought out and goes together easily. Attention has been given to achieving a

Photo 1: Pre-assembly component layout.
Photo 2: The front panel. Photo 3: Internals.

professional finish and I particularly like the case top code decal that includes all the procedural signals that I never learned as a teenager. A competent builder can assemble and have the kit working in around an hour, albeit not something I would recommend for the beginner.

My advice is, as always, assemble with care as, you're a long time looking at it. Be proud of what you've done and not afraid to take the lid off.

The only thing missing from the kit are two AAA batteries. Not an issue as excluding them helps to keep the cost down and avoids any postal problems. Oh yes, and while it has an internal sounder, bring your own earphones.

It's so easy you could almost assemble the kit from the photographs in this review, in the good old *PW* traditions of yesteryear.

Nevertheless, it's wise to download and print off, read and follow the build instructions from the website (below). They are not included in the box and there's a wealth of additional information on how to get the best from the PT20.

https://tinyurl.com/2p9wvvet

What Does it Do?

OK, you've built the kit and admired your handiwork for a while. Now what? Firstly, don't be fooled by the lack of many knobs and switches. Being based around a microcontroller makes it possible to keep the overall size down and minimise the number of front panel controls.

When combined with the mode switch it's possible to adjust volume and the gap (thinking time) between characters, the words per minute rate and the pitch of the internal sounder. There's a convenient 3.5mm stereo headphone socket for use in crowded places or late-night practice.

The instructions detail how to make initial setup adjustments, pitch and words per minute rate (a standard word is 5 characters). Your preferred speed setting is memorised and you can then adjust the gap between characters, from the rotary control.

The PT20 has six modes as follows:

Letters, Numbers, Procedure signs, Mixed, Callsign and Contest. As you change modes the device announces the new mode – in CW, of course.

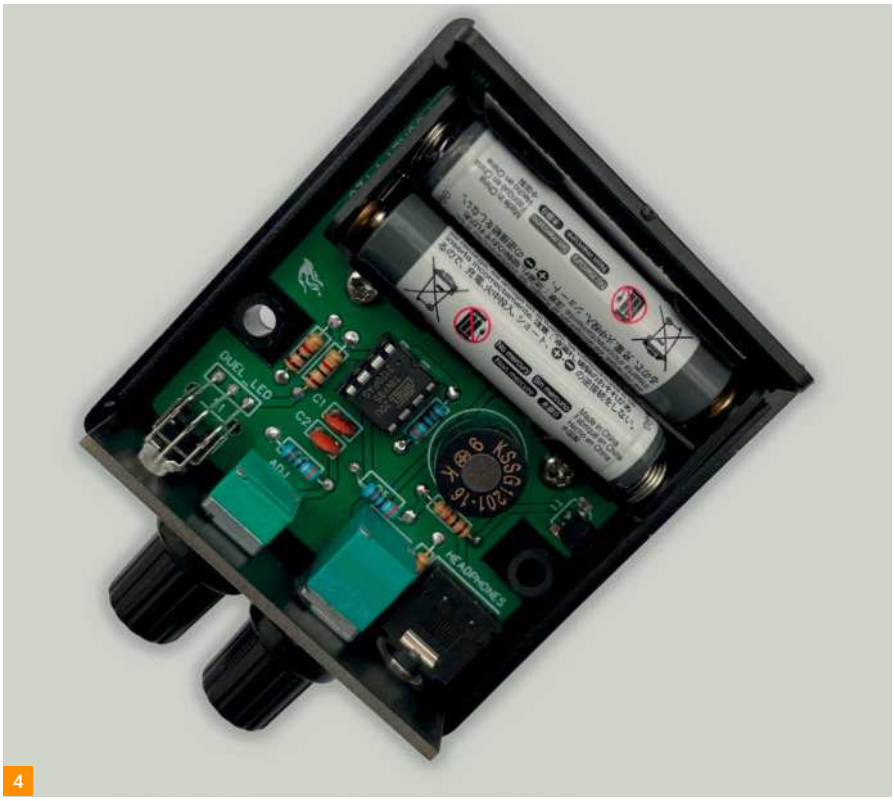
L = letters. N = Numbers. P = Prosigns. M = mixed. C = contest.

The callsign mode is interesting because it's a good way to prepare for receiving international prefixes that come in all shapes and sizes these days. Certainly, something I wasn't prepared for when I first started out. If you're considering contesting at some point, the PT20 can even replicate a simple contest exchange – very handy.

Conclusion

The PT20 offers a lot more than the good old D70 that I mentioned earlier and that many amateurs remember so fondly. Not least of which is that it can be available in your pocket any place, any time. It appeals on many levels and it's not a bad gift idea too. Much thought has obviously been given to this product and the price is definitely right. It's excellent for all levels of constructor, an ideal club project, great for learning or re-learning the code, excellent for taking basic code a stage further and preparing for real on-air contacts.

My thanks to Paul at Kanga Products for the opportunity to review this item. Kit version £23.00. Assembled £29.00. Prices correct at time of press. **PW**



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Practical Wireless Christmas Quiz

Here are a couple of questions a day to keep you thinking during each of the 12 Days of Christmas! Some history, some on antennas, some on general amateur radio skills and knowledge. No prizes – just a bit of festive fun – so award yourself 1 point for each correct answer, except for the last four questions which score up to 4 points each. The answers can be found on page 57.

Q1. The first issue of *Practical Wireless* was published in September 1932, **Fig. 1**. How much did it cost at the newsagent?

Q2. If you applied for an amateur radio licence in England when the first issue of *Practical Wireless* was published, what prefix would you have been issued: (a) G2, G3 or G4, (b) G2, G5 or G6, (c) G3, G4 or G5, or (d) G5, G6 or G8?

Q3. Solar cycles are approximately 11 years long, **Fig. 2**, but in which year did Solar Cycle number 1 begin: (a) 1555, (b) 1655, (c) 1755, or (d) 1855?

Q4. Who originally developed frequency modulation (FM) transmission: (a) Heinrich Hertz, (b) Peter Eckersley, (c) Lee de Forest, or (d) Edwin Armstrong?

Q5. The ARRL's DXCC award was introduced in which year: (a) 1935, (b) 1937, (c) 1945, or (d) 1947?

Q6. In which year was 'SOS' adopted as the radio telegraphy signal for distress: (a) 1900, (b) 1906, (c) 1912, or (d) 1918?

Q7. When was the first UK Foundation licence issued?

Q8. Who was the Patron of the Radio Society of Great Britain until 2021?

Q9. To the nearest whole figure, how long is a half-wave dipole antenna for 50MHz?

Q10. What is a 'coupled resonator' antenna?

Q11. What is a 'Quagi'?

Q12. The G5RV antenna is usually described as a 'multiband' antenna but its inventor, Louis Varney, originally designed it and optimised it for which HF band?

Q13, Which antenna has the most gain: (a) a quarter-wave ground plane, (b) a half-wave dipole, (c) a six wavelengths-long wire, or (d) a full-wave loop?

Q14. If you were to 'dip and load' something what would you be doing?

Q15. What does 'working split' mean?

Q16. Approximately how many islands or island groups with IOTA reference numbers are there in the IOTA programme today? (**Fig. 3**): (a) 1000, (b) 1100, (c) 1200, or (d) 1300?

Q17. The IOTA reference number for the mainland of Great Britain in EU-005. But what is the IOTA reference for the Isle of Wight?

Q18. Which, according to Club Log, is the 'Most Wanted' (that is, the rarest or least worked) DXCC entity, as of October 2022 (world-wide, regardless of mode): (a) Scarborough Reef BS7H (**Fig. 4**), (b) Crozet Island FT5W, (c) Bouvet Island 3Y/B, or (d) DPRK (North Korea) P5?

Q19. What was the listed claimed input power of the KW Atlanta transceiver, **Fig. 5**?

Q20. What does the abbreviation 'CW' stand for?

Q21. What are the following operating trophies awarded for: (a) the G5RP Shield, (b) the Brendan Trophies, (c) the Elser-Mathes Cup, and (d) the ROTAB Trophy?

Q22. For those amateurs that are permitted to use the 60 metre (5 or 5.3MHz) band, what is the maximum allowable power in: a) USA, (b) the UK, (c) New Zealand, and (d) Bonaire, St Eustatius and Saba?

Q23. Radio in general and amateur radio in particular use numerous abbreviations – and a lot seem to begin with 'D': DX, DXCC, DARC, DOK, DAC, DVK, DAB. But what do these 'Ds' stand for: (a) DSP, (b) DMR, (c) DSB, and (d) DRM? (1 point for each).

Q24. In the UK the licensing authority is Ofcom. But which countries have: (a) Agentschap Telecom, (b) the FCC, (c) BnetzA, and (d) Traficom, as their licensing authorities?

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1

Salvaging Laptop Screens and Batteries for Amateur Radio

Daimon Tilley G4USI explains how to 'recycle' laptop screens and batteries.

I like to think that it is in the nature of most amateur radio operators to tinker, and this month I am going to describe two very practical and simple projects, which take old redundant laptops and repurpose two of their components for use in amateur radio, or other purposes.

First of all, as I described in my last article, old laptops can sometimes be given a new 'set of legs' by a fresh install of an Operating System, especially a Linux distribution, or indeed perhaps additional RAM etc. But, inevitably, there comes a point where that is not worthwhile or necessary. What happens to the laptop then? Most recycling centres will take them and dispose of them appropriately. Before you take it to a recycling centre though, why not harvest useful parts, particularly the screen or batteries, for use in the hobby? We can always make use of battery power, particularly for portable work, or to allow operating during power cuts, etc. As for the screen from a laptop, well re-using them as a computer monitor can provide cheap additional screen space for the shack or for a 'go-box' or whatever.

Batteries

Most older laptops will contain a number of Lithium-Ion (Li-Ion) cells. These cells are typically 18650 cells, which are a little larger than AA cells and have a nominal voltage of 3.7V per cell. There are often around six cells in each laptop battery pack and these tend to lose capacity over time. This may be one reason for replacing the machine. However, in practice it is often the case that this is a result of just one or two faulty cells, with the other cells remaining perfectly usable. We can harvest these cells, test them for capacity, re-using the good cells and responsibly disposing of the ones that are beyond use.

Although the nominal voltage of a cell is 3.7V, when fully charged the voltage will be as high as 4.2V per cell. A widely agreed typical safe discharge voltage is considered to be 3.2V per cell. So, three cells in series will provide 12.6V at full charge, diminishing to about 9.6V at discharge. Four cells will provide 16.8V down to 12.6V.

Although many transceivers specify 13.8V as their required input voltage, most manuals show a tolerance of ±10%. This would indicate a supply voltage of between 12.42V and 15.18V. In practice, however, my experience is that with portable QRP gear, the range that can be safely used is significantly wider than this. I have personally used all of my (many) QRP rigs with both three cell and four cell batteries very successfully indeed.

But what if you are concerned about operating outside of your rig's specifications? Well, in practice there is not much to worry about working a little below the rig's specification. All of my portable rigs operate down to 10V with no issues whatsoever. Power output will likely be a little reduced, but not to a degree that concerns me. Similarly, I have never had any issues about using four-cell batteries at 16.8V, and benefit from slightly greater RF output as a result. If that does concern you though, it is simple to address that. You can either use a cheap 'buck' converter module from an online store to set a lower voltage, or you could use a simple diode or two. A diode has a typical voltage drop of 0.7V, so by adding two diodes in series in the positive line a reduction of 1.4V can be achieved, limiting the 16.8V to 15.4V at the rig. As the battery voltage drops, you might switch these diodes out of circuit to maintain the voltage delivered to the rig.

Making Good Use

So how do we harvest these batteries and put them to use? Well, first of all, a warning. Lithium-Ion batteries, while normally perfectly safe to use, can be dangerous if not handled correctly. For example, a significant short-circuit can cause the battery to catch fire or explode, as can physical damage such as crushing or puncturing. That said, if sensible precautions are followed, we can consider them as generally safe to use.

In reality, the greatest risk comes at the time of harvesting the cells from the laptop and the process through to encasing them again in your chosen battery container. Let us now examine how we might do that.

Most laptop battery packs are removable and are not designed to be opened at all. This makes them really quite difficult to open safely. It is not possible to describe here how precisely to do this as every pack is different. My advice is to move outside and to wear safety specs, some stout gloves and to use hand tools to pry or break open the plastic casing, paying great care not to damage the cells inside. This can be tough work and take a while, but patient persistence is the way to go.

Once open, inside the plastic case you will often find a small circuit board and number of coloured cells. Remove these entirely and carefully cut away the wiring between the circuit board and the cells. DO THIS ONE WIRE AT A TIME to prevent a short circuit. You should now be left with a number of cells, often joined together by a zinc metal strip that is spot-welded to each end of the battery.

Again, being careful to not create a short circuit,

separate the cells from this metal strip to give individual cells. I find an easy way to do this is to use a pair of fine nose pliers. I grip the zinc strip between cells and twist them, wrapping the zinc around the pliers in a spiral. This will rip the zinc from the cell ends and leave a couple of raised points on each end of the cell. Dispose of the sharp zinc strip and plastic casing carefully and then gently tap each end of the cells on a slab or other hard surface to flatten the raised points on each cell.

The next stage is to charge each cell individually, for which you will need an appropriate charger for Li-Ion cells. I personally use one by Nitecore, which will charge four cells at a time, but many other brands are available. Once charged there are two ways to test the cells to identify the good and bad.

The simplest and easiest way is to measure the cell voltage using a multimeter after charge. If any cells are reading below 4.1V at this stage (most should be nearer to 4.2V), then discard them in a responsible way, recycling if possible. Write the voltage on each cell using a permanent marker and then set aside safely for a week or more and measure the voltage again. If it has dropped by more than a few decimal points, say anything more than 0.2V, I personally assume it will not hold charge and again, dispose of it safely. The others should be good to use.

A little more complicated, and more time-consuming method is to properly check the capacity of the cells to gain a reading of what the actual amp-hour (Ah) capacity is. To do this, you again charge the cells and then use a cheap module available online. It is called a ZB2L3 battery capacity tester. These cost around £4 to £6 and are very useful. They come with one or more resistors to act as a load, but a recent article in *QST* magazine (ARRL) showed how to improve the reliability and accuracy of the readings by replacing the supplied resistors with an 8Ω, 100W resistor, mounted on a heatsink, in my case a piece of aluminium angle.

The process is to charge an individual cell, connect it to the module and set the module to discharge to a set voltage (I set it to 3.2V). The module will discharge the battery slowly and at the end, display the measured battery capacity in milliamp-hours (mAh). The process can take several hours per cell, but by going through this discipline, and writing the mAh rating on the cell, you can then later match cells of similar capacity when putting together a battery pack.

If you don't want to go down that route, then it is possible to determine the factory-rated capacity of each cell by the information printed on it. A combination of brand, numbers and cell colour will help you identify the original battery capacity by using the website below or similar databases: **https://tinyurl.com/2bfymtku**

Of course, there is no guarantee that the battery has maintained that level of capacity, but it can help to give you an indication and to match cells of similar capacity from different sources, when building a battery pack.

Fig. 1: Three cell battery unit. Fig. 2: The six-cell battery unit. Fig. 3: Three cell unit in an Altoids tin. Fig. 4: Driver and control board taped to the back of the screen. Fig. 5: The control buttons. Fig. 6: Screen and ancillary boards inside the author's Go-Box.

Creating a Battery

Having successfully harvested and checked a number of cells, we need to consider how we are going to use them together as a battery. There are three main routes, all fairly straightforward.

Perhaps the simplest way is to use a standard battery holder, of the type you might use for AA cells. A search for '18650 battery holder' will bring plenty of internet results, with spring loaded battery holders for between one and four cells. Pictured, **Fig. 1**, is my own three-cell battery box of this type, terminated in a 2.1mm co-axial power plug, which is my shack standard for QRP gear. The advantages of this approach are that it is cheap and simple. The disadvantages are that you will need to remove the individual cells to charge on a separate charger, and there is no inbuilt short-circuit or other protection.

Another simple route is to purchase a battery box with a built in Battery Management System (BMS) to which you just need to add your own harvested cells. These are a little more expensive, but still cheap if ordered from China, and look more professional. They usually include short circuit protection, under and over voltage protection, and allow balanced cell charging from an external power supply (no special charger needed). My own 12V, six cell, unit is pictured, **Fig. 2**, and has the batteries in a three Series, two Parallel (3S2P) configuration. The three cells in series provides a nominal 11.1V, which the in-built circuitry maintains at 12V. The two parallel configuration is effectively doubling the capacity of the battery. So, for example, if cells of, say, 2,000mAh are used, the parallel configuration should give an overall battery capacity of 4,000mAh or 4Ah. This takes us back to checking the capacity of our harvested cells. By using cells of similar capacity we can achieve best results. A good internet search term for such boxes is '12V 18650 DIY Power Bank'.

I mentioned balanced charging above. Balanced charging is where the system charges each individual cell separately, rather than as a single battery, in the same way that an external charger such as my Nitecore does. This ensures each cell is charged to the same voltage, improving the performance and life cycle of the battery.

The final solution to be described here is to

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connect your cells together yourself, connecting them to a BMS board and building your own enclosure. This is easier than it sounds. A search on the internet for '3S BMS' will bring plenty of results for a 3S pack. A 20A version is more than sufficient and will set you back a little over £3.50. It is then a case of lining up your three cells correctly, gluing them together and soldering the connections between cells and the BMS, which is sized to sit 'on the end' of the three cells. It is a little tricky to explain this part, but more details on the build, photos and a wiring diagram are available on my website at: **https://tinyurl.com/buyhw9pb**

The end result was housed in an Altoids mint tin as a nice compact unit, pictured, **Fig. 3**. This little pack was made before I built my capacity tester, but I used three cells that held their charge and that were from the same laptop. If you wish you could make this a 3S2P pack, by having a bank of three cells in parallel with a further three. To balance charge this pack you would use the same 3S BMS board but balance charge the cells in pairs rather than individually.

To test the pack I connected my QCX Mini which has a WSPR beacon facility and transmitted at 5W. I used a two-minute transmission window every ten minutes. The pack lasted for 5.5 hours and a total of 33 WSPR transmission windows. That is a receive time of about 4.5 hours and a transmit time of a little over an hour. I am happy with that, especially as WSPR is 100% duty cycle, CW being considerably below that, at around 50 to 60%. So, with CW operating I reckon I will happily operate for a day and given that my portable

activities are usually for periods of no more than a couple of hours, I think I probably have three QRP portable operating 'days' available to me from this pack.

If you wish to build a much bigger pack, by using more batteries in parallel, or perhaps for 24V gear, then you may wish to consider special connectors that space and hold the cells together in a grid and allow the cells to be connected together using nickel strips, nuts and bolts. I have not used one personally, but an example can be found here:

https://tinyurl.com/2suryfad

Laptop Screens

For many of us, computers and displays are an integral part of our hobby, and often the more screen 'real estate' we have, the better. As well as three commercial monitors in the G4USI shack, I have an old laptop display in use as a CCTV monitor, and a large 17in laptop display built into my HF/VHF/UHF go-box project.

So how do you make use of laptop screens as external monitors? Well, it is surprisingly easy and I will take you through it step-by-step.

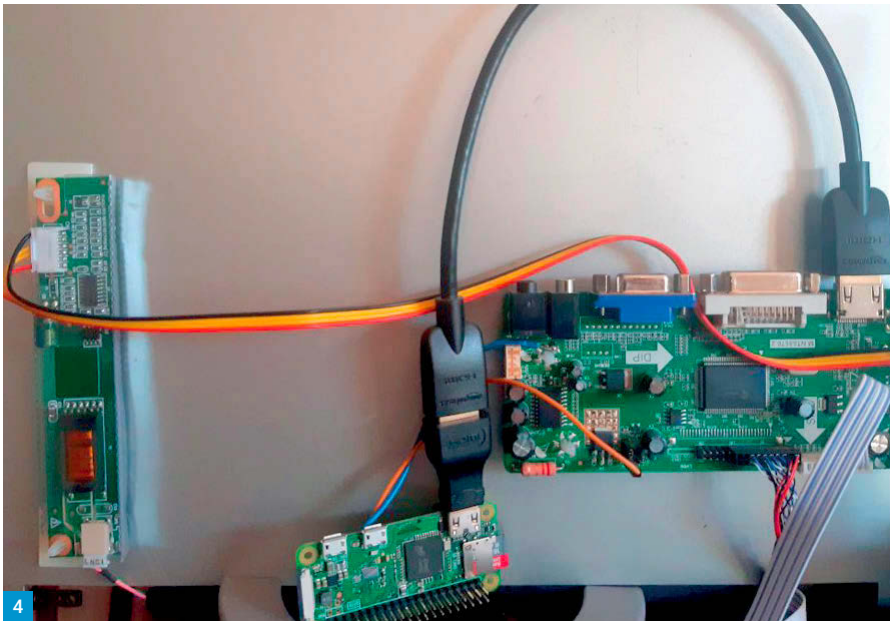
First, of course, you need to carefully remove the screen part (lid) of the laptop from the main body, and there are two parts to this. You need to disconnect the screen at the hinges and also remove any connecting ribbon cable between the two parts. You will not need this cable again, so feel free to cut it (assuming the laptop is powered down, of course!).

Once the screen is off, you need to remove the actual LED element from the casing and bezel. Do this carefully as we want to return the screen to this casing later. Often there are some little screw caps around the screen surround, which will pop off with a small screwdriver, revealing mini screws. Removing these screws removes the bezel. Inside you will see any ribbon cable and wiring, and sometimes there may be speakers and a webcam. Remove those for future projects if you wish. Next you should see that the screen is in a metal surround, which itself is screwed to the back case. Remove these screws and gently lift the LED panel out, turning it over to show the rear.

Now, this part is delicate. The ribbon cable from the machine will go into a connector on the rear of the screen, and is probably held in place with some tape. Carefully peel this tape back and remove the cable. The screen should now be entirely free of encumbrances.

On the rear should be one or more stickers with a variety of numbers and this is where it gets a bit 'try it and see' for a moment. One of these numbers will identify this screen as unique from other types. We need to identify that number so that we can purchase a driver board for that model. You cannot just attach your computer to the screen as it is.

You need to take one of the numbers and put it into your web browser, adding the words *"LED driver board"* after it. Do this until you have tried a number that works, and that will be the board you need. Prices vary but are typically around the £15 to £20 mark if purchased from China via AliExpress, Banggood or similar.



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When this board arrives you attach the provided ribbon cable to your screen, apply 12V to the driver board and plug in the device you want to show on the screen. Most of the boards accept a variety of inputs, usually VGA, DVI and HDMI. Many also come with a second smaller board with some control switches on to adjust brightness, ratio and usual controls you would expect from a monitor.

And that is it. You are ready to go! I tend to then place the screen back into the casing of the laptop lid to give a neat appearance. You then need to find a way to mount the driver board and control board. This will depend on your application. On my CCTV monitor, I used self-adhesive PCB stand-offs to secure it to the back of the screen casing, and used self-adhesive tape to stick the control buttons on the front (see pictures, **Figs. 4** and **5**). The item dangling from the rear and not affixed is a Raspberry Pi Zero. This is acting as a 'kiosk server' and effectively fetches CCTV images from my router's wi-fi network, displaying them on the screen.

Also pictured is my laptop screen in the inside lid of my Go-Box project, **Fig. 6**. On this picture the laptop screen is pictured with a Raspberry Pi 4 to the top right, with the LED driver board underneath. A 5V buck converter takes the 12V input I use for the screen and radio, and provides 5V for the Raspberry Pi. A 128GB solid-state drive (SSD) is connected to the Pi and tucked behind the display. The display is used for any task I choose, but primarily the intent is for SDR software to complement the SDR transceiver I intend to integrate, but also for digital modes and logging.

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Enough for Now!

So that is it for this month. I hope you find these ideas helpful and that they inspire you to make use of these parts in any old laptop you may have. Don't forget, of course, that there are many other components you may wish to harvest from the laptop, including RAM and hard drives. Don't neglect the keyboard either, the key caps can be prised off and used to make neat signs, a callsign plaque maybe, or any other sign or notice of your choosing.

In the next instalment of *On a Budget* I will be presenting a practical antenna project, how to build a 49:1 UNUN to make a multi-band End Fed Half Wave antenna. **PW**

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561.....Iambic CW Travel Paddle.....£44.95

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911H..... 1:1 or 4:1 Switchable Balun.....£59.95
912.....4:1 Remote Balun box.....£89.95

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923.....2m/70cms Tuner & SWR/Power..£299.95
931.....Artificial ground unit.....£149.95
934.....300W Tuner + artificial ground..£359.95
941.....300 Watts Versa Tuner II.....£249.95
945.....1.8-60MHz 300W manual tuner..£234.95
948.....300W PEP reading ant tuner.....£219.95
949.....300W tuner + Dummy load.....£299.95
959C..... Receive ant tuner + pre-amp.....£179.95
971.....200W 1.8-30MHz Portable ATU .£179.95
974HB.....300W Balanced Tuner.....£299.95
986.....1.5kW HF differential ATU.....£499.95
989D..... 1.5kW HF Roller Inductor ATU....£599.95
991B..... 150W HF Auto Tuner.....£309.95
993B ..... 150W/300W Auto Tuner.....£395.95
993BRT... 150/300W Auto Remote Tuner...£495.95
994BRT... 600W remote Auto Tuner.....£549.95
998.....5kW 1.8-30MHz Auto Tuner.....£849.95
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1112..... 6 way 15A DC multi power outlet...£59.95
1117..... 4 way 35A DC multi power outlet...£89.95
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1129..... 10 way 40A DC power outlet.....£159.95

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1020C..... Tuneable indoor active antenna...£159.95
1026..... QRM eliminator+active antenna.£299.95
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1799X..... 9 Band vertical.....£379.95
1982LP... End fed half wave 80-10m 30W...£64.95
1982MP.. End fed half wave 80-10m 300W.£95.95
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1904H..... 25ft Strong Telescopic mast.....£224.95
1904HD.. 25ft Super Strong Fibreglass.....£249.95
1906..... 33ft Strong Fibreglass mast.....£224.95
1908H..... 43ft Strong Fibreglass mast.....£359.95

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1700C..... 6 Way coax switch,2kW.....£189.95
1701..... 6 Way coax switch 2kW (SO239)..£119.95
1702CN.. 2 Way coax switch 2kW (N Type)..£99.95
1704 (P)..4 way coax switch 2.5kW (SO239)£139.95
1704 (N)..4 way coax switch 2.5kW (N type)£139.95
1705H..... RF By-pass switch 60MHz 1.5kW...£59.95
1708B..... RF Sensing T/R Ant Switch 200W.£132.95
1708BSDR.....RF sensing SDR switch.....£179.95

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813.....QRP SWR/Wattmeter.....£59.95
826B..... Digital SWR/Wattmeter.....£295.95

DUMMY LOADS
260C..... 300W DC-650MHz SO-239.....£74.95
260CN.....300W DC-650MHz N type.....£74.95
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1234B..... Rig Pi Station server.....£399.95

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COMET - UK IMPORTER

CA-52HB4
50MHz 4 element HB9CV Wideband Beam

£129.95

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

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- 1.8-60MHz
- 300W PEP

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GP-1M..... 144/430MHz 1.2m..... £59.95
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GP-6M..... 144/430MHz, 3.07m.....£99.95
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GP-9M..... 144/430MHz 5.15m.....£199.95
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BOX SET HF-350M
Multi Band Vertical

- Covers: 160m to 6m
- Complete Portable system
- With Carrying pouch

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CBL-2500.... 1.8-56MHz 2.5kW/CW.....£44.95

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DUPLEXER
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CF-530..... 1.3-90/125-470MHz SO239 2xPL259. £57.95
CF-530C.... 1.3-90/125-470MHz 2xSO239 PL259. £49.95
CF-706PL.. 1.3-57/75-550MHz SO239 2xPL259. £54.95
CF-706N.... 1.3-57/75-550MHz SO239 N PL259. £59.95

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CFX-514N..50/144/430 MHz 2 x PL259, N sock.. £69.95

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CMX-400.... 140-525MHz 30/60/300W.....£109.95

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AB1230M... Mobile Airband receive.....£39.95
AB380..... Base Airband receive.....£99.95

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CSB7900..2m/5.1dBi, 70cms/7.7dBi.....£79.95
SBB-2..... 2m/2.15dBi 70cms/3.8dBi 0.46m. £29.95
SBB-4..... 2m/3.0dBi, 70cms/5.5dBi 0.92m. £39.95
CA-285.... 2m/3.5dBi, 50MHz/0dBi 1.32m...£34.95

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

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CTC-50M...Thru window cable/SO-239 assembly £45.95
3D4-M..... SO239 socket/Cable assembly 4m. £26.95
3K-054M...SO239 w/ 4m miniature cable/PL259 £29.95
CS-400P...Lightning arrestor DX -500MHz...£29.95

MORSE KEYS

Iambic Chrome

Bencher BY-1

BENCHER
BY-1..... Iambic Black.....£189.95
BY-1B..... Iambic Black Chrome NEW!....£239.95
BY-2..... Iambic Chrome.....£239.95
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Pro-7IC..... For Icom (also Red EOL).....£279.95
Pro-Set 6.....HC6 element.....£159.95
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PRASEQ..... Audio Processing unit.....£269.95

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ICM.....Quality Hand mic for Icom radios.. £123.95
PR-781G..... Gold Studio Microphone.....£209.95

ACCESSORIES
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FS-2..... Footswitch dual channel.....£54.95
FS-3..... Footswitch single channel.....£35.95
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Full range of leads and mounts in stock!

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Tecsun H501x
Flagship radio with Bluetooth

- Covers: LW, MW, SW, FM (64-108 MHz)
- All mode reception incl. SSB

£329.95

Tecsun PL-990x
Top of the Range Portable Radio with Bluetooth

- Covers: LW, MW, FM, SW (1.711-29.999)MHz
- MP3 player via SD port

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SSB

SSB Masthead Preamplifiers

SUPER AMP - SERIES

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

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Sound card - Supports all digital modes
FT8, FT4, WSPR, RTTY, SSTV, CW plus lots more!

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- Radio Interface Lead..... £24.95

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- TX: HF Amateur Bands
- RX: 0.5-30MHz
- Large colour TFT Screen
- Built in Auto Tuner

20W Portable HF Transceiver **~~£449.00~~**

XIEGU X6100

- HF/50MHz ALL Modes + data
- Power: 10W external supply, 5W internal battery
- High-resolution colour screen
- Automatic Antenna Tuner
- Built-in Bluetooth/Wi-Fi function

10W QRP SDR Transceiver **~~£599.95~~**

XIEGU

Xiegu XPA-125B
100W Amplifier with ATU

- Covers: 1.8-54MHz
- Input power 1-5W
- Output power 125W (max)
- Antenna Tuner built-in

£599.95

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Digital Audio & Noise Filter

- Improves SNR up to 22dB
- Low cut - Hi cut audio filters
- Headphones or Speaker output
- Power: 12V DC (not supplied)

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Anytone AT-588
70MHz (4m)
40W FM Transceiver

- TX/RX: 66 -88MHz
- Memories: 200

~~£169.95~~ **now £139.95**

SPIDERBEAM

SPIDERBEAM YAGI KITS

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

SPIDERBEAM YAGI KITS

Spider 3	10/15/20m Standard	**£389.95**
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Spider 5	10/12/15/17/20m Standard	**£429.95**
Spider 5HD	10/12/15/17/20m HD	**£499.95**

TELESCOPIC MASTS AND POLES

Fibreglass Telescopic Poles

10m – **NEW!** Mini pole	**£69.95**
12mtr Heavy Duty	**£109.95**
18mtr Standard	**£229.95**
22m 'Long John' **NEW.**	**£399.95**
26mtr Standard	**£499.95**

Aluminium Telescopic masts
German engineered!

10 metre Standard (1.35m retracted)	**£399.95**
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Alinco DM-330MW MkII
'Best in Class!'
Communications Grade 30A Supply

£159.95

DM-330FXE..30A standard filtered supply..**£149.95**
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Alinco DR-MD520E
Dual Band DMR Mobile Radio

FEATURE PACKED!

- Built in GPS w/ APRS support
- DMR Tier 1 and Tier 11
- Large LCD colour display
- 55W VHF/ 40W UHF
- Plus lots more!

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Alinco DJ-MD5X-EG
Dual Band DMR/Analogue

- Built in GPS with APRS support
- Automatic repeater roaming
- Power: 0.2/1/2.5/5W

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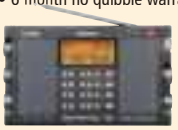
Acom 600S
600W Solid state Amplifier

- HF + 6 Metres
- Complete with box & handbook)
- 6 month no quibble warranty!

£1849



Tecsun H-501X
Portable SW radio with SSB

- Covers: LW, MW, Shortwave, VHF (FM).
- Large LCD Display
- Bluetooth
- Plus lots more
- 6 month no quibble warranty!

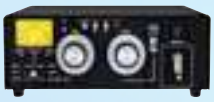
New £329.95 **Used £279**

Elecraft K3
with KAT3 ATU

- Manual
- Cables (no mic)
- 6 month no quibble warranty!

£1,695

PALSTAR



Palstar AT-2K
2kW Antenna Tuner

Built like a tank!

- Covers 160 - 6m
- 6 Way antenna switch

£699.95

DIAMOND POWER SUPPLIES

Genuine Diamond with 2 year warranty!

GZV-2500

- 25 Amp (5-15V DC) supply
- With built-in speaker

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GZV-4000... 40 Amp (5 -15V DC)..... **£199.95**
GZV-6000... 60 Amp (5 -15V DC)..... **£359.95**

ALINCO

Alinco DX-10
28MHz Multi Mode Transceiver

- AM/FM/SSB/CW
- 25W RF output
- Channel operation
- Frequency Programmable
- Multi colour display

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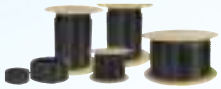
ULTRA LOW LOSS COAX



Ecoflex 15
per metre.....£8.29 price per 102m drum..... **£829**
Ecoflex 15 plus
per metre.....£8.95 price per 102m drum..... **£889**
PL259 connector (Part: 7350)..... **£8.95**
N type connector (Part: 7395)..... **£10.95**
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per metre.....£4.75 price per 102m drum..... **£430**
Ecoflex 10 plus
per metre.....£4.30 price per 102m drum..... **£429**
PL259 connector (part: 7378)..... **£5.95**
N type connector (part: 7367..... **£6.50**
Aircell 7
per metre.....£2.99 price per 102m drum..... **£279**
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N type connector (part: 7392)..... **£6.95**
Aircell 5
per metre.....£2.75 price per 102m drum..... **£259**
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RG-213 (Cabnex) Drum..Low loss good quality.. **£139.95**
RG-Mini 8..... Super XX..... **£99.95**
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Twin Feeders
450 Ohm..... Twin feeder..... **£89.00**
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Coated flex weave Antenna wire..... **£69.95**
Nevada KEVLAR – green ultra-strong wire!
Nevada 28..... 2.8mm 2kW per metre..... **£0.99**
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LDG ELECTRONICS

FAST AUTO TUNERS

REMOTE – DESKTOP – ZERO POWER

Designed to work seamlessly with your transceiver and match a wide range of antennas!

Z-100 Plus
Zero power Auto Tuner

Handles 125 Watt and will work from just 100mW of drive. Latching relays use almost zero current once tuned. 2,000 memories and a matching range of 6 to 800 Ohms its ideal for Portable or mobile operation

£179.95

AT-600 Pro II
General purpose Auto Tuner

Designed for mid sized amplifiers up to 600 Watts with a large easy to read bargraph that shows Forward/Reverse power and SWR. Switch between two antennas with 2,000 memories for each antenna, giving almost instantaneous recall.

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AT-100 Pro II
100W & QRP Auto Tuner

Requires just 1W for operation, so ideal for QRP, but will also handle up to 100W. Has two antenna outlets and 2,000 memories per antenna. The bargraph display provides both 12.5W and 125W scales for easy QRP or higher power readings.

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LDG IMPORTERS of LDG products

AT-1000 Pro II
Flagship Auto Tuner

Handles 1,000 Watts with a large easy to read Bargraph display. Covers 1.8-54MHz with a choice of two antennas. Matches from 6 to 1,000 Ohms so easily handles Yagis, Dipoles, or virtually any coax fed antenna.

£539.95

Z-11 Pro II
QRP Portable Auto Tuner

Ideal QRP tuner needing just 0.1W for tuning, but capable of 125W. Dedicated buttons for manually fine tuning the antenna once near match. Ideal for portable use with internal AA batteries requiring just 20 micro amp standby current.

£199.95

BALUNS
LDG provide a selection of 200W Baluns & UNUNS with 1:1, 2:1, 9:1 & 49:1 ratios

FROM £34.95

RBA-4:1 RU-9:1 Unun RU-1:1 Unun RU-49:1 Unun

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YAESU

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

Hy Gain YRC-1X
Computer controllers for Yaesu rotators

£249.95

CREATE
Uses worm gear for higher torque
RC5-A3
Heavy Duty with preset controller

£899.95

RC5-3	Medium/HD with pre-set	**£679.95**
RC5-1	Medium duty	**£569.95**

AIRSPY

Airspy HF+ Discovery

- Pre-selectors
- 9kHz - 13MHz
- 60MHz - 260MHz
- Use over internet
- 60x45x10mm

£199.95

Airspy R2
VHF/UHF/SHF Receiver

- 24MHz-1,800MHz
- 10MHz panoramic spectrum
- 3.5 dB NF (42-1002)MHz
- Tracking RF filters

£199.95

Airspy Mini

- SDR Dongle
- 24 – 1,800MHz

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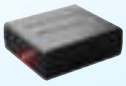
SDRplay

RSPdx SDR in metal case
Covers: 1kHz-2GHz
Now with Improved:

- Performance below 2MHz
- Plus more!

£194.95



RSP 1A
Wideband Budget SDR

- Covers: 1 kHz - 2GHz
- Software upgradable
- Good dynamic range

£99.95

RSP DUO Dual Tuner SDR

- Covers: 1 kHz - 2GHz
- Software upgradable

£239.95

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XIEGU G-106

NEW PRODUCT

- QRP Portable Transceiver
- 5W RF output, 3 CW Filters
- AM/CW/SSB + FT8 (with DE-19 option)
- Receives: 0.55 – 29.7MHz + FM Broadcast

£329

FOR A RELIABLE FAST, FRIENDLY SERVICE

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ACOM Amplifiers you can trust!

FREE UK MAINLAND DELIVERY this month!

Acom 1500
- Power: 1.5kW PEP
- Frequency: HF + 6m
- Silent QSK operation

£3299.95

Acom 1200S
- Covers: 1.8-54MHz
- Power: 50W input for 1.2kW output
- Full protection for SWR and overheating

£2999.95

Solid State Amplifiers

A1200S	1.2kW HF + 6m…new version	£2999.95
A700S	700W HF + 6m	£2599.95

Valve Amplifiers

Acom 1000	1kW HF + 6m	£2599.95
Acom 1010	700W HF	£1979.95
Acom 1500	5kW HF + 6m	£3299.95

Auto Antenna Tuner

Acom 04-AT	1.5kW Auto Tuner + 4 way switch	£1069.95

ICOM Hot products!

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

£1299.95

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

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

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Full ICOM RANGE in Stock!

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NEW

FT-710 AESS
HF/50MHz 100W SDR
- Pre-set mode for FT8
- 4.3 inch TFT Colour Display
- Plus many features

£1099

Yaesu FT-991A
Full coverage HF/VHF/UHF
- 160-6m, 2m and 70cm
- SSB/CW/FM/AM/RTTY/PSK/C4FM
- 160-6 meter built-in Autotuner

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

£2999.95

Yaesu FTdx-101MP New 200W version **£4199.95**

ICOM

NEW

New from ICOM

Icom ID-52E
D-STAR Digital Handheld
- Bluetooth Technology
- UHF Military Airband RX
- Picture sharing function
- Louder audio output
- Waterfall Scope
- Tough & IPX7 Waterproof
- Micro SD card slot

£549.95

YAESU

New Product!

YAESU FTM-200DE
50W DUAL Band C4FM/FM with single receiver & GPS
- TX: 2m/70cms
- RX: 108-999.995MHz
- Recording function
- Micro SD card slot

£349.95

DAIWA

QUALITY PROFESSIONAL METERS from JAPAN at AFFORDABLE PRICES
Factory Direct - FULL RANGE IN STOCK!

CN-901HP
- Freq: 1.8-200MHz
- Power: 20/200/2kW

£154.95

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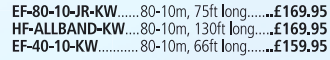

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PA70-3-1A	4m 3 el 6.9 dBi 1m	£99.95
PA70-4-1.5B	4m 4 el 8.2dBi 1,46m	£159.95
PA70-5-3B	4m 5 el 3m boom	£189.95
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PA144-432-37-7-2CBGB	12/25 el 2 con	£349.95
PA144-432-13-1,5-2CB	5/9 element 2 con	£159.95
PA144-432-17-2A	6 el/ 12 el	£184.95
PA144-432-19-3-2CBP	7 el / 12 el	£226.95
PA144-432-21-3BP	7 el / 14 el	£219.95
PA144-432-13-1.5A	5 el/9 el 1.5m boom	£139.95
PA144-432-34-6-2CBGP	11 / 23 el 2 conn	£369.95
PA144-432-38-6BG	11 / 28 element	£299.95

2M Yagis

PA144-5-1.5B	5 el 1.5m boom	£99.95
PA144-6-2A	6 el 2m boom	£119.95
PA144-8-3	8 el 3m boom	£169.95
PA144-9-5A	9 el 4,67m boom	£199.95
PA144-11-6BG	11 el 5.72m boom	£249.95
PA144-12-7BGP	12 element	£342.95
PA144-13-8BGP	3 el, 7.84 boom	£339.95

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PA144-CROSS-20-6BP	2m 10 + 10 element	£349.95
PA144-XPOL-16-4-5B	2m 8 + 8 element	£249.95
PA144-XPOL-18-5B	2m 9 + 9 element	£295.95

70cms Yagis

PA432-8-1.2RA	8 el 1.2m boom	£121.95
PA432-14-3	14 el 3m boom	£169.95
PA432-23-6	23 el 6m boom	£259.95
PA432-30-8BG	30 el 8m boom	£269.95

23cms Yagis

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PA1296-36-3BUT	36 el Teflon Balun	£189.95
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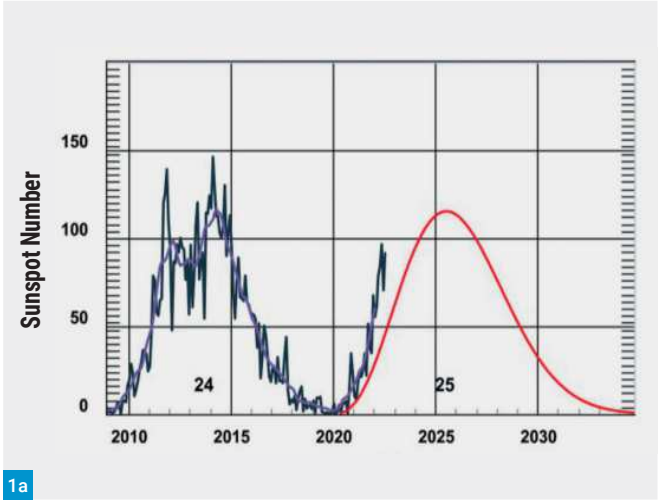

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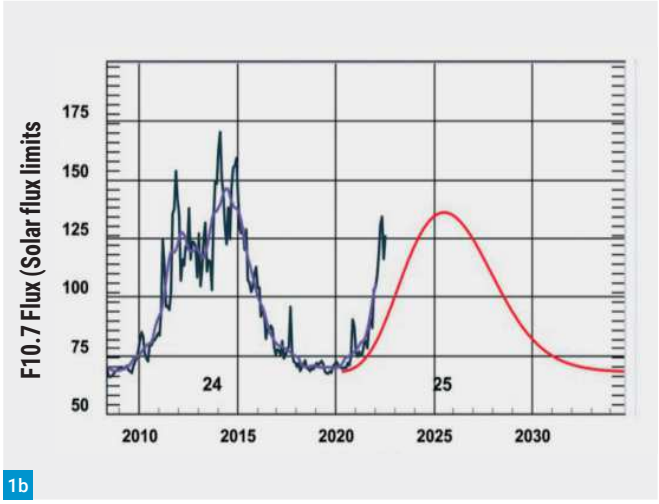

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The Good Times Continue

Steve Telenius-Lowe PJ4DX lhas another busy column, with readers managing to work plenty of stations across all bands.

Steve Telenius-Lowe PJ4DX
teleniuslowe@gmail.com

Welcome to the December *HF Highlights* and, if it is not too early, I'd like to wish a very Merry Christmas to all readers. The Solar Flux Index (SFI) peaked at 163 on 11 October and was at or above 150 for weeks, leading to enhanced propagation on the higher HF bands and F2 openings as high as 50MHz. The Sunspot Number (SN) was briefly as high as 173 on 3 October but had fallen by the 11th of the month, see **Table 1**.

Solar Cycle 25 is coming along very nicely: **Fig. 1(a)** shows how the cycle's Sunspot Number has been progressing while **Fig. 1(b)** shows the 10.7cm Solar Flux over the same period, courtesy of the Space Weather Prediction Center, part of the US government's National Oceanic and Atmospheric Administration (NOAA). In both cases the red lines show the predicted levels and it can be seen that the actual recorded values, in blue, are well above those predicted.

www.swpc.noaa.gov

HF Highlights in 2023

The next *HF Highlights* column will be the first of the New Year and, with the agreement of the *PW* Editor, I would like to introduce some minor changes. Both Don and I believe that the long lists of callsigns of stations worked in the 'Around the Bands' section of the column are of little interest to most readers. I have already been editing these lists quite strictly so as to prevent them from taking up too much space in the column but, from next month, I will be even more ruthless! The column is called *HF Highlights* and I would like to include only the real *highlights* of what you are working each month. In practice this means that, with a few exceptions, I won't include any European callsigns or those from 'near DX' such as EA8, CT3, 4X, TA, 5B4 etc. Even those running low power and/or simple antennas should be able to work the eastern half of the USA and Canada most days, especially now that the sunspot cycle is progressing so well and, for the next few years at least, we should be enjoying better HF propagation.


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of the XXII Commonwealth Games

Celebration Radio Marathon

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For the last couple of years I have been following the progression of the new solar cycle as activity has been increasing. I think it has been interesting to see a snapshot of the solar activity each month, but now that we are moving closer to the peak of the cycle (expected to be in 2024 or 2025) it will no longer be necessary to include solar flux or sunspot numbers each month. I will, of course, still report on unusual activity and propagation as and when it occurs.

Finally, I would like to include more illustrations in the column so I am asking for readers to send in some photographs. Almost everyone these days has a smartphone capable of taking good photos, yet only two or three of the regular contributors to this column send in any pictures. Please go out and take a photo of your antenna(s) or ask a family member to take a photo of you in the shack. Have you put on a special event station recently? If so, please send in a picture of the activity. Did you receive a particularly special QSL card this month? Or have you received an operating certificate recently? (I'm happy to receive .JPG, .PDF or .PNG images.)

To kick us off, **Fig. 2** shows the certificate I received for working over 40 Commonwealth countries during this summer's Commonwealth Games held in Birmingham. Also, in September I worked **Harald Becker DF2WO** operating as **XT2AW** from Burkina Faso on 21, 24 and 28MHz. **Fig. 3** shows his QSL card, received from his QSL Manager, **Charles Wilmott M0OXO**.

Amateur Radio Transatlantic Centenary

Christmas Eve this year marks the 100th anniversary of the first European amateur radio station being received in North America.

Fig. 1: How Solar Cycle 25 is progressing: (a) Sunspot Number, (b) 10.7cm Solar Flux. (Images from NOAA/Space Weather Prediction Center). Fig. 2: PJ4DX's RSGB 'Commonwealth Games' certificate. Fig. 3: QSL from Harald XT2AW. Fig. 4: Inquisitive visitors inspect the 2E0HPI/P station at RSPB Saltholme (GFF-0226). Fig. 5: 440 FT8 contacts made by ZG2GI on eight bands from 5 to 8 September.

That station was 5WS in Wandsworth, London. To commemorate the centenary, the RSGB is hosting the 'Transatlantic Centenary Tests' during the whole of December.

Details of this event appeared on page 6 of last month's *PW*, but it's worth repeating briefly here. Look for 11 historic callsigns: G5WS, G5AT, G6XX, G6ZZ, G3DR, GM5WS, GW5WS, GU5WS, GD5WS, GJ5WS and GI5WS operating on CW, SSB and digi modes on all bands from 1.8 to 28MHz. There are five awards available for making various numbers of contacts with these special stations.

UK amateurs are invited to operate the special callsigns from their home stations. Further details of how to participate and of the awards are at:

rsgb.org/transatlantic-tests

Readers' News

"*I was determined to a work a DX station each day of September"* says **Victor Brand G3JNB**. "*All went well with contacts in Suriname, Brazil, Puerto Rico, Madagascar, Mali, Morocco and Argentina. Then came 8 September* [when HM The Queen died – **Ed**]. *I closed down for a period but, on returning, found the DX bands in fine fettle – some of the time* [see 'Around the Bands'].

"Having long hoped that a new digital service would emerge with full 'keyboard-to-keyboard' facilities, I was much taken by the RSGB/NARC 'Tonight at 8' presentation by our ***Mike Richards [G4WNC]*** *on the recently-introduced VarAC suite by* ***Irad Deutsch 4Z1AC*** *and his team. Being almost a computer illiterate, my initial attempt to install and operate the software was unsuccessful but Mike very kindly came to my rescue. Certainly, once up and running in the last days of the month, I find this mode to be a delight. I see it as the worthy successor to our beloved Digipan, but on steroids! So easy to use and comprehensively equipped, I commend VarAC to the readers. New features are still flowing from the development team and I anticipate that there may soon be considerable migration from the FT8 channels! My 20 watt G3JNB beacon, on 20m to a small vertical, has seen PSK Reporter (accessible direct from the VarAC window) responses from far and wide, with my best DX report and 'vmail' this morning from VK2ATW."*

See this month's *Data Modes* column by Mike G4WNC for much more on VarAC and VARA, and how to install them.

Carl Gorse 2E0HPI/P wrote that *"September has brought some good activations with plenty of contacts and some DX using the Elecraft KX3 and the Slidewinder DX antenna by M1ECC Antennas. Even had the cattle joining in at one point* (**Fig. 4**)*!"* Carl bought a weekly rail rover ticket to put on POTA activations in northern England, South Yorkshire and Lincolnshire. After **HM Queen Elizabeth** passed away Carl used 2Q0HPI/P on 7MHz SSB to work the WAB Awards group callsign GQ3ABG, the BBC Amateur Radio Group station GQ8BBC and others using special 'Q' callsigns. *"I think over the month I've managed to work over 1000 QSOs from 80m to 10m with some good propagation... We also held the GxFF Autumn activity weekend for a second year. It was a successful weekend and hopefully have other activities planned over the winter",* he added.

In his regular 28MHz beacon report **Neil Clarke G0CAS** reported that the Sporadic E season continued to decline, although on 1 September 29 beacons were heard. *"The 7th saw a good opening to Italy and Spain when 14 beacons were logged. This was the last day when I heard the number of beacons in double figures. The most heard beacon from Europe this month was IW4EIR 28194 on eight days. The average daily number of beacons heard for September was six. Small localised openings can still take place throughout October."*

Neil said that, overall, the 2022 summer Sporadic E was a good one, judging by the number of beacons heard. *"For those who enjoy the DX on 28MHz conditions should improve and, with the continuing increase in the sunspot cycle, good times lie ahead. On the 5th FR1GZ 28215 was heard for the first time since 27 May. Just in time for the DX season an old friend returned on the 16th, 5B4CY 28219 was logged for the first time in a long time and then was heard on a further seven days. 4X6TU 28200 was heard on 16 days during the month. Also in that general direction SV5TEN 28188, SV2RSS 28265, SV6DVG 28269 and SV2HQL 28271 will provide excellent indicators for conditions in that direction. Beacons in South America were heard on 16 days of the month but beacons in North America were logged on only two days."* Finally, Neil noted that ZS6DN on 28200kHz was heard occasionally but no beacons were heard from the Pacific.

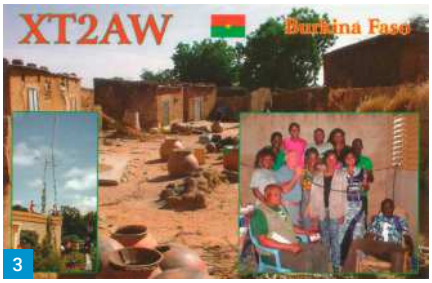
Unfortunately, **Etienne Vrebos OS8D** has been unwell so wasn't very active this month, making fewer than 150 QSOs altogether. Nevertheless, he worked some great DX on SSB during September, as can be seen in 'Around the Bands' below. He found 21MHz to be particularly productive, with Indonesian contacts from Java in the south to Borneo in the north to the island of Timor in the east of the country.

Jim Bovill PA3FDR wrote *"September was an exciting month for DX. Carrying on from last month I continued using the long wire antenna coupled with the Icom AT-4 tuner, using it for about 30% of the month, and the combination continues to surprise me. In part because the wire is strung around my small garden, running from about 6m to 2.5m above ground level (my QTH is 4m below sea level!) One advantage is that it gives access to all the HF bands whereas only 40, 20,15 and 10 metres are available with my other antenna, an MFJ-196 vertical. New DXCC entities this month were Barbados (8P6PD), Uruguay (CX2AQ), Malta (9H1FL) and Monaco (3A2MW). I also established second contacts with two remote stations, New Caledonia (FK8GX) and the Falkland Islands (VP8LP).*

"I enjoyed Etienne Vrebos's remarks about SSB [*HFH*, October 2022 – **Ed**], *and especially as a former native of Northern Ireland his comment about Northern Irish and Scottish accents. For more than 30 years I used almost exclusively SSB but with increasing interference and diminishing hearing it was either give up the hobby or switch to data modes, which I have enjoyed using for the past three years. While I do miss the occasional 'ragchew' on SSB I find that the information provided by QRZ.com can compensate, often providing more information about my contacts than a voice contact, often including photos of their shack, etc".*

Kevin Hewitt ZB2GI wrote: *"Gibraltar National Day is celebrated on 10 September to commentate the sovereignty referendum of 1967. Operating as ZG2GI from 5 to 8 September, I made 440 FT8 contacts across eight bands, 55 on each band to mark the 55th anniversary* (**Fig. 5**). *The passing of HM Queen Elizabeth II, aged 96 years old, on 8 September led to the cancellation of all National Day celebrations. Operating as ZQ2GI from 15 to 18 September, I made 96 FT8 contacts across seven bands and 96 SSB QSOs."*

Reg Williams G0OOF was touring Scotland and northern England so only spent a week on



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	Oct '22	Apr '22	Oct '21	Difference
SFI:	163	101	89	(+74)
SN:	73	13	38	(+35)

Table 1: Solar Flux Index and Sunspot Numbers on 11th of the month: this month, six months ago and one year ago. The final column shows the difference between now and the same time last year.


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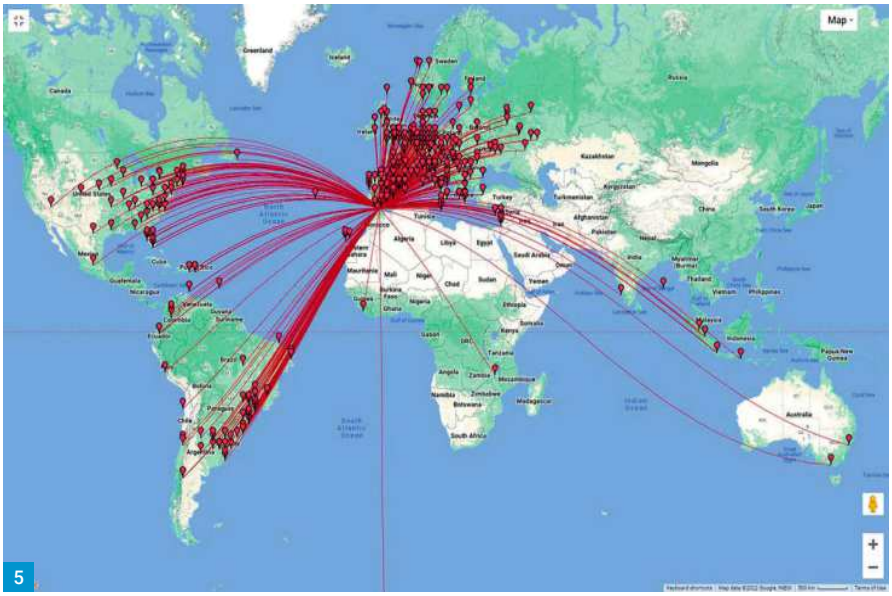

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the radio, but *"It was fairly productive on FT8 producing some new countries and prefixes on the various bands. Some of these were islands in the Pacific Ocean, worked generally in the early mornings on 30 and 20m. The best DX during this period was ZL7/K5WE Chatham Island, working on 14.090MHz at 0745UTC. Another station was FO5QB, French Polynesia,10.136MHz at 0656UTC.*

"Using WSJT-X improved version allows setting various bands to monitor. In my case generally 30, 20 and 17m. The software changes the radio to the normal frequencies for these bands every two minutes. During one of these periods 17m was becoming active early in the morning for an hour and then died away. During this time quite a few JAs and VKs were worked and added some new grid squares to the band for me. I now use another tool for spotting DX called HamAlert. This is an app for Android phones. Wanted stations can be entered into the app and when any of the stations are on air an alert is sent to the phone notified by an audible sound. I made the mistake a couple of times of an alert I had set was sending alerts through the night from a very active station on my list. XYL not too pleased, as the phone was on my bedside table at half volume. There is a facility on the app to turn off alerts. Lesson learnt!"

Carl Mason GW0VSW said that he *"decided to stick with QRPp using the G90 and 1W CW to my inverted G5RV for the vast majority of my contacts. Conditions seemed quite good for a change and I managed a few good DX QSOs."*

Owen Williams G0PHY also commented that *"Conditions are certainly on the up; 28MHz has been really buzzing for the last three days and there have been some DXpeditions and new IOTAs to chase. On the IOTA front I had contacts with 5J0DX on NA-033 and CR3SI on AF-047 for two new ones. **Janusz SP9FIH** was on his travels again from Bermuda as SP9FIH/VP9 and I had QSOs on 18, 24 and 21MHz. The F6KOP gang have been active on 28MHz as D60AE and I managed to get them in the log. I also managed to work three stations from Pennsylvania on 28MHz in the Pennsylvania QSO party. Today WX3B was very loud on 28MHz and when he called for QRP stations I turned the power down to an indicated 16W and managed to get him. The highlight of the month was undoubtedly the Oceania phone contest when I managed contacts with nine VKs, one WH7 and three ZLs. I can't remember the last time I worked a ZL."*

Around the Bands

Victor G3JNB: 10MHz CW: A61Q, HV0A, JH1HDT, OJ0/UT5UY, TF/K5KG, TZ4AM. **14MHz CW:** CN2DX, LW2DO, PZ5JW. 18MHz CW: 9Z4Y, CX2AQ, NP3A, VU2TMP. **21MHz CW:** 5R8AL, KP3W, LU7YZ, PV200BRV, TZ4AM, V31XX.

Etienne OS8D: 14MHz SSB: 9M6TMT, HS5NMF, HV0A, OJ0/LB5SH, P29LL, UK8FAI, UN0LM, UN9L. **18MHz SSB:** JL8PZO, ZL4RMF. **21MHz SSB:** 4L2M, 7D1C, 9M2T, AU75SMS, CX7SS, EX0DX, FH/OK1M, J20EE, JH5MXB, TI1T, V31XX, VK2YUS, VR2WNP, YB1ACN, YB1AR, YB7YGR, YB9AOS, YB9ELS, YB9MX, YC2DBW, YC3DOC, YI1WWA. **24MHz SSB:** VP9/SP9FIH. **28MHz SSB:** FR4KR, PT5J, PY5AMF.

Carl 2E0HPI/P: 14MHz SSB: 3A2MG, VE2CSI. **18MHz SSB:** NC4XL (K-6931 POTA). **21MHz SSB:** K4OKI, KC1KUG, N8II, WX3B. **24MHz SSB:** YO3FQA. **28MHz SSB:** 4Z4DX.

Jim PA3FDR: 7MHz FT4: HL2IFR. **10MHz FT8:** JH3KCW. **14MHz FT4:** AC2BI, CX2AQ, FK8GX, HK3X, K4HNT, JH5FTY, JH7DFZ, JR4GPA, KA3IRT, N5IF, PY2IQ, RX0AT, VE2PI, VP8VK, WA1SKY, YB9ELS. **14MHz FT8:** 3A2MW, BD8AHK, CN2DX, K1VK, K3JGJ, K4RUM, PS8RV, PV200BR, VK5PO, VO1NC. **18MHz FT4:** NG3S. **18MHz FT8:** JA4MMO, JJ5RBH, KC3TCT, N4TZ, NE8Z, VE1DAD, VO1BE, WB2BIN. **21MHz FT4:** JR4FYW, K4C/75, N9UUR, VE3XN, W6JZ, WA1EXA, YD2CRO. **21MHz FT8:** A71XX, BD4UJ, CO8LY, HC3RJ, JA1JAN, JR7RHO, K2OO, KC5RR, KR0P, N5XZ, N7NF, N9EA, PU5YSV, PY7ZZ, VE2EDT, W4AWJ, WJ8L, YC1FDF, YD7ICF. **24MHz FT8:** E25CRF, HC7AE, JA6FIO, K1SM, KC5RR, KP3AV, OD5ZZ. **28MHz FT8:** PY1VOY.

Kevin ZB2GI/ZG2GI/ZQ2GI: 5MHz FT8: 4X4DK. **7MHz FT8:** EL2BG, K7CA. **10MHz FT8:** CX2AQ, HK3T, OD5ZZ, VU3CAU. **14MHz SSB:** BD0AS, K0PJM, KP4VET, VE2CSI, VY2FU. **14MHz FT8:** NP4JN, VK2QV, VK3KJ. **18MHz FT8:** KA9FOX, VK3AUX. **21MHz SSB:** PY1EZ, V51MA, VE2CSI. **21MHz FT8:** CM6TC, CX2SA, KF0ADW, LU9DMG, ND7C, PU2MVE, VE7DX, W0IZ, W6RMC, WP4QIZ. **24MHz SSB:** OM3TWM. **24MHz FT8:** 8P2K, AJ6T, CX2SA, HC1HC, HI8RMQ, HK3X, KI7FK, KL7NW, KP4HF, LU5VV, N6RW, PJ4DX, PT7AZ, XE1CL, YS1RR. **28MHz SSB:** 5K7T, CE2EP, CX6DF, LU7YZ, NP2J, PY2CP, V51WW, VP8LP, WO3E. **28MHz FT8:** 7Q7CT, CE2SV, CX7BBR, HI8T, HK4ZZ, KP4DDY, LU4ER, OA4DVG, PJ4DX, PP5TG, VO1HP, W6NWS, W7DO, XQ1CY, YB5QZ.

Reg G0OOF: 7MHz FT8: VK3PRG, VP2EIH. **10MHz FT8:** 3B8CW, FO5QB, KL7J. **14MHz FT8:** VK1POR, WC3A, YB8RRN, ZL7/K5WE. **18MHz FT8:** JA7BXS, VK2BGL, VP9/SP9FIH. **21MHz FT8:** HK3C, VU2ZMK.

Carl GW0VSW: 7MHz CW: OS5Z. **14MHz CW:** EA6/DL6AP/P, TM100UNOR, IM0/DJ8QP, N1MX. **18MHz CW:** 9A2022ICM, EA8RM/P, R85RTO. **21MHz CW:** 7X4AN. **24MHz CW:** RG0A. **28MHz CW:** CT3MD.

Owen G0PHY: 14MHz SSB: CR3SI, VK2YI, VK4A, VK5RS, VK7C, VL3E, WH7T, ZL2ABK, ZL3JAS, ZM1A. **18MHz SSB:** 5J0DX. **21MHz SSB:** SP9FIH/VP9, ZF2OO. **24MHz SSB:** SP9FIH/VP9. **28MHz SSB:** D60AE, K3CT, WX3B.

Signing Off

Thanks to all contributors. Please send all input for this column to teleniuslowe@gmail.com by the 11th of each month. For the February issue the deadline is 11 December. 73, Steve PJ4DX. **PW**

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1

Promoting Amateur Radio

Colin Redwood G6MXL looks at some techniques for promoting amateur radio, focussing on meeting the public.

With the worst of the Covid-19 pandemic hopefully behind us, opportunities to promote amateur radio to the public face-to-face have started to open up again. One technique in particular is to operate individually or as a club in locations that are accessible to the public. If you do this and are armed with information about what you are doing, the curious will start to engage with you. How you do this can depend on the scale of your operation and your intentions.

One-Man Band

If you're operating just by yourself with the primary focus of participating in a contest or to activating a particular hilltop or area of countryside, then you may not have time to deal with questions from the public. In this case a simple notice explaining what you are doing perhaps with a website or QR-Code or leaflet to enable the inquisitive visitor to follow up is probably as much as can reasonably be done in the circumstances.

Club

If your club or group's primary aim is to attract newcomers to the hobby, then you'll want to make sure that you have sufficient members available to actively engage visitors in conversation and answer their questions. You'll certainly need to be prepared to answer questions from the public, **Fig. 1**. In my experience the most common questions asked are: How far can you make contacts? Is amateur radio still going – I thought the internet and mobile phones would have killed it off? What do amateurs talk about during their contacts? So, you'll need to have answers to these and similar questions.

Occasions

There are a number of occasions throughout the year when it may be possible to promote our hobby. Local fetes, shows, open days are certainly worth considering. Others include the Scouts Jamboree on the Air and the Guides Thinking Day on the Air. If your club runs an amateur radio rally, convention or similar gathering, then some promotion for the club to visiting amateurs is certainly worth trying.

Display Material

It is a good idea to have some display material to interest visitors, particularly at busy periods when visitors might outnumber club members. Well-chosen material can act as a point for discussion with visitors. The choice of material can be wide ranging from posters to pieces of home-made equipment. My local club has a few 2ft by 4ft 'A' boards, **Fig. 2**. These are made of hardboard with stiffeners simply linked at the top so the boards can fold over and protect each other in storage. Each face of the board has brief notes about an aspect of amateur radio. Often, passers-by will stop to see what it's about and a club member can then approach them and initiate a discussion. For outdoor events, we also have a pair of five metre high 'feather' banners, **Fig. 3**, announcing who we are. These banners are made of rip-stop nylon (available from sail and hot air balloon makers and sometimes other suppliers) and are mounted on fibreglass roach poles attached to ground stakes.

Activities

There are several activities that you can use to engage the public. For youngsters sending their name in Morse Code can be a remarkably effective way to engage them, **Fig. 4**. On a recent event that my local club ran, we even had a young lad drag his dad back the following day to have another go! It is a technique that you can also use with visitors to your shack at home or at your local club – just make sure that whoever it is understands that you don't have to use Morse to get a licence and operate these days. You can also supervise members of the public to passing greetings messages over amateur radio if you are using a club or special event callsign, **Fig. 5**. You'll often find existing amateurs or those who have let their licence lapse are also attracted to exhibition stations.

Applying for a Special Event Callsign

Many will think that every exhibition station needs a special event callsign. This certainly isn't the case. You can use your own callsign, your club's callsign (e.g. G4PRS) or your club's 'club' callsign (e.g. GX4PRS). There are advantages to using a 'club' call, primarily that an unlicensed person can send greetings messages under supervision. The same is true with Special Event callsigns. If you decide to go ahead with a special event callsign, then you'll need to contact Ofcom at least 28 days in advance. You can often work with Ofcom to

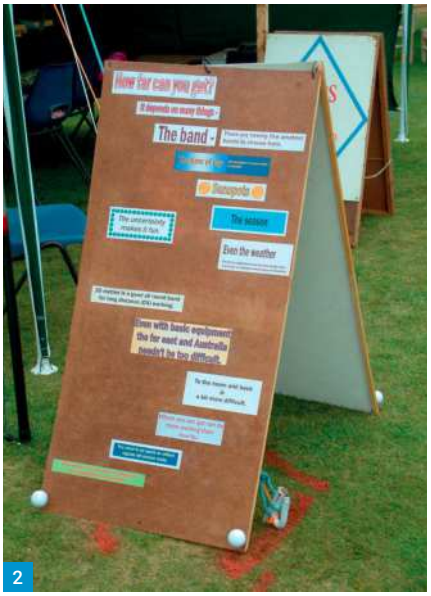

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Fig. 1: Engaging visitors. Fig. 2: A-Boards can display all sorts of information about the hobby and can be folded over for storage. Fig. 3: A feather banner seen at a hilltop field day. Fig. 4: Getting youngsters to send their name in Morse code. Fig. 5: Listening for stations.

agree a special event callsign. If you are planning to use FT8, you'll want to keep the callsign short so that your messages don't exceed the maximum number of characters the FT8 message protocol will support. Note that only those holding a full licence or a club licence can apply for a special event callsign.
https://ofcom.force.com/licensingcomlogin
Ofcom provide useful guidance in a document at:
https://tinyurl.com/5bxhfzc2

Risk Assessments

No matter how many exhibition stations you've run, you should carry out a risk assessment for each event, **Table 1**. It might be based on a previous event, but things can and do change. It might simply be seasonal weather risks (cold, wind, rain, sun), which may not have been relevant on a previous occasion. You may be using different sources of power, different antennas or accommodation. In some locations, you may need to consider security, to make sure 'little fingers' don't pick up things on display and drop them into long grass or walk off with them. These days, no risk assessment would be complete without completing an EMF assessment. At a recent exhibition station run by my local club, our hosts pointed out that there were certain places where we could not hammer stakes into the ground due to the presence of underground utility services. Many hosts will want to see your risk assessment before allowing you to proceed. Have a look at the July 2016 *What Next* column, which covered risk assessments.

Site Visit

I would strongly recommend a site visit before the event, ideally before finally committing to it. It is an excellent opportunity to identify risks and their mitigations. It is also the right time to check parking and access arrangements, antenna locations, feeder routes and lengths, and sources of power. Just because you were granted access to the roof of a building on a previous occasion to erect antennas, doesn't automatically mean that this will be permitted on a subsequent occasion – owners of premises change over the years! Look out for possible sources of QRM. If you are planning to operate a generator, make sure that the owners of the site are happy to tolerate the noise it will produce. Also consider arrangements to refuel the generator and prevent spillages.

Equipment

Make sure that between club members, there is a clear understanding of who is to bring what. From experience, I've found that assigning each station to a particular member works well. They can then each take responsibility for bringing everything needed from antenna to mains leads and everything in between, as well as seating,

4

Description of Risk and Harm	Likelihood	Harm	Overall Score	Prevention and Reduction
Heavy antenna mast, rotator and antenna falls and causes serious injuries	2	3	6	a) Keep people not involved away b) People involved wear hard hats c) One person coordinates and takes charge of erecting antenna d) One person stays outside danger area and looks out for anything un-planned e) Guy ropes installed to provide support before antenna raised f) All antenna raising done before public arrive g) All antenna work done in daylight

Table 1: Part of a risk assessment.

tables, refreshments and transport.

In particular, make sure that the smaller items such as DC leads between power supplies and transceivers and adapters from PL259 to BNC etc. don't get forgotten, along with mains leads of sufficient length and sufficient mains sockets. A checklist or a trial run in the back garden can help here.

Log Keeping

I have no doubt that individual operators will have their own preferences for log keeping. Do make sure that everyone logs in UTC – you may be surprised that some amateurs log in the current local time, especially if they don't normally keep a log.

At the end of the operation, I would suggest getting all the logs into a common electronic log from where you can upload logs to the likes of QRZ.COM, Club Log, eQSL and LoTW. If you have paper logs to deal with, I'd suggest getting them into an electronic form and printed out for the individual operators to check – trying to decipher other's handwritten logs can be quite a challenge. Ideally, each operator should be encouraged to computer log to avoid this problem!

QRZ.COM

If you are going to be on the air with a special callsign, then I would strongly recommend setting up at least a basic entry on QRZ.COM. It should state the purpose of the station and explain QSLing arrangements. Anything more is desirable, but not essential. If you are using Club Log, then it will automatically assume that GB calls are in England for DXCC purposes, unless you advise the Club Log administrators differently.

QSLing

If you have run an exhibition station and made a reasonable number of contacts, you'll need to consider QSLing arrangements. Besides the common electronic ways to confirm contacts, some amateurs like to receive QSL cards from special event stations.

I'd suggest waiting to the end of the event before making arrangements for printing QSL cards. I'd also suggest checking on QRZ.COM which stations you have worked actually collect QSL cards. Following a recent special event station that I was involved with, I was surprised how many stations worked were not on QRZ.COM, did not collect cards, or only would QSL direct (not via the bureau). Getting small quantities of cards (say less than 250) printed by the popular QSL card printers can be expensive on a per-card basis. If the numbers are sufficiently small, it may make sense to print these individually, or on sheets of four on a domestic laser printer. Some host organisations may be prepared to sponsor printing QSL cards. If you load your log onto Club Log, then you need to set up your QSL preferences – direct and/or bureau, and whether you accept Paypal for direct QSL requests.

5

Follow-Up

Having gone to the trouble of setting up and running an exhibition station, you'll need to make sure that anyone who is genuinely interested in becoming a radio amateur or in joining your local club has clear information on the next steps. You'll need a leaflet that you can hand out with details of your club meeting venue and dates of meetings, together with a pointer to where licence training can be obtained, and contact details so that they know how to contact you after the event. It is also a good idea to conduct a post-event review. What worked well? How could arrangements be improved for a future occasion? Above all, don't forget to thank the host organisation. This leaves a lasting impression, and may encourage them to forward contact details if any visitors make enquiries via the hosts.

Revalidating Licences

Finally, a quick reminder to re-validate your licence at least once every five years. To do this, visit the Ofcom website at:

https://ofcom.force.com/licensingcomlogin

You can then verify your current information or update it as necessary.

Season's Greetings

As this is the last *What Next* column for 2022, I'll take this opportunity to wish readers season's greetings, and good DX for 2023. **PW**

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*Denotes Bluetooth on input

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Fully featured flexible single or dual channel DSP noise cancelling unit
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- Enjoy clear "noise-free"speech

New In-Line Module

- 8 noise filter levels 8 to 40dB - Tone reduction up to 65dB - Bespoke 5W audio amplifier with latest bhi DSP noise cancellation - Audio bypass feature - 3.5mm mono inputs and outputs - Headphone socket - Audio input overload feature - DC power 10 to 16V DC - Compact unit, 135mm x 65mm x 46mm - Replacement for ANEM MKII and NEIM1031MKII

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1

Newark 2022

Our editor **Don G3XTT** was at the National Hamfest at Newark and reports on how it went.

A gap of three years, a change in date to mid-October (just a week after the RSGB Convention), train strikes and ongoing worries about Covid, not to mention financial concerns. Was this year's Hamfest at Newark going to be a disaster? Fortunately not. A couple of the larger traders were missing (Nevada and Radioworld) while Moonraker chose not to show products but only to take online orders during the event (which certainly attracted some criticism on social media) but there were new exhibitors, such as Canny Components from Newcastle, who took a large stand, and visitor numbers, from what I could see (and as I am writing this just a day after the event, the actual numbers aren't available) were more than acceptable. And, thank goodness, despite an overnight storm on the Friday night, the daytime weather was sunny and probably no more cold than during previous events, so even the outside flea market guys and gals had nothing to complain about.

Who was There?

Icom and Yaesu were in their usual spots and showing the full range of equipment, including Yaesu with the new FT-710 AESS while Icom were showing the IC-905 UHF/Microwave transceiver and IC-PW2 HF/50MHz linear amplifier. Both these, of course, I had seen the previous weekend at the RSGB Convention but they were new to many attendees. LAMCO, Martin Lynch and others seemed to already have the FT-710 available and Yaesu assured me that more supplies were on their way in the next week or two.

ML&S had one of the largest stands at the show, again in their usual spot, and seemed to be doing a good trade. Well done to their team, several of whom had spent the previous weekend in Milton Keynes. And it was good to see **Judy Birkett** carrying on the good work of her late father. Rigol had a large stand too – while their equipment is out of the price range of many radio amateurs, they told me they value the opportunity to showcase their products, given that many attendees work in the electronics world and are responsible for equipment purchases in their professional lives. bhi and Peak Electronic Design had adjacent stands and it was good to have a chat with both of them in person – yes, great to be meeting our advertisers and other vendors again. Both have new products coming along imminently, and both have offered to send them along to us for review.

Next to our stand (yes, *PW* had a stand again, having taken a different approach at the 2019 show) was **Paul Bonning** of Purple Zebra, showing some snazzy illuminated shack callsign plaques from Crystal Design but also the Geochron World Clock. I remember the latter from the days when it was a very expensive mechanical display showing daylight time as it moved across the globe. Now, as a fully digital product, it does so much more – again, we have been promised the opportunity for a review so I won't say any more here.

Other stands included RFinder, RF Design UK Ltd, South West Broking (I was reminded that I need to insure the equipment and antennas at my new station!), Future Networks (an interesting one this – they are busy setting up a network of LORAWAN nodes and radio amateurs can earn some pocket money by hosting a node on their tower). CEECOM antennas had some great VHF antennas, while Canny Components (mentioned earlier) were at their first Newark although they have been in business for about four years.

I've probably missed a few out – you can always look up the list on the internet (URL below). But I should mention stalls selling a huge variety of components from antenna hardware and ropes to connectors, ICs and more along with surplus laptops and the like.

www.nationalhamfest.org.uk

Outside

I had been led to believe that the number of


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Photo 1: Martin Lynch talks to Dave Stockley of Icom UK. Photo 2: The PW team – Luke (Marketing Executive), Katherine (Marketing Manager), Don (editor) and Kristina (Advertisement Manager). Photo 3: There are always lots of visitors staying in caravans and camper vans. Photo 4: Happy memories – your editor's first transmitter was a Codar AT5 and we had a T1154 for the school Cadet Force. Photo 5: Don with Chris M0HLS who writes our Lab Tutorial series. Photo 6: Icom took centre stage with a large stand. Photo 7: Judy Birkett visits our PW stand.

outside traders would be reduced, given that the event was in mid-October, but that wasn't the case by any means. There were all the usual suspects in the flea market area. Then there were Economasts and Total Mast Solutions. The latter have recently gained a large MOD contract but **Simon**, MD, told me they remain committed to the amateur radio market (and look out, probably next month, for an announcement in our *News* pages).

The Camb-Hams were there with their mobile station, Flossie, operating the special event callsign GB22NH and doing a steady trade. When I visited them this had included some 60 QSOs via the QO-100 satellite.

The RSGB

As is always the case at Newark, the RSGB were out in force, with their usual large bookstall, the *RadCom* team available to chat, committee and regional stands, the QSL bureau, Brickworks (the scheme for building on the Foundation course) and more.

Special Interest Groups and Clubs

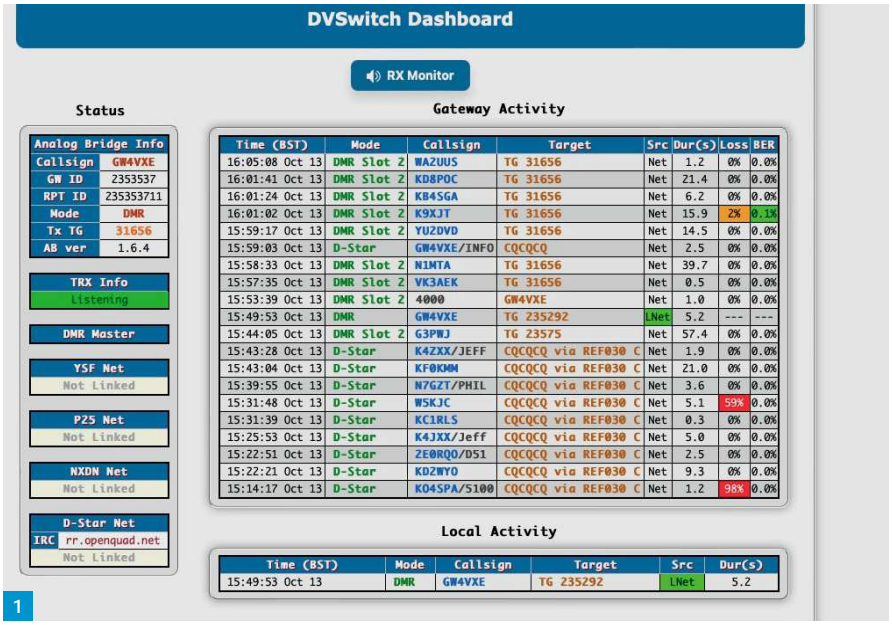
There were many of the same groups as I had seen at the RSGB Convention (CDXC, BATC, BYLARA, etc) but also the GB3IN repeater group, i-telex.net, the Leicester RS, March & District ARS, RAOTA, VMARS, WAB and WACRAL.

Summing Up

All in all, another great Newark event – I certainly found it very useful meeting advertisers, contributors and readers face-to-face after so long. Roll on next year! **PW**

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

Tim Kirby GW4VXE
gw4vxe@icloud.com



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DV Switch

Tim Kirby GW4VXE explains how to set up a DVSwitch server to make digital voice QSOs from an Android mobile phone!

If you were with us last month, you will have read that I had an intriguing time with an app called DVSwitch Mobile running on an Android device. It allowed me to connect to Allstar nodes around the world and make some interesting contacts. I could see there was also a capability to connect to digital radio networks such as D-STAR, DMR, Fusion as well as NXDN and P25. However, that didn't seem to be available without setting up a DVSwitch server.

With my interest piqued, I found a Raspberry Pi that was not getting too much use and set about creating a DVSwitch server. Fortunately, this proved very simple indeed, following the excellent instructions at:

http://dvswitch.org/DVSwitch_install.pdf

I created an image, which I transferred onto microSD card, and booted up the Raspberry Pi, giving me a server, which needed some fairly simple configuration but which was reasonably self-explanatory.

The next thing was to try connecting a client to the server. I used an Inrico T-320 'network radio', but you could use any Android device that you have around which is capable of running the DVSwitch mobile app. Incidentally, I mentioned last month that I had experienced some problems registering the DVSwitch Mobile app for full use, but there has been a new version of the app released that resolves this issue.

Within the DVSwitch mobile client, I set up, under the Accounts section, a connection (USRP) to the Raspberry Pi server I had set up. Initially, I simply connected to the server, using the server's internal IP address on the network – this will only work if your client and server are on the same WiFi network, but will be fine for testing.

I selected DMR mode (the default is for the Brandmeister network, but other networks can be connected with a little work) and tried a call on the Salop DMR network, talkgroup 23575. To my surprise, a voice was heard – **Dan M0MST**! We had a quick QSO, which proved that the system was working and that both transmit and receive audio was of good quality. I then changed modes to D-STAR and connected to the REF030C reflector and again, was slightly surprised to hear voices coming out of the speaker! The DVSwitch server uses a software vocoder to turn the data into speech, which works very well for DMR, YSF, NXDN and P25 but slightly less well for D-STAR. It's quite reasonable though and very usable. It's suggested that you don't use DVSwitch on D-STAR for 'transmitting' but I'd guess it would be fine for short QSOs. The photo, **Fig. 1**, shows the DVSwitch dashboard.

This was all very encouraging and interesting. I wanted to be able to set things up so that I could access my DVSwitch server when I was away from home, or perhaps in the car. This was quite simple, as a few months ago I had started using a Dynamic DNS Service to enable me to remote control my FT8 station on 6m, 2m and 70cm. Dynamic DNS is needed because potentially, your Internet Service Provider can change your IP address from time to time. With a Dynamic DNS client installed, you can associate a hostname (eg gw4vxe.noip.net – not my real hostname!) with your IP address, which will be updated, if it changes.

With this already in place, it was a simple matter of doing a bit of port forwarding on my router, such that the port used by the DVSwitch server (I used 50111 as per the instructions) was directed to the internal IP address of the DVSwitch server running on the Raspberry Pi.

It sounds worse than it is, honestly! Then, a change was needed in the setup of the connection on the Android device, so that rather than connecting to the local IP address, it used the hostname created in the Dynamic DNS service (eg gw4vxe.noip.net). I stepped outside the range of the WiFi network with the Inrico T-320 to see if I could connect to my server from the mobile network and, somewhat to my surprise, it worked straightaway!

With all that in place, I was all set to use the Inrico T-320 in the car (with Bluetooth headset etc) as well as from when I was away from home, giving me easy access to all the digital networks.

Another interesting feature of the DVSwitch server is that it provides a Digital Monitor facility, so that you can listen to the digital network that you are connected to, from a web browser. With a bit more port forwarding, you can make that work across the internet as well, should you wish.

Well, this probably doesn't constitute 'real radio' for some people, but it's quite an interesting system to set up and play with. It also affords a means of trying out the digital voice modes without having to buy a digital radio. This might be useful if you're intrigued with digital radio but are not sure if you want to spend money on it – or perhaps for newcomers to the hobby who have a licence but no radio as yet! All you need to make it work is an internet connection, a Raspberry Pi and an Android device capable of connecting to the internet. If you try setting one up, let me know how you get on. I found it a really interesting and fun project.

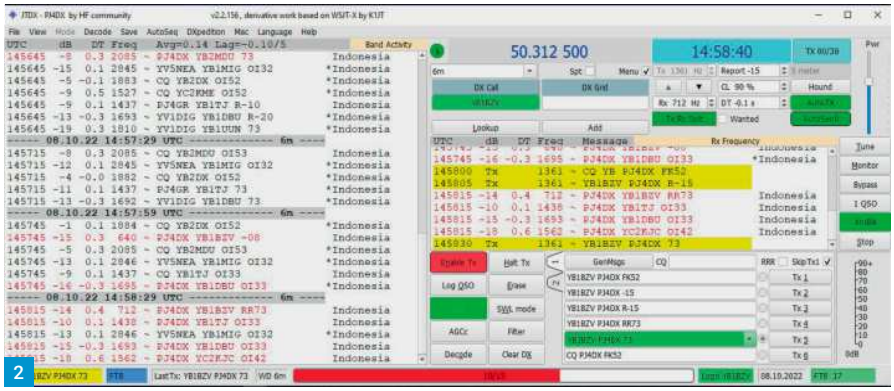
GB3BUX Beacons

Thanks to **John Ashmore G8GXF** (Wolverhampton) who wrote to say that he had noticed the GB3BUX beacons on 50.000 and 70.000MHz are back on the air, having been off for maintenance.

Ribbit–Rattlegram

Jef Van Raepenbusch ON8NT is always looking at new applications that can be used in the hobby. This month he writes about Ribbit. "*Ribbit allows an amateur operator to type in SMS messages on an Android app. Each SMS message is converted to digital audio tones. The*

Fig. 1: DVSwitch provides a dashboard to monitor the status of the server
Fig. 2: Steve PJ4DX sent this screenshot of his 6m opening to Indonesia
Fig. 3: The P&O cruise liner Aurora visiting Gibraltar harbour recently, with G7CUU/MM on board.



2

3

tones are played out the phone's speaker into the microphone of an amateur radio handheld or mobile rig. This can turn any (cheap) analogue HT into part of a digital messaging network. The app can do point-to-point communications (in FM, AM, SSB) and also has a repeater mode".

Find the Ribbit 'Rattlegram' application (BETA) here:
https://tinyurl.com/2s42b7h3

PW List of VHF/UHF Nets

Don't forget that the UK's best list of VHF/UHF nets on the amateur bands can be found at:
https://tinyurl.com/2ma53dyy

If you would like your club or local nets added to the list, just drop me an email with the details and I'll be happy to oblige. This month's random selection from the list appears as **Table 1**.

The 8m Band

Roger Lapthorn G3XBM (Cambridgeshire) says that he is still trying to reach the USA with his QRP FT8 on the band, although has had no success so far. He did receive a spot from a Spanish monitor recently, which was encouraging. Roger says that more monitors on 40.680MHz FT8 are needed in the USA, although he feels that until recently the MUF has been too low, in that direction, to support QSOs. Roger feels passionately that a small allocation should be made available at 40MHz by NoV to enable wider research to take place. On 13 October, Roger spotted ZS6OB (KG44) at a distance of 9099km via TEP during the afternoon.

The 6m Band

John G8GXF says that following the mention of the GB3MBA 'meteor scatter' beacon in *PW*, he decided to build a half wave wire dipole for the band to see if he could hear it. He can hear GB3MBA in the noise via tropo as well as by meteor 'pings'. John hears GB3BUX at S2-3, well out of the noise.

Keith Watkins G8IXN (Redruth) wrote to say that he hadn't been on the band very much of late, but had caught an Es opening into Romania on 10 October.

Steve Telenius-Lowe PJ4DX wrote that *"8 October was a quite extraordinary day on 6m. There was a major opening from the Caribbean to Indonesia, see **Fig. 2**. Indonesia is almost antipodal to Bonaire, so this would be like a UK station seeing the FT8 screen full of ZL stations! I worked 11 YB stations on FT8 and could probably have worked more but I handed the station over to **Eva PJ4EVA**, who also worked several Indonesians. The strongest signal was from YB2DX who peaked at +01dB and would have been strong enough to work on CW and possibly even SSB. One of the stations I decoded was YB5QZ who is not so very far from 9V1 and 9M2, but unfortunately nothing was heard from either of those two countries. The opening lasted from before 1440UTC until about 1630UTC.*

"This must be the return of F2 propagation, presumably chordal hop in this case, because I can't think of any other mode of propagation that would allow for such long-distance signals on Six. All the signals were heard and worked on a skewed path, beaming due east from Bonaire.

"Then in the afternoon of 8 October, the D60AE Comoros DXpedition showed up on 6m and was worked at 1910UTC. I have never heard anything from the Indian Ocean area on Six before. Apparently D60AE is only using 50W to a Hexbeam, so this is quite remarkable.

"VK8AW near Darwin was decoded on 6m FT8 at 1417 on 10 October. Just one 15-second decode, so no QSO, but it showed that 6m was still doing interesting things. Also on 10 October I worked TT8SN at 2010UTC for a new one on Six.

"On 11 October there was another opening from here to Indonesia from before 1440 until about 1735UTC. This was a longer duration opening than the one on 8 October, although signals were weaker and most of the stations decoded were the same as those already worked on the 8th. However, YC9FZ (on Bali), YB1BZV and YB1AR were all new ones.

*"Earlier in the month, the first real DX since the end of the Sporadic E season was worked on 29 September: D2UY in Angola. D2UY has been heard almost every day since. On 5 October FO5QB on Tahiti was worked, first on FT8 and then on SSB, when I received an RS 55 report from **Michel** despite running only about 40W PEP during the three minutes it takes for my amplifier to warm up!*

"Saturday 15 October was also a good day on 6m, with ZD7MY, ZD7BG, HZ1SK and ST2NH worked for three new DXCCs. The D60AE DXpedition, worked a few days ago, was coming in well again and often CQing with no takers, along with TR8CA who I'd worked before. The band was also open from here to EA, EA8, CT and CT3 as well as the more local Caribbean and South American stations.

"All this was worked on a 2-element Hexbeam at 14m AGL".

Here at **GW4VXE** (Goodwick) I've caught a few Es openings over the month which has been enjoyable. With the beam pointed down to South America there have been a few one period decodes from stations in Brazil, Argentina

and Chile. During one opening, when I was operating remotely and couldn't turn the beam, the ZD7 stations were very strong with the beam pointing north.

Don G3XTT (Wells) has heard quite a bit of DX via TEP, including PY, ZD7 as well as TT8SN, TR8CA, a couple of V5 stations, HC2FG and ST2NH. He says that other stations have worked Reunion Island in recent days as well as hearing **Robert 3B9FR**. **Peter G8BCG** (Liskeard) and others have heard and worked EL2BG.

The 2m Band

Jef ON8NT (Aalter) worked G8XVJ/P (IO93) on SSB on 3 September during the contest. In the FT8 Activity session on 7 September, Jef worked OV3T (JO46), GW4HDF (IO81), GI6ATZ (IO74), EI8KN (IO62), EI2FG (IO61), G8EEM (IO93) and MW3ASG (IO81).

Simon Evans G6AHX (Twyning) writes that he took part in the RSGB UK Activity Contest on 4 October. Simon's best DX was PA5Y (JO21) although he was aware that Spanish and German stations were being worked. Unfortunately, they were not audible with Simon. Simon says that his friend **Adrian GU0VLG** reports that the Guernsey club have been donated a 15-element Parabeam and rotator for 2m and they hope to have those installed before long. Simon has also been experimenting with using Yaesu's System Fusion, simplex on 144.6125MHz, and has worked **Martin G7KPR** and **Lee G1CBL** there, using GM mode.

Keith Nolan EI5IN writes *"**Owen EI4GGB** and I operated as EI2SBC/p (Shannon Basin Radio Club) during the IRTS Autumn 2m/70cm contest on 18 September. We were on a small hill (173m ASL) beside Mullingar; 90km west of Dublin. We had the benefit of some tropo on the day. Using a small Diamond vertical and 100W, we were delighted to have an FM QSO with **Malc MW0NLG**. After the contest, Keith worked **Richard M7MGO** via the Isle of Man repeater, which was 200km from the location also".* Keith says that he is currently testing a VHF amplifier kit using the MRF300 LDMOS transistors in the hope of using it on meteor scatter.

Tony Collett G4NBS (Cambridge) has had fairly limited time for operating recently but says that his only real DX was on 4 October, when he worked EA2T on SSB before the UK Activity Contest started. Once the contest had ended, Tony had a look on FT8 and worked EA1UR (IN53), EA1HRR (IN83), F4BKV (IN95) and EA2XR (IN83).

Tony has some interesting observations about the FSK441 vs MSK144 debate as to which is better for 2m meteor scatter. Activity has moved away from FSK441 towards MSK144, but some people feel that FSK441 works better for short pings (which it probably does). Tony feels though, that in a noisy environment, MSK144 seems to work better.

Day	Time (local)	Frequency	Description	Area
Monday	1100	GB3DN	Holsworthy RC	Devon
Monday	1930	145.400	Bromsgrove ARC	Worcs
Tuesday (2)	1930	145.550	Stockport RS	N West
Tuesday	2000	144.550	Bury RS	N West
Thursday	2000	GB3FG	Carmarthen ARS	Wales

Table 1: This month's selection of VHF/UHF Nets.

Not much to report from GW4VXE (Goodwick) as I'm still using the vertical for FT8 operation. MM0ABM (IO75) was a nice contact on 27 September.

The 70cm Band

Kevin Hewitt ZB2GI writes with news about ZB2BU/R, which is the UHF FM repeater in Gibraltar, located at the top of the Rock, close to the upper cable car station. Kev says that **John King EA7JNC** called into the repeater from a distance of 180km from the beach at Motril, using a Baofeng and the stock antenna. Later in the day, John tried using a small 4-element Yagi attached to the Baofeng and his signal into the repeater was fully quieting. **George Tomkinson EA4/G4GEO** called into the repeater from Malaga using a handheld radio and a simple homemade antenna. **David Stainforth-Small G7CUU/MM** was onboard the P&O liner *Aurora*, **Fig. 3**, using a handheld. He continued to get into the repeater for around 90 minutes after his departure into the Mediterranean Sea, on the last leg of his journey back to Southampton.

Jef ON8NT worked GW8IZR (IO73) for a new locator, on FT8 during the FT8 Activity session on 4 September.

Roger G3XBM enjoys the 70cm FT8 Activity periods and uses his 2m Big Wheel antenna, but says he hears Eire and the Netherlands every time.

Tony G4NBS worked F4BKV (IN95) and EA2XR (IN83) on 70cm FT8 on 4 October. He also wryly notes that it is a long time since he heard VP9 on 70cm. Tony uses a 28Mhz to 432MHz transverter and with better conditions on 10m recently, there has been some IF breakthrough. It may be a feature over the next little while!

The 23cm Band

Jef ON8NT worked G7LRQ (IO91) and G0JJG (JO02) during the FT8 Activity session on 21 September.

Roger G3XBM has a 2W transverter on order and hopes to be able to work some locals from home and perhaps some portables during the UK Activity Contest sessions next year.

Satellites

Jef ON8NT worked SQ8M (KN09) through the FO-29 satellite, and EB3FWC (JN11) via the CAS-4B satellite, both contacts on FT4. Jef also monitored an ARISS contact from the ISS on 27 September.

With AO-91 close to apogee over the path to North America, I have been enjoying the low Atlantic passes here at GW4VXE. Some of the contacts made have been VO1SW (GN28), VA3VGR (FN25), AA8CH (EN75), N8AJM (EN72), K4DCA (FM28), N8MR (EN83), VE3PMK (EN92), VE3GOP (EN77), VE2FUA (FN45/FN46) – not to forget GM0WDD (IO85), who was a new square for me on satellites!

Patrick Stoddard WD9EWK (Arizona) writes, *"On the weekend of 8-9 October, I planned a trip to visit four grids in southeastern Arizona and southern New Mexico. I started with a drive to the DM51/DM52 grid line in southeastern Arizona, where I worked nine passes in FM and SSB for a few hours on Saturday (8th). Early the next morning (9th), I drove to New Mexico and parked on the DM61/DM62 line north of the Mexico/USA border.*

"I last visited the DM61/DM62 line in November 2021, and a couple of other times before that, so I was familiar with the surroundings. The grid line is about 1.5 miles south of a US Customs installation with an aerostat – a tethered blimp, with radar and other equipment to monitor the international border to the south. The aerostat wasn't up in the sky due to high winds, but still visible from the grid line. I was able to work eight passes from there, before storms started heading my way.

"AO-27 is starting to be available for most of the continental USA in the mornings. It doesn't appear that its onboard schedule has been reset, so its clock has continued its drift. When it was available in the evenings over the Northern Hemisphere, it now is available in the mornings over much of the same area. Stations further north, in both North America and Europe, have been using AO-27 in the mornings lately. I look forward to having it available here in Arizona soon.

*"**Kjell Lindgren KO5MOS** has returned to Earth. He had been active on the ISS radio as NA1SS, even up to his last day on the ISS. I heard Kjell on a pass Monday (10 October) morning, and a station on the US east coast worked him on Friday (14th) morning, only a couple of hours before departing the ISS".*

That's it for this time! Thanks to everyone who's been in touch. See you next month for the January 2023 issue. **PW**

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See: HamRadio.co.uk/JPC

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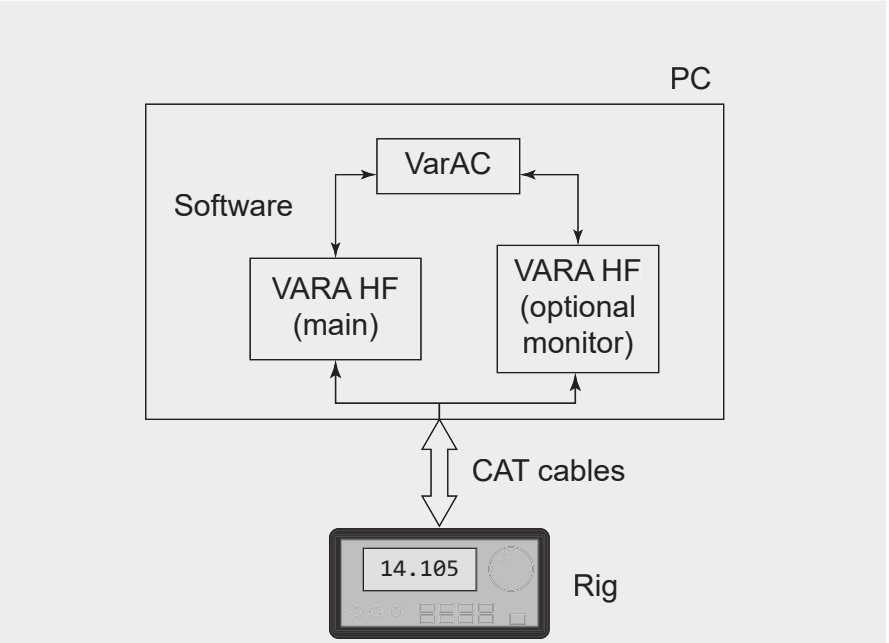

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VarAC

Mike Richards G4WNC explains how to use this new real-time QSO mode.

This month I'm continuing to look at modes that support keyboard QSOs as opposed to the automated exchanges of FT8, FT4, etc. Last month it was PSK31 but this time I turn my attention to a new kid on the block, VarAC.

VarAC

VarAC is a new mode specifically designed to support keyboard-to-keyboard, chat style QSOs. In use it reminds me of AMTOR, but it is very different to that mode as you will see. VarAC has been developed by **Irad Deutsch 4Z1AC** (hence the mode name) and is supported by a lively group of enthusiasts. The idea was to create a straightforward chat mode where most of the procedural exchange of callsigns, signal reports, etc. could be automated. This approach means you can concentrate your attention on the chat.

Vara Modem

The free VarAC application relies on the VARA HF modem to provide and manage the radio link. I suspect VARA HF will be new to some of you, so I'll outline it here. The VARA series of modems was developed by **Jose EA5HKV** and was derived from the ROS mode that you may have encountered a few years ago. The VARA modem is built entirely in software and provides a sophisticated modem that can automatically adapt its speed to make the most of any radio link. In addition to its adaptive rate, VARA-based radio links are 1:1 connections, where the modems at each end are locked together to form a synchronised link. This is important because VARA uses full error correction. By that, I mean the receiving modem checks each data frame for errors and automatically requests a repeat for any damaged frames. One of the benefits is that we can chat freely without adding any repeats as the system handles the integrity of the message. This 1:1 link can make it difficult for others to monitor as they will see repeats when they don't need them and miss repeats for errors they suffer. However, the monitoring usually works well enough to get the gist of a QSO.

To support a wide range of radio links and data demands, the VARA modems have 17 data levels at bandwidths ranging from 500Hz to 2750Hz. However, the free tier covers the first five levels of the 500Hz bandwidth systems as shown in **Table 1.** For all speeds, the modem uses OFDM (Orthogonal Frequency Division Multiplex) In a much-simplified form. This means the data being sent is divided among several carriers, each of which can be separately modulated (using the system in the table) at a much lower rate. At the receiving station, the data from these carriers is combined to reconstruct the message. The VARA modem has become widely accepted in amateur radio and is currently the preferred modem for the Winlink international email network and associated emergency comms.

While the full VARA modem is a proprietary product, VarAC utilises the free, low-speed, modes so we can use it without payment. However, if you want to try some of the more advanced aspects of VarAC such as file transfers, you may need to consider upgrading to the faster speed licence. I'll cover the VARA modem in a bit more detail in a later column, but let's now get stuck into VarAC.

Installing VarAC

Installing VarAC is slightly more complex than some other modes because there are three components in play, **Fig. 1**. The first is the VARA HF modem, then a second copy of the VARA HF modem is required for monitoring and then VarAC itself. At the moment, VarAC is a Windows-only application, but I know some have got it working on a Pi and I'm following that up.

I've shown a suggested naming of Windows folders in **Fig. 2**. They are used as follows:

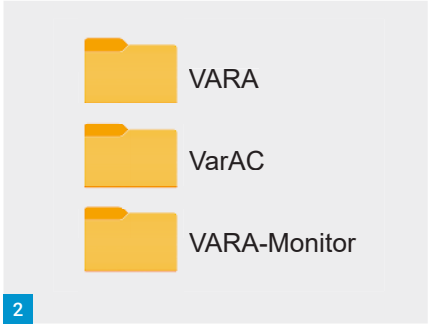
C:\VarAC – This holds the VarAC program and associated files

C\:VARA – This is the default location for the VARA HF modem and manages your VarAC communications link

C:\VARA-Monitor – This holds an exact copy of the files in C:\VARA and is only used to monitor VarAC traffic

Expert Install: For those with plenty of PC experience, here's a quick and dirty installation guide:

- Download VARA HF and install it in the default C:\VARA and a copy in C:\VARA-Monitor
- Download and install VarAC in C:\VarAC
- Run VarAC and follow the prompts
- However, having seen others get in a pickle during installation, I've included the following detailed installation guide. To simplify installation and later upgrading, I suggest you use dedicated folders on your C: drive. Please don't be tempted to put the files inside the Program Files folder or you're likely to hit permission problems.
- Begin by creating two new folders in your C: drive called VarAC & VARA-Monitor
- Download VARA HF from: **http://rosmodem.wordpress.com** (v4.6.4 or later)
- Unzip the VARA setup file to the downloads folder (click the option to view files after expansion)
- Right-click on the expanded VARA setup file and select Properties, tick unblock, then Apply and OK.
- Right-click again on the VARA setup file and choose Run as Administrator, click Yes to the Administrator prompt



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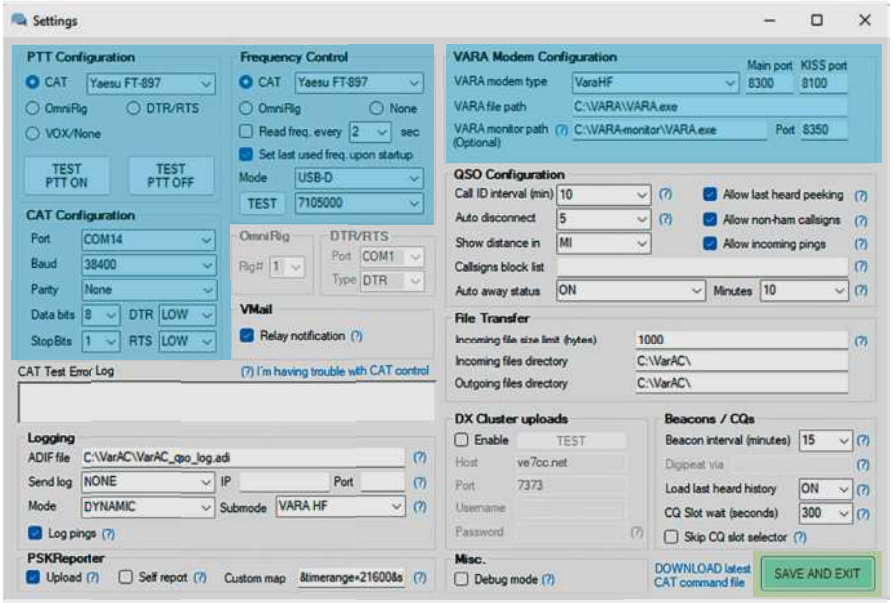

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- Follow the prompts to install VARA in the default C:\VARA folder. You now have VARA modem
- Run the installed VARA by double-clicking VARA.exe
- In VARA click the Settings menu then Soundcard. Select the desired soundcard for your system.
- You can also use the Tune button and level slider to adjust the transmit drive.
- When complete, click Close to finish and then exit VARA
- Next, open two instances of File Explorer (Windows key + E will do this)
- Duplicate all the files in C:\VARA to C:\VARA-Monitor (Use drag and drop with Ctl held depressed)
- Download the latest VarAC from **www.varac-hamradio.com** (v6.0.8 at time of writing)
- Unzip VarAC to the newly created C:\VarAC
- Right-click on VarAC.exe and choose Properties and click unblock followed by Apply and OK
- Double-click on VarAC.exe to start the program
- Enter your station details in the pop-up panel
- You should see VARA-HF and VarAC running
- At this point, you won't have the second VARA HF modem running, so we need to add that.
- In VarAC click on Settings – Rig Control and VARA Configurations, **Fig. 3**
- In the top-right section, titled Vara Modem Configuration, enter C:\VARA-Monitor\VARA.exe in the monitor path box
- Set the monitor Port to 8350
- To finish, click Save & Exit at the bottom of the panel
- Exit and restart VarAC and you should see the VarAC main panel plus two VARA HF panels

To make the most of VarAC you need to use CAT control so you can change frequency from within the application. Fortunately, the VarAC development team have integrated CAT control into the main interface. However, before you configure, it you need to download the latest CAT control file. Here's how to download and install it:

- Open a browser and navigate to: **www.varac-hamradio.com/rig-control-file**
- Click on the download link and you will go to another page that has the VarAC_Cat_command.zip file.

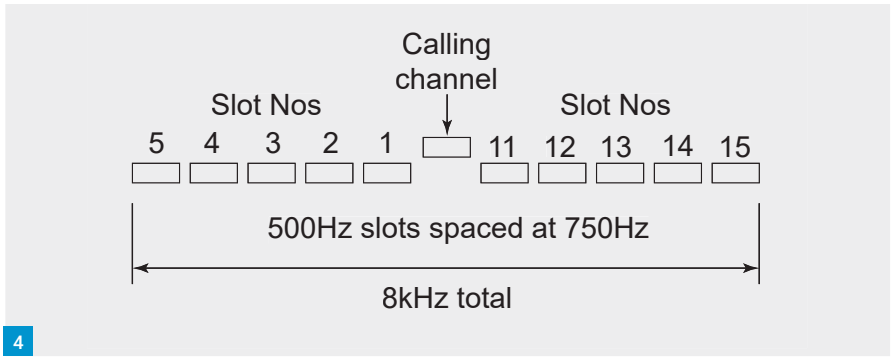
NB: Also on that page are screenshots of other operators' CAT configuration settings. This makes a great starting point and can save a lot of time. If your rig is listed, download and print a screenshot.

- When the CAT file has been downloaded, expand the zip file into your c:\VarAC folder and overwrite the existing file.
- The final stage is to open the Settings menu of VarAC and enter your rig details. The simplest option is to utilise the built-in rig control (OmniRig users see note below). You can use this guide to help:
- In VarAC choose the Settings menu then RIG control and VARA settings
- In the first box titled PTT Configuration, tick CAT and use the drop-down to find your rig.
- Move across to Frequency Control and also select CAT and choose your rig
- Next move down to the CAT Configuration section. Here you need to enter the COM port baud rate and other factors appropriate to your rig,
- Before hitting Save and Exit you can check that everything is working. Start by pressing TEST PTT ON to make sure your rig switches to Tx, then click TEST PTT OFF to switch back to Rx.
- Next move over to the Frequency Control section. Here you can set the mode, choose a frequency, press the TEST button and the rig should change.

If all that is working, you have full rig control!

NB: Those currently using OmniRig can ignore the above and simply click the two OmniRig radio buttons under PTT Configuration and Frequency Control. You can then use the Test buttons to ensure you have control.

Well done, you're now fully set up and ready for the fun. Before you get on the air, you need to learn a little about the operating protocol.



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Operating VarAC

Let's begin with the band organisation. VarAC QSOs each use a 500Hz wide spectrum segment, so we need a little more space than a single SSB channel to make room for a few QSOs. It's still early days for the mode, but the initial system, that seems to be working well,

Fig.1: VarAC installation block diagram
Fig.2: Windows installation folders
Fig.3: VarAC Settings panel
Fig.4: Band diagram Fig.5: CQ panel

is based on a common calling frequency on each band. I've shown the current frequencies in Table 1. In many of the popular bands, it is 105kHz after the band starts, for example 14.105kHz. To facilitate multiple QSOs on the same band, a system of slots has been devised. The slots are spaced at 750Hz intervals with five slots above and below the calling frequency. That results in a total band occupancy of 8kHz for ten concurrent QSOs as shown in **Fig. 4**. The operating protocol is to call CQ on the calling channel then QSY to one of the slots for the QSO. However, VarAC cleverly automates this process. To make a CQ call you begin by clicking the CALL CQ button. That brings up the panel shown in **Fig. 5** where you choose your QSO slot. Once you've made your choice, click the SLOT SNIFFER and your rig will retune to that slot so you can check that it's free. If all is well, you can click the CALL CQ button and VarAC will then send out a CQ call on the calling frequency and encode your QSY slot into the call.

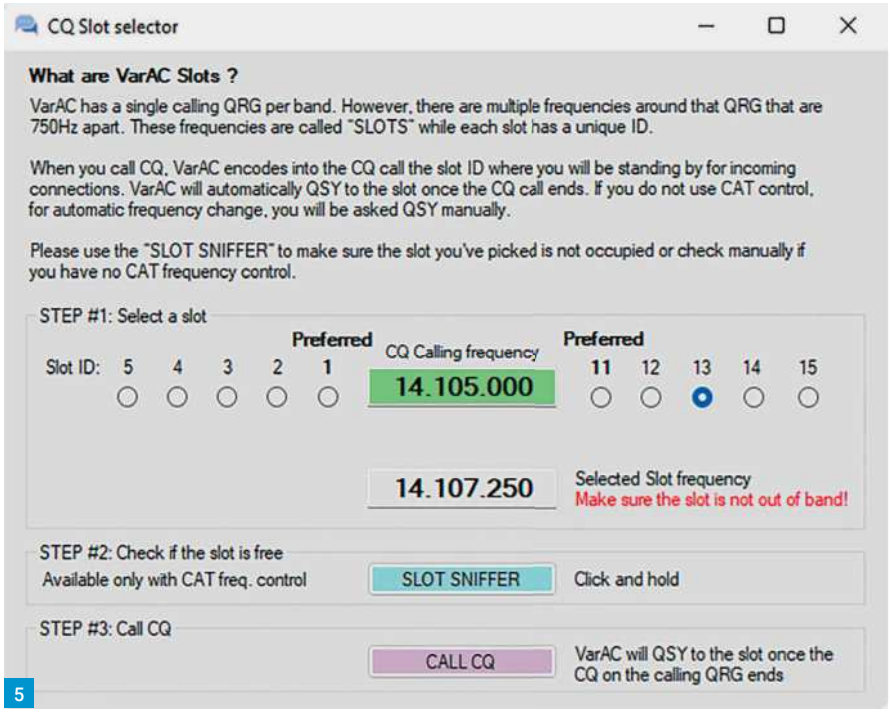
Your rig will then retune to the slot frequency to await a call. Anyone within range will see your call appear in the Last heard CQ calls box. To make a call they just double-click your callsign. After you've made your CQ call, the rig will wait for 15 minutes on the selected slot and then return to the calling frequency. It might sound a bit complex when you write it down, but it's an ingeniously simple system that makes CQ calls a breeze.

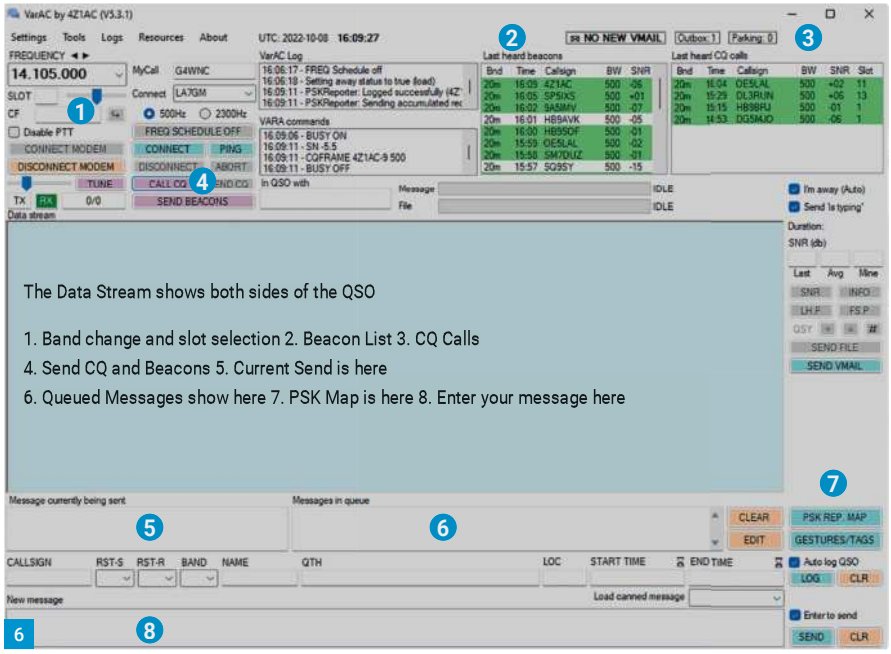
VarAC has a few other interesting features that can help you get started, see **Fig. 6**. The first is beaconing. Beacons are short signals that are usually sent every 15 minutes and include your call and QRA. These can be observed in the Last Heard Beacons list in the VarAC main panel. Their main purpose is to signal stations that may be available for QSO at some point, but it also keeps some activity on the band.

To supplement the Beacons, VarAC includes a ping function. By right-clicking on a station in the beacon list, you can choose to ping that station. When you do this VarAC will make automated contact with that station and exchange signal reports. This is very useful for those new to the mode as you can quickly see how you're being heard. PSK Reporter is another good propagation tool and VarAC has a dedicated button The other useful way to check how you're getting out is to use the PSK Reporter Map. There's a dedicated button that opens a custom PSK Reporter map for your station – Brilliant!

Vara HF Level	Symbol rate	Carriers	Mod	Net Rate bps
1	23	11	FSK	18
2	47	11	FSK	41
3	47	11	FSK	61
4	94	2	BPSK	88
5	94	2	QPSK	177

Table 1: VarAC speeds using VAR HF.





VarAC also includes canned messages or macros that can be populated with commonly exchanged information to save typing. I've found that a lot of users don't bother with these and get straight into live QSOs.

In these early days of VarAC adoption, most of the activity is on 14.105MHz during the day and 7.105MHz at night.

I think that's about enough for one session, so I'll look forwards to seeing you on VarAC. **PW**

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Acom 1500 Fault Diagnosis and a Simple Fix!

Steve Telenius-Lowe PJ4DX undertakes a challenging but ultimately successful piece of fault-finding.

Back in 2014 I ordered an Acom 1500 HF/6m linear amplifier from the American dealer and had it shipped to Bonaire. It was expensive, but it was the first piece of new equipment I had bought in almost a decade and I figured it would probably outlast me! After three years of almost daily use I was so pleased with the amplifier that I wrote a user review for *PW* **[1]**.

It continued to work perfectly until 29 July this year but, when I turned the amplifier on again that same evening, the normal 180-second warm-up period would not begin and instead 'Auto Protection: PN07' appeared on the front panel display. There had been no prior warning of anything starting to go wrong: it had always worked perfectly – until it didn't. The owner's manual told me that 'PN07' meant there was no HV.

I'm not an experienced service engineer so there was no way I was going to mess around inside any piece of equipment with nearly 3000 volts flying around (or so I thought). On the other hand, the amplifier is a bit of a beast with a shipping weight of 30kg (66lb) and I did not relish having to pay the cost of shipping it to and from the USA (or elsewhere) if it was a simple repair job.

Unfortunately, I did not know where to start but, having heard that their customer service was second to none, I sent an email to Acom in Sofia, Bulgaria, explaining the problem. The next morning I received a reply from **Krasimir Kostov ('Krasi')** who asked whether I had any electronic experience, but warned: *"If you don't want to make some measurements or tests, you definitely have to send amplifier to dealer or to us for non-warranty repair. It could be costly."* Krasi suggested a series of tests in order to diagnose what was causing the fault.

Step 1: Preparation

As my operating room is rather cramped, I moved the amplifier from the shack to a large table in the living room where there was more space and also a lot more light so it was easier to see what was going on after the covers had been removed, **Fig. 1**.

I had never removed the covers before (I hadn't needed to) so the first job was to remove eight years-worth of dust that had accumulated inside the amplifier. This was done with cotton buds, a dry cloth, a domestic vacuum cleaner – and a lot of puff!

Step 2: Check the Fuses

Inside, on the mains board, are two 2A slow-blow fuses labelled F2 and F3, **Fig. 2**, and Krasi said that probably one of them would had blown: in fact both of them had. While I knew that it was extremely unlikely that two fuses would blow without there being an underlying problem, I had plenty of fuses so I simply replaced them, put the cover back on, plugged the amplifier into the mains and switched it on. This time it powered up OK, the 180-second warm-up clock started to count down but, after the three minutes, as soon as I pressed the 'OPER' (Operate) button the same PN07 fault indication appeared. Oh well, it was worth a try!

Step 3: Any Burning?

Krasi asked me to check whether the NPN transistor Q1 on the mains board, **Fig. 3**, showed any sign of burning, or if any components close to the transistor were burnt, but everything looked good. He also asked me to check for signs of burning in four large blue capacitors, **Fig. 4**, which are under a sub-chassis close to where the 4CX1000A valve is located. Again, there was no sign of any damage.

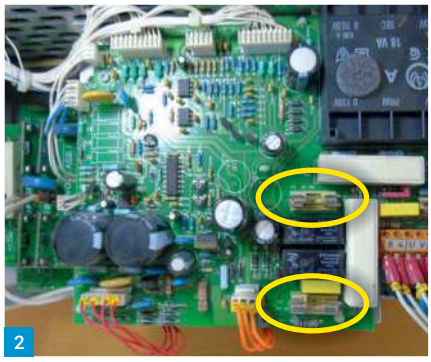
Step 4: Removing the HV

The next stage was to disconnect the HV cable that carries the 2900 volts from the diode bridge board to the valve. At all times Krasi emphasised safety when carrying out the tests and told me to ensure that electrolytic capacitors had discharged before doing any work. As there is a seven-hour time difference between Bonaire and Bulgaria I received Krasi's emails when I woke in the morning but by the time I carried out the test and told Krasi the result it was after the end of his working day so he would only read my reply the following day, when he would suggest another test. In practice this meant that each test was carried out only after the amplifier had been removed from the mains for many hours during the evening and overnight, so there was no danger of receiving a belt from the electrolytics. Nevertheless, I still kept well away from them!

Krasi's suggestion was to remove the HV cable, **Fig. 5**, replace the covers and power up the amplifier. If the two fuses blew, this would eliminate the 4CX1000A valve and the blocking capacitors as reasons for the fault. However, Krasi pointed out: *"The amplifier is eight years*

WARNING!
Do not attempt to repair any mains equipment unless you are absolutely certain you know what you are doing. 220 volt shocks can kill and 3000 volts would certainly be fatal!

Fig. 1: The Acom 1500 HF / 6m linear amplifier. (Mine was manufactured in 2014; current ones have a redesigned front panel, though the circuit is the same.) Fig. 2: The two fuses that blow when there is a serious fault condition.
Fig. 3: Transistor Q1 on the mains board.
Fig. 4: There was no sign of burning on the blue capacitors under the sub-chassis.
Fig. 5: The yellow HV cable (top) that carries around 2900V from the diode bridge board to the valve. Fig. 6: Removing the temperature sensor by pushing the rubber chimney towards the valve.
Fig. 7: These two screws must be removed to separate the anode clip from the UHF suppressor.
Fig. 8: The two safety cut-outs, the HV crowbar (bottom) and the cover sensor (top).
Fig. 9: The voltages are measured at G1 and G2 in the valve socket (Photo: Acom).
Fig. 10: The 4CX1000A was quite rusty under the heat sink. Fig. 11: Cleaning the socket contacts with a Dremel tool.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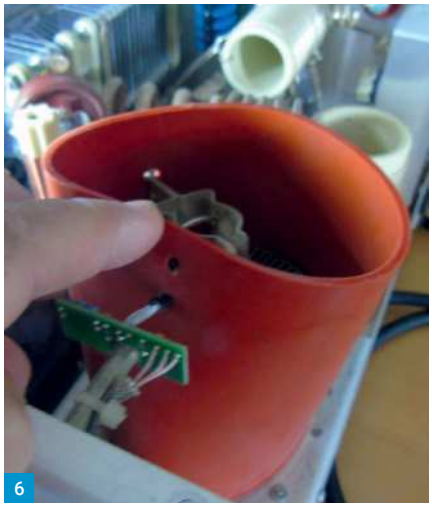
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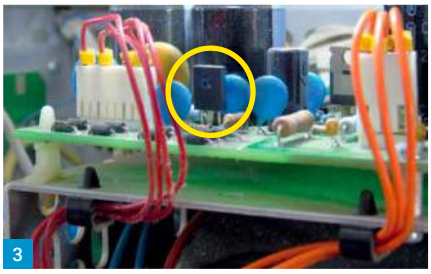
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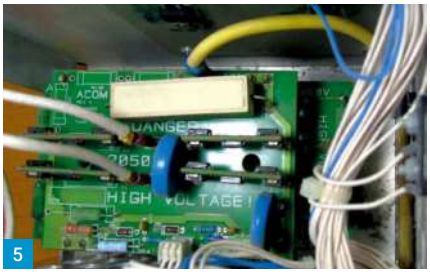
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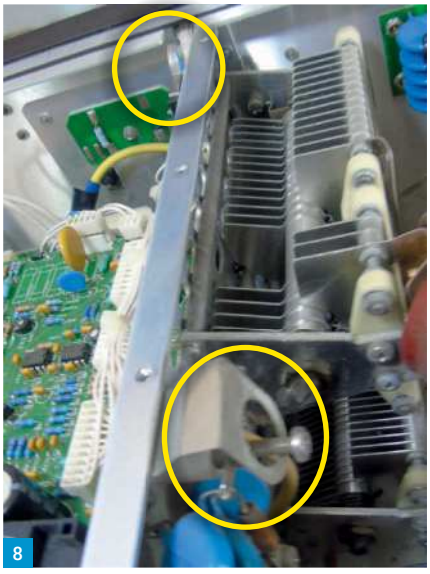
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old and tube [valve] could be the reason too."

As everything looked clean (no burned-out components visible) I also suspected the valve was the cause of the trouble and, after powering up the amplifier and pressing 'OPER', there was no fault indication on the display. Having switched everything off, the following day I checked the two fuses and they were still intact: it was looking very likely that it was a faulty valve.

Step 5: Removing the Valve

The next test was to remove the 4CX1000A valve and then reconnect the HV cable to the diode bridge board. This test would determine whether the problem was with the blue ceramic blocking capacitors: if the fuses blew again the problem would be with the capacitors and likely not the valve.

Removing the valve was quite a delicate operation. For safety reasons the power had been removed from the amplifier for many hours before the start of the test and the HV cable was still disconnected.

Krasi forwarded me an eight-page PDF called *'Acom1500 Tube Replacement'*. It was full of warnings about the high voltages and well illustrated so it was clear how to carry out each step of the operation safely.

The 4CX1000A is surrounded by a silicon rubber chimney, which funnels heat from the valve, allowing it to escape through the grille in the top of the cabinet. The chimney has two openings in it, a tiny hole through which a temperature sensor is fitted, and a vertical slot through which the valve's anode clip is connected to the UHF suppressor.

The chimney must be removed before the valve can be. In order to do this, it's first necessary to remove the temperature sensor and the anode clip. The rubber chimney must be pushed in slightly towards the valve to allow the delicate sensor to be released, **Fig. 6**. Then, two M3 screws that connect the anode clip to the UHF suppressor are removed, **Fig. 7**, allowing the chimney to be pulled off with the clip still inside.

The valve is then released from the socket by grasping the heat sink fins and turning it 120° anti-clockwise.

After the valve was removed, for this test the HV cable was reconnected to the diode bridge board, the covers replaced and the amplifier powered up. Once again, the two fuses were OK, meaning that there was no problem with the blue blocking capacitors.

Step 6: Measuring Voltages

The final test, which should rule out anything other than the valve itself, was to check the voltages at the valve socket. I enlisted the help of **Bert van Oort PJ4KY**, who also owns an Acom amplifier that uses a 4CX1000A valve, for this test.

First, for safety reasons, the HV cable was disconnected once again. Krasi confirmed that when the HV cable is removed the HV voltages are only present on the diode bridge board and electrolytic capacitors, well away from the valve socket where we would be making the measurements. To his credit, once again Krasi emphasised: *"Beware that when the yellow cable*

is disconnected, you have to wait not less [than] 30 minutes for discharging the HV from the capacitor bank." (There is no harm at all in repeating the safety messages again and again!)

In order to measure the voltages at the valve socket, it is necessary to simulate the covers of the amplifier being in place, so the two safety cut-outs, the HV crowbar and the cover sensor, **Fig. 8**, must be temporarily overridden, so it was particularly important to have the HV cable disconnected.

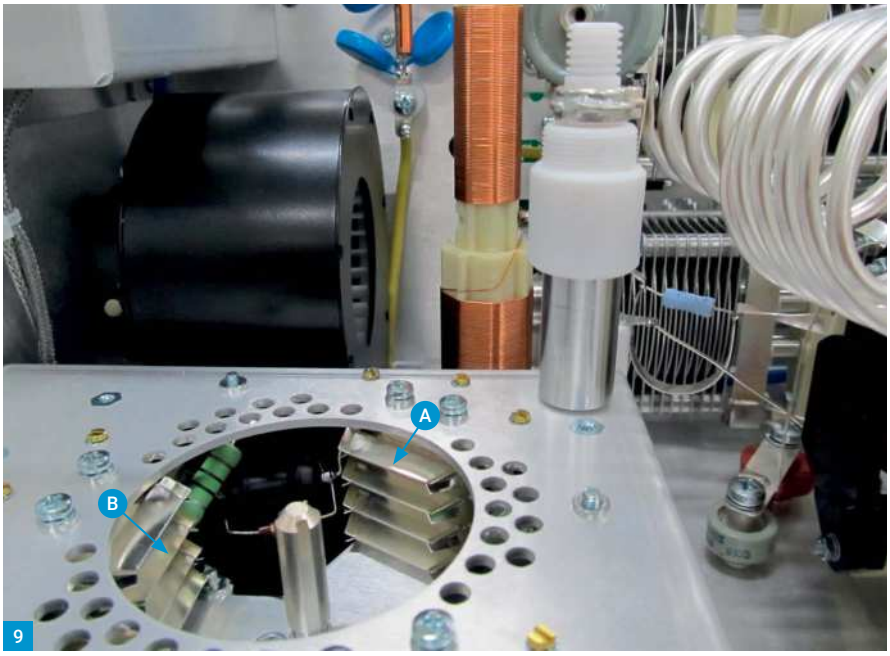
Krasi attached a photograph, shown here as **Fig. 9**, which indicated where to measure the voltages. There were four measurements to be made, two at G1 and two at G2. Krasi said that the normal voltage at G1 ('Eg1') is –130V when the amplifier is in STBY (Standby) or OPER mode, and –60V to –70V when the amplifier is in OPER mode with the PTT on (shorted). The normal Eg2 is +1V to +3V when the amplifier is in STBY and +325V when in OPER mode. *"If these voltages are OK the tube is the fault reason,"* Krasi said: the voltages we measured were very close to these figures.

Step 7: Corrosion!

When the 4CX1000A was removed, we noticed that the connections to the valve in the socket were quite corroded and G2 in particular was covered in verdigris (very different from the pristine condition shown in Acom's photo, Fig. 9). The underside of the valve, beneath the heatsink fins, was also quite rusty, **Fig. 10**. Bonaire has a hot and humid climate and, after confirming that the voltages we measured were normal, Krasi offered the opinion that *"Eight years in humid area is too much for the tube. Check the socket and other metal parts for rust and clean them. You will need a new tube."* I had been expecting, but also fearing that: a new 4CX1000A costs over $1000 in the USA.

The socket was cleaned using a Dremel rotary tool, **Fig. 11**, and a wire brush but as I was doing this I wondered if in fact the fault condition could simply have been caused exclusively by the build-up of corrosion? Perhaps the valve itself, despite being a bit rusty, was actually still OK? Other than the likelihood of blowing two more fuses I had nothing to lose, so after also cleaning some of the rust from the 4CX1000A I replaced it along with the rubber chimney, the temperature sensor and the anode clip to the UHF suppressor, then reconnected the HV cable, replaced the covers and switched on the amplifier.

Bingo! It powered up with no fault indication. Reinstalling the amplifier in the shack confirmed that it was once again working normally and putting out the power it should.



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A: G2 – the top contact B: G1 – the second from the top down

So, What Happened?

Why had this fault occurred and why had it appeared to be so certain that it was the valve which was faulty?

As it's always hot in the shack, we sometimes use air conditioning and the temperature difference between the valve, which can reach over 90°C after a lengthy operating session, and the air-conditioned room must have caused condensation around the valve, leading to the corrosion (there was no corrosion anywhere else in the amplifier). Also, even if you can't always feel it when away from the seafront, Bonaire has a salty atmosphere, carried by the trade winds that blow all across the Atlantic before reaching the island, and that speeds up corrosion.

When making the voltage measurements, the sharp points of the voltmeter's probes penetrated the corrosion so were able to give accurate readings even though the valve itself was not making proper contact with the connections in the socket. Knowing that the voltages at the socket were all correct quite naturally led both me and Krasi to draw the incorrect conclusion that it was the valve itself which was faulty.

I learned quite a lot from this exercise, the main thing being *"don't jump to conclusions"*! What had initially seemed to be a major fault condition that would have involved shipping the heavy amplifier overseas for repair or having to fork out over $1000 for a new valve, turned out to be very easy to fix and at no cost other than that of a few fuses.


10


11

Acknowledgements

I would not have been able to start diagnosing this fault without the helping hand of Krasi, who guided me carefully through each test and emphasised safety at all times. He writes in clear English and when necessary attached photographs to illustrate what was required. Thank you Krasi: it's true that Acom's customer service is second to none!

Thanks also to Bert PJ4KY who helped me carry out the voltage checks and loaned me the Dremel tool.

Reference

[1] 'Acom 1500 Linear Amplifier User Review', Steve Telenius-Lowe PJ4DX, *Practical Wireless*, June 2017. **PW**

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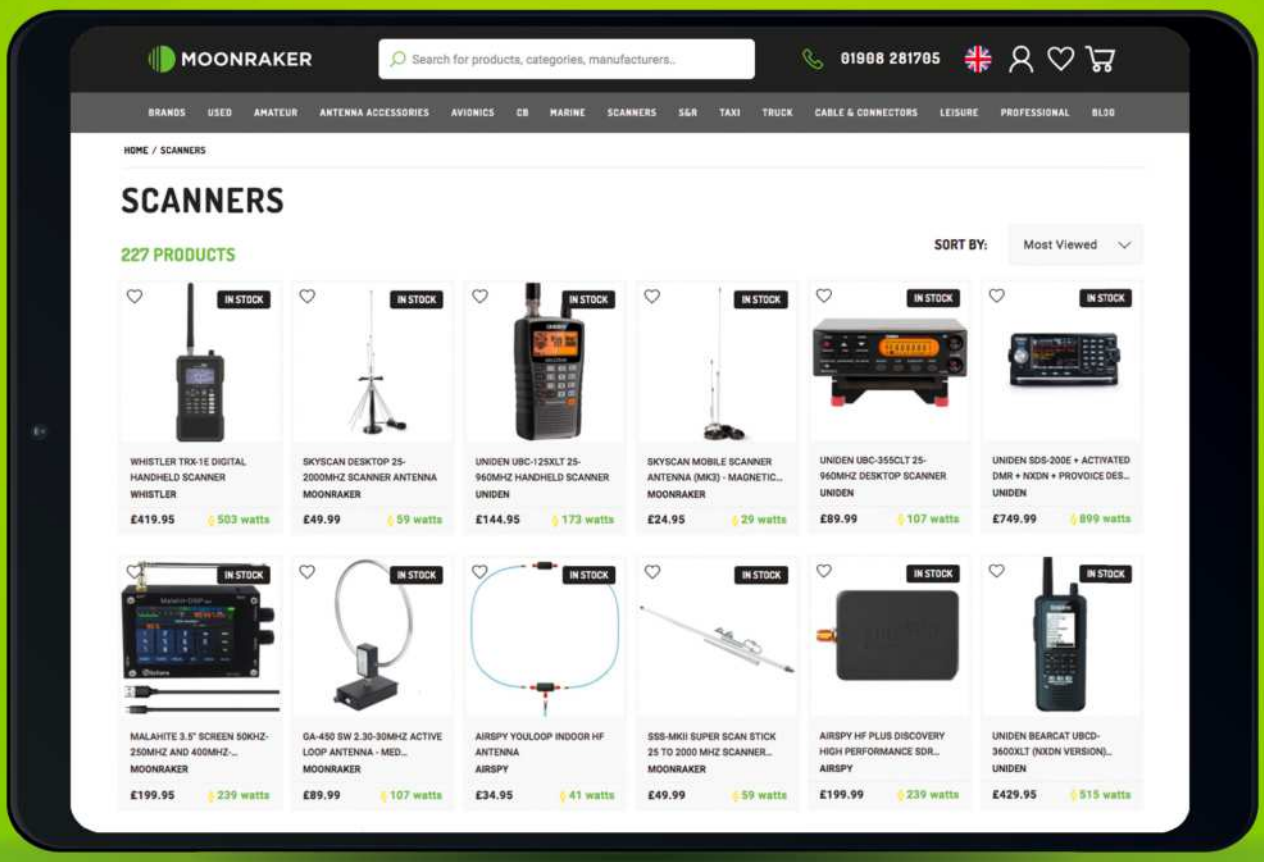

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SCAN TO SHOP

Roger J Cooke G3LDI
roger@g3ldi.co.uk

1

Keyers and Contest Settings

Roger Cooke G3LDI starts with some interesting keyers and keys before offering advice on CW settings in the N1MM contesting software.

I am writing this on a chilly afternoon with sunshine in October, but I guess it will be time to wish you all a Happy Christmas and a much more peaceful 2023. The world is in turmoil and it almost seems like we are heading toward a Dickensian Britain.

However, there are much better things to do in amateur radio and at least we are all of the same mind and interests. It was really nice to meet up with friends not seen for 2-3 years at the RSGB Convention. I enjoy the social interaction as much as, and sometimes at the expense of, the presentations.

I made an error in the October column. Talking about the Jubilee Key, I mentioned that **Mike** had just received his key. Unfortunately, I typed his call as G3SMB and it should have been **G4SMB**. Apologies to both for getting that wrong.

Hal 1550 Keyer

Another TTL keyer from the 1970s. **Victor 4X6GP** has this one, **Fig. 1**. He says: *"Someone gave me this HAL Devices 1550 keyer. It was dirty and didn't work, but only needed a couple of minor fixes. I also replaced the knobs with slightly larger ones to hide some guy's ugly markings above the speed control.*

"It was sold in the early 1970s, so it has no microprocessors, just a lot of TTL gates. It is iambic and has a dot memory -- but it only remembers the dot if the dot lever is released last. In other words, it feels like the Curtis mode A.

"I found a schematic for the model 2550, which seems quite similar. I'm going to study and try to figure out if there is a way to make the dot memory work like mode B. This will probably prove to be above my pay grade!"

If you are interested in the actual circuit here is a link to it.

https://tinyurl.com/m95yck42

I built a TTL keyer in the 60s with six memories. I remember being accused of cheating in NFD at the time for not using the paddle! That was from a YL CW operator too, who was quite a purist! Compare those days with the ones we have now, where it is quite rare for anybody to use a paddle in a contest. Having said that, locally we are using paddles in the CWops activity periods but the only problem with that is that everybody else assumes you have a cheat-sheet, in other words pre-fills to populate N1MM. Some of those ops will insist on sending at 40+wpm. That's difficult to keep up with!

Another Key

The photo, **Fig. 2**, shows an interesting historical key and what looks like a sounder from the Northern Nevada Railroad Museum/State Park. This was on the CWops reflector and came from **Hank W6SX**.

CWops

CWops were at the RSGB Convention this year with a stand in the activities room. There was a lot of interest so hopefully some new members will be forthcoming before long. We had a group photograph taken at lunchtime on Saturday. The weather was so nice that we all sat outside in the sun and ate our lunch and put the world to rights! In the photo, **Fig. 3**, left to right are **John G4IRN**, **Stew GW0ETF**, **Ray G3XLG**, **Mike G4IZZ**, **Jim G3YLA**, **Roger G3LDI** and **Duncan G3WZD**.

CWops is well supported in the Norfolk area. We regularly have eight or nine participants in the CWTs on a Wednesday, not quite so many on the Thursday AM ones! I am trying for a personal challenge for 2022 and that is taking part in every one for the whole year, so far so good!

Contesting with N1MM

Kevan N4XL, **Fig. 4**, has given talks to our club – Norfolk ARC – on several occasions now and they are always interesting and informative. He has written this piece about using N1MM in CW contests and how to hone your skills at the keyboard. Some of you might find the following useful, particularly in the CWTs.

Use them as you will, don't take them all verbatim, the suggestions are just a guide. In fact, there has been one small suggested modification from **Pete VE9AAV**: *"Just a small quibble – If something that I have said in the past was interpreted to mean that I recommended against contest word spacing, on the grounds that it would interfere with RBN spotting, then I can say flatly that it does not. I use contest word spacing*

Fig. 1: The HAL 1550 keyer.
Fig. 2: Some interesting keys photographed by W6SX. Fig. 3: Some of the CWops members at the recent RSGB Convention. Fig. 4: Kevan N4XL.

in CWTs and am spotted literally hundreds of times during a one-hour session. What is more likely to happen, I believe, is errors in RBN spotting because of 'manual' spacing errors. I see erroneous spots every contest that appear to result from people running their calls and the contest abbreviation together – for example N4ZRT or TN4ZR – and it's gotten to the point where if I see such spots in the Available window, I just delete them, almost automatically".

N1MM Configurer Settings

Function Keys tab

- Send corrected call before end of QSO (automatically acknowledges corrected call before moving on to next)
- Use CW contest word spacing off (I think it was **Pete N4ZR** who said messing with contest word spacing can cause some skimmers to incorrectly spot your callsign)
- Stop sending CQ when callsign is changed (touching keyboard stops CQ. Helps when someone calls late in the space between CQs. Otherwise, you have to hit ESC to stop CQ.)
- Work dupes when running (Overall quicker than arguing about it. Dupes don't count against you. Plus, you might earlier have thought you were working the station when they were actually working someone else and you are not in THEIR log.)

Other tab

- Primary CW speed step '2'
- Hitting PGUP/PGDN adjusts CW speed by 2 WPM each press. Allows for quick speed changes to match speed with slower/faster stations
- If need to change by more than two WPM just tap it twice or three times. Much quicker and more accurate than reaching for a speed pot.
- CW & Dig Up/Down Arrow Incr '0.02'
- When S&P hitting arrow changes rig frequency by 200Hz. Quick way to fine tune someone in after jumping to a spot. You can actually move up/down the band using this, but it is somewhat tedious. 200Hz works best for my own personal choices of normally operating CW filter width and hearing.
- When Running and have RIT on hitting arrow changes only the receive freq if someone off frequency calls you. When using Enter Sends Message (ESM) you put the {CLEARRIT} macro in your F1 (CQ), F3{Thank you), and F12 (Wipe – if you use that) F-keys. That automatically resets RIT so you can automatically continue your CQ with both TX and RX freq set to your run frequency.
- Clear automatically populated exchange on callsign change (Overrides incorrectly 'filled' data drawn from Super Check Partial files from wrong call sign being entered)

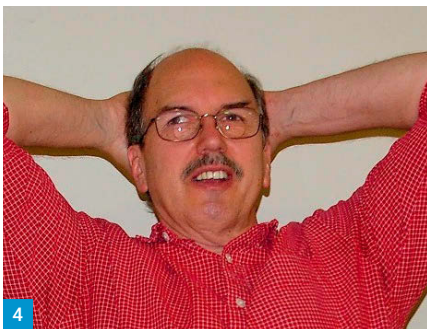
Winkey tab

- Use Winkey Speed Pot for Paddle and Keyboard CW Only

o I use microHAM interfaces. They have a CW speed pot. Since I normally control CW speed in contests by using N1MM via the keyboard PGUP/DN keys the CW speed pot on the interface is set at my comfort zone for manually sending CW. It is always the same so I know what to expect when I grab the paddles.

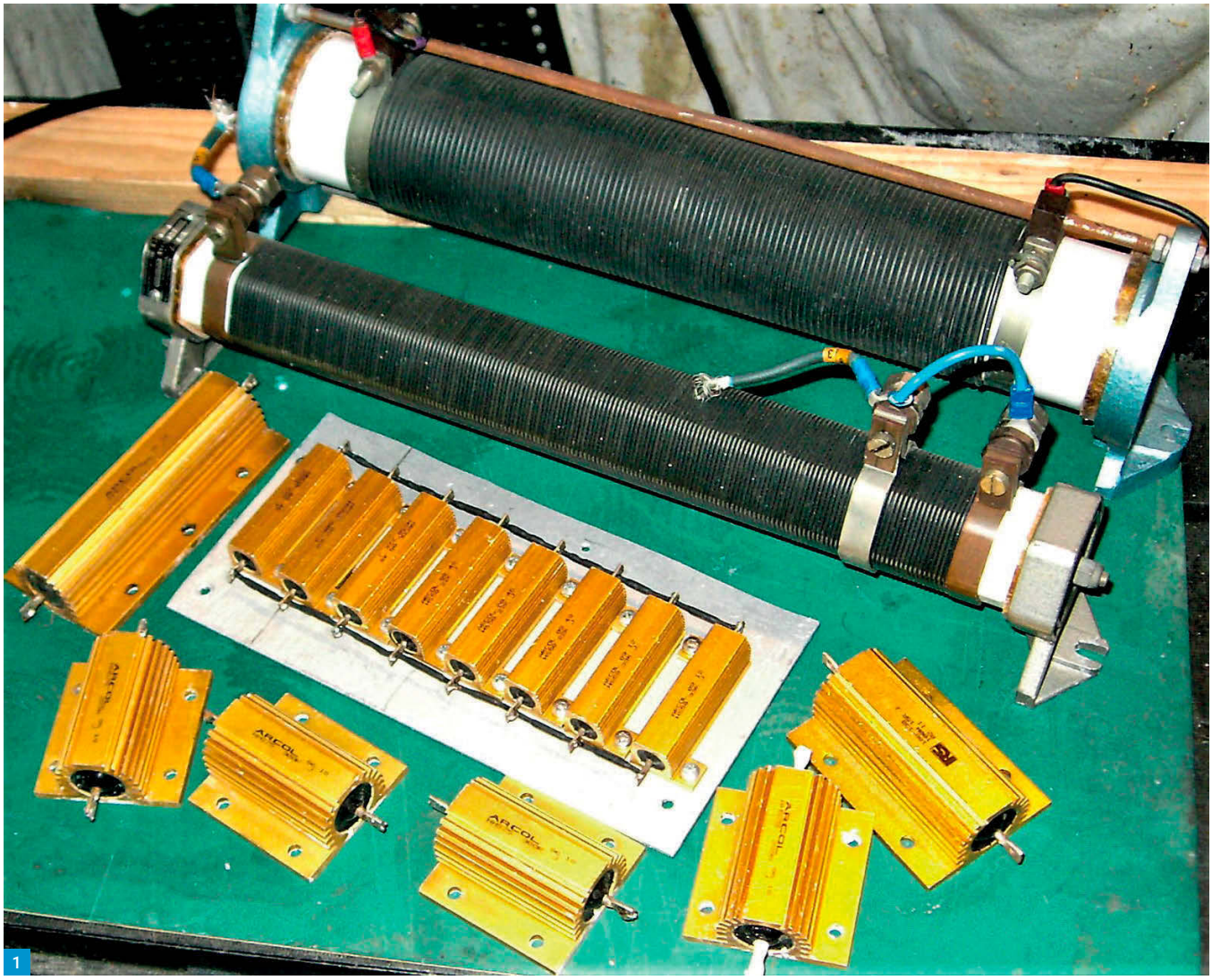
Band Map buttons

- There are programmable buttons at the top of the Band Map. Four are fixed, but there are 32 or so others available that you can personalize. For CW I have set three of them to select filters (400Hz, 200Hz and 80Hz).
- I have an 8in touchpad located within inches of my keyboard. By running a program called TouchPortal on the touchpad I just reach my finger over and tap the screen to quickly change filters.
- I also use the touchpad for things like sending "N4" or "XL" (common miscopied info about my callsign), switching antennas, turning the Preamp/Attenuator/Rcv antenna on or off, forcing an unrecognized by N1MM callsign into the log, spotting people, incrementing received serial numbers by 1 (CTRL+U), and marking a frequency as busy by folks not in the contest so I know to skip them during my next S&P pass through the band.



N1MM is the most commonly used contest program and there will be lots of variations on this theme of course, but it is always useful to see other people's suggestions and hints.

Please send all your comments, offerings, information to: **roger@g3ldi.co.uk.** 73 and may the Morse be with you! Roger G3LDI. **PW**



1

Eric Edwards GW8LJJ
ericgw8ljj@outlook.com

A Variable Electronic DC Load

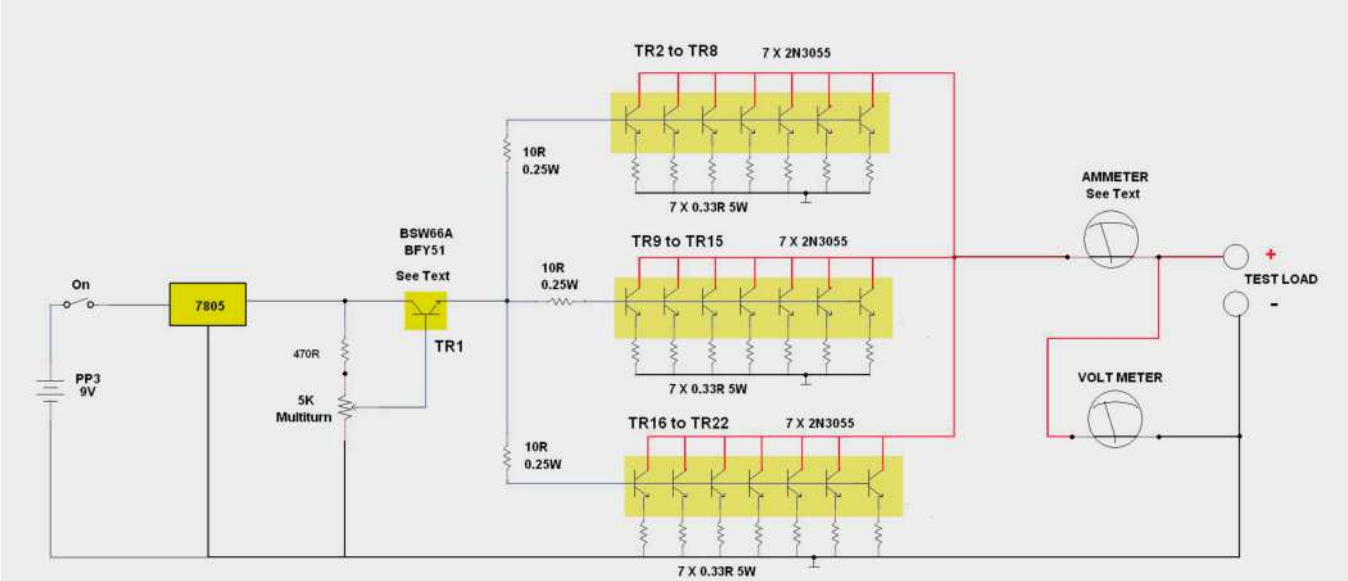
Eric Edwards GW8LJJ presents a variable electronic load suitable for testing power supplies.

When building a low voltage shack power supply or testing a commercially built one for solid-state projects or for providing the power source for the shack transceiver, the current as well as the voltage needs to be evaluated for any set of applications. This can be a problem because a specific value load resistor is needed for each application, or one that can 'load' the power supply to its maximum capability.

The resistance value of the external test load along with the power capability (wattage) of the load will depend on the required voltage and current measurements of the power supply. If the power supply to be measured is 13.8 volts (V) and the rated current is 30 Amps (A), a resistor of 0.46 Ohms (Ω) with a wattage rating of 414W will be needed. The wattage can be 500W or higher, which will be very big, and one at 0.46Ω will be difficult to obtain.

Using High Wattage Resistors

The photo, **Fig. 1**, shows some 100W 'gold' resistors along with smaller wattage types and large open wire-wound types with a slider to adjust the resistance value on one of them. This gives some idea of the physical size of the resistors needed. The nearest available resistance value to 0.46Ω is 0.5Ω to test the 13.8V power supply at 30A and can be considered near enough for testing the power supply. All resistors have a percentage tolerance so that their resistance value can be either a little lower or higher in value and are normally ±5%, which means a 0.5Ω resistor can be anywhere between 0.475Ω and 0.525Ω. Several lower wattage resistors can be used in parallel and/or series to make up the power rating but the resistor values of each resistor will have to be calculated accordingly. If, for example, a resistance of 1Ω is needed to load a 10V power supply at 10A (keeping the maths simple), one 100W resistor would be needed or ten 10Ω 10W resistors can be used in parallel, or ten 0.1Ω 10W resistors can be used in series, although it may be difficult to obtain 0.1Ω high wattage types, but you can see the principle used. The resistors in series or parallel will share the total power, because each resistor will only dissipate the



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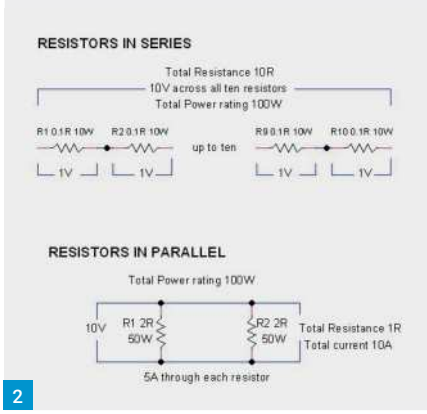
power created by the voltage across it and the current through it, **Fig. 2**.

The Principle

Using a fixed resistor (or resistors) for evaluating the rating of the power supply under test, a voltmeter is placed across (in parallel with) the power supply and the required load resistor/s with an ammeter of the current rating to be measured, is placed in series with the power supply (positive to negative), **Fig. 3**.

When using the electronic load, the power supply under test is connected to the terminals with a voltmeter placed across them, or one on the power supply can be used. The ammeter (and shunt) on the test unit is internally connected in series with the power supply positive terminal and the 2N3055 collectors. The current is to be monitored on the ammeter along with the voltage displayed on the voltmeter. Connect the power supply to the terminals of the tester, and with the variable load control turned anticlockwise (fully off), switch on the power supply. Note that the voltage is as supplied by the power supply (let's say 13.8V), then slowly increase the load by turning the control clockwise. Monitor the voltage and current on the meters.

If the voltage remains at 13.8V when increasing the load until the current drawn is 30A, the power supply can be considered within specification. If the voltage falls dramatically, the power supply is either faulty or not rated for continuous loads. Some power supplies although rated at a specified current, may not be continuous, but will provide the required current for short, intermittent periods. This may not be a problem when using it with an SSB transmitter because the peak current drawn from the power supply is momentary, so it may be suitable for the purpose, but it should be investigated before buying commercial power supplies.



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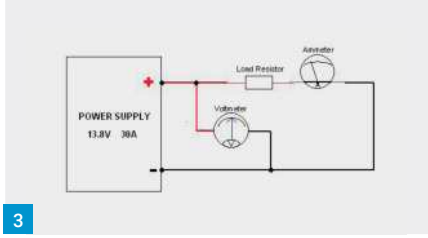

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Fig. 1: Examples of high-wattage resistors. Fig. 2: Resistors in series and parallel. Fig. 3: Setup for evaluating a power supply. Fig. 4: Circuit of the variable electronic load. Fig. 5: The heatsinks in the author's unit. Fig. 6: 50A meter. Fig. 7: A suitable shunt for an ammeter. Fig. 8: Ordering information from the ST datasheet. Fig. 9: Suitable add-on tester. Fig. 10: Checking out the load to test the regulators. Fig. 11: Testing a regulator.

An Electronic Load

Using fixed, high wattage resistors as loads for evaluating power supplies is clumsy and they get hot, which our 'Elves with their safety pins' don't approve of. Using an electronic load system is a much better and more economical way of testing many different types of power supplies. The unit presented here will allow testing of DC power supplies with up to 40V at 50A. There is no need to obtain large wattage resistors for different power supply voltages and current ratings, and it is just as easy to test a 12V 1A power supply as it is to test one rated 40V at 50A. The load can be varied so that almost any power supply with a range of voltages and current ratings can be tested with this unit.

How it Works

In the circuit, **Fig. 4**, an NPN transistor (TR1) with a variable 5kΩ resistor is the control to adjust the current through the bases of a bank of larger power NPN transistors type 2N3055 (TR2 to TR22), which creates a larger current through the emitter/collector. The control transistor can be a BSW66A or BFY51 or similar type. Any switching transistor such as a BFY51 will be suitable as a maximum of 9V is applied via the PP3 battery and a 5V regulator. The regulator is used because there is a digital voltmeter fitted on my unit that requires 5V. If an analogue meter were used to measure the power supply under test, the regulator would not have been needed and the 9V from the battery would be used directly (via the switch) to supply the voltage to TR1. The total current drawn by this transistor when fully turned on (max load adjusted by the potentiometer) is 300mA. A 470Ω resistor is in series with the potentiometer to limit the base voltage (prevent it) reaching the collector voltage. The transistor (TR1), which has a collector/emitter voltage (V_{ceo}) higher than the

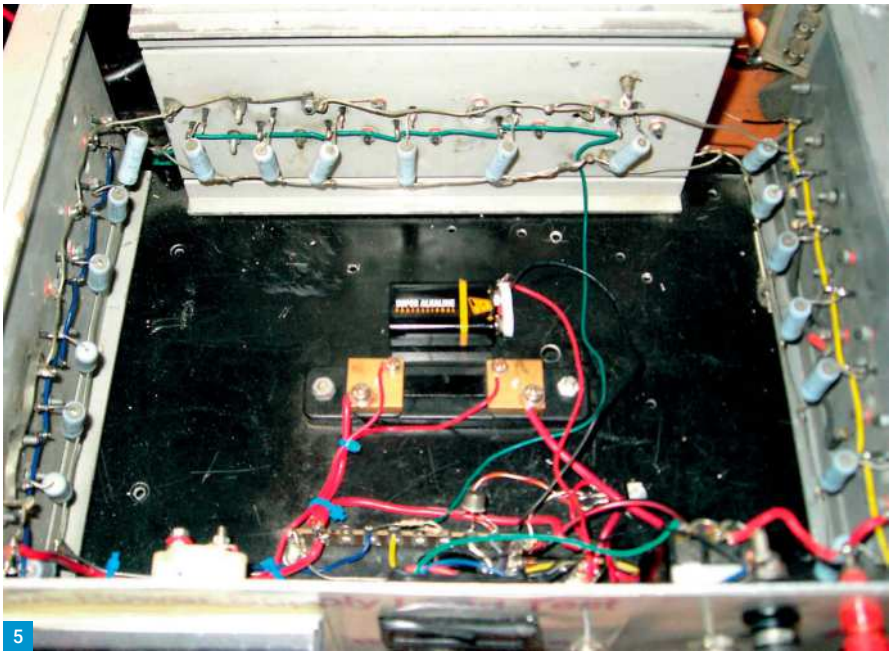
applied voltage (5V from a PP3 battery and regulator, or 9V without the regulator) with a maximum current of 1A will be suitable. A BFY51 has a V_{ceo} (Volts collector/emitter with zero base current) of 30V and a collector current (I_c) of 1A, so it is suitable in this position.

A Bank of 2N3055s

A bank of transistors TR2 to TR22 is used to share the current and dissipate the power in the form of heat. Normally the transistors will be matched so that they all dissipate the same power but by using resistors in the emitters of each one as feedback, the matching is not so important along with the use of a large quantity of transistors passing smaller amounts of current each, so enabling a larger current to flow with them in parallel. The transistors used are 2N3055s. These have been around for many years and have been popular in power stages of audio amplifiers and as the power transistor in voltage regulators. These have a V_{ceo} of 60V and an I_c of 15A. This project uses 21 of them because my three heatsinks were capable of housing seven each and three heatsinks provided 21 power transistors. A lower number can be used and ten will be sufficient for a 40A load so that each one is passing 4A. The 2N3055 can handle a current of 15A albeit with the use of a large heatsink, but using several of these, a smaller amount of current passes through each one as the current is shared. The more used in parallel, the less each one will dissipate so less heat per transistor. Other transistors can be used such as 2N3772. These have a V_{ceo} of 60V with an I_c of 25A, so a higher power transistor allowing fewer of them to be used. Another similar device is a 2N3773 with a V_{ceo} of 140V and an I_c of 16A. These can be used if higher voltage power supplies are to be tested. It is also permissible to use plastic types such as TIP3055s in place of 2N3055s and others. A good heatsink is required for mounting either the plastic or the metal can types. The photo, **Fig. 5**, shows the heatsinks used in my unit and close observers will notice that there are only six transistors on the back heatsink. I am only using 20 transistors, but there are more than enough transistors in total.

Meter it

It is necessary to fit an ammeter to monitor the current when loading the power supply under test and if required, a voltmeter can be added to the tester or one fitted to the power supply can be used. It will be useful to monitor the power supply's voltage when drawing current as it will indicate the power capability of the power supply. The ammeter must have a full-scale deflection (FSD) of the maximum current to be drawn by the load. High current meters are usually, in fact, low current types that need



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an appropriate shunt in parallel with the meter connections. A suitable meter can be seen in **Fig. 6** that has a FSD of 50A but it will need a shunt placed across it because the meter is actually only capable of passing small currents.

From Wikipedia

Ammeters must be connected in series with the circuit to be measured. For relatively small currents (up to a few amperes), an ammeter may pass the whole of the circuit current. For larger direct currents, a shunt resistor carries most of the circuit current and a small, accurately-known fraction of the current passes through the meter movement. Use of a shunt also allows convenient location of the indicating meter without the need to run heavy circuit conductors up to the point of observation. Ammeters must not be connected directly across a voltage source since their internal resistance is very low and excess current would flow. Ammeters are designed for a low voltage drop across their terminals, much less than one volt.

Ordinary Weston-type meter movements can measure only milliamperes at most, because the springs and practical coils can carry only limited currents. To measure larger currents, a resistor called a shunt is placed in parallel with the meter. The resistance of shunts is in the integer to fractional milliohm range. Nearly all of the current flows through the shunt, and only a small fraction flows through the meter. This allows the meter to measure large currents. Traditionally, the meter used with a shunt has a full-scale deflection of 50mV, so shunts are typically designed to produce a voltage drop of 50mV when carrying their full rated current.

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

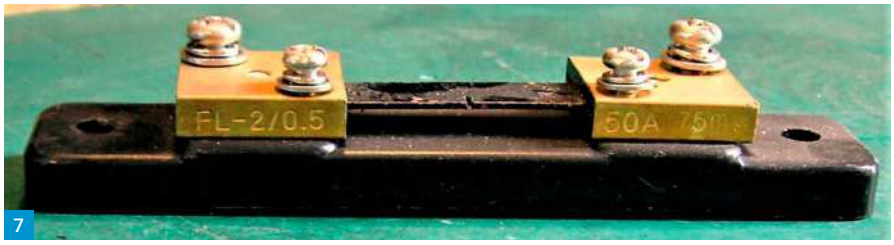
The meter I used is designed to have a voltage

6

drop of 75mV so the shunt has to be a type that can provide the correct voltage. A suitable shunt for this type of meter is shown in **Fig. 7** with the right-hand terminal labelled as 50A 75mV. These meters and shunts are readily available from several sources found on the internet sales sites. The shunt must suit the meter's voltage as shown on the front panel of the meter. If the meter has printed 50mV on the panel, then a 50A, 50mV shunt must be used.

Building it

There are not a lot of different parts used in the construction of this unit as it mainly consists of a set of heatsinks for the 2N3055 or similar transistors and a front panel to house the controls and meters. A typical constructional layout can be seen in Fig. 5 where the heatsinks are clearly seen at the sides and rear. On a bottom plate (base), the control transistor TR1, is mounted onto a tag strip where the connections to it are taken from the potentiometer (current control), voltage regulator (if fitted) and the 9V battery. The ammeter shunt is also on the bottom plate where there are two large connectors used for the current supply, and is connected in series



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Part number	Order codes					Output voltages
	TO-220 (single gauge)	TO-220 (dual gauge)	DPAK	D²PAK	TO-220FP	
L7805C	L7805CV	L7805CV-DG	L7805CDT-TR	L7805CD2T-TR	L7805CP	5 V
L7805AB	L7805ABV	L7805ABV-DG		L7805ABD2T-TR	L7805ABP	5 V
L7805AC	L7805ACV	L7805ACV-DG		L7805ACD2T-TR	L7805ACP	5 V
L7806C	L7806CV	L7806CV-DG		L7806CD2T-TR		6 V
L7806AB	L7806ABV	L7806ABV-DG		L7806ABD2T-TR		6 V
L7806AC	L7806ACV	L7806ACV-DG				6 V
L7808C	L7808CV	L7808CV-DG		L7808CD2T-TR		8 V
L7808AB	L7808ABV	L7808ABV-DG		L7808ABD2T-TR		8 V
L7808AC	L7808ACV	L7808ACV-DG				8 V
L7885C	L7885CV					8.5 V
L7809C	L7809CV	L7809CV-DG		L7809CD2T-TR	L7809CP	9 V
L7809AB	L7809ABV	L7809ABV-DG		L7809ABD2T-TR		9 V
L7809AC	L7809ACV					9 V
L7812C	L7812CV	L7812CV-DG		L7812CD2T-TR	L7812CP	12 V
L7812AB	L7812ABV	L7812ABV-DG		L7812ABD2T-TR		12 V
L7812AC	L7812ACV	L7812ACV-DG		L7812ACD2T-TR		12 V
L7815C	L7815CV	L7815CV-DG		L7815CD2T-TR	L7815CP	15 V
L7815AB	L7815ABV	L7815ABV-DG		L7815ABD2T-TR		15 V
L7815AC	L7815ACV	L7815ACV-DG		L7815ACD2T-TR		15 V
L7818C	L7818CV	L7818CV-DG				18 V
L7824C	L7824CV	L7824CV-DG		L7824CD2T-TR	L7824CP	24 V
L7824AB	L7824ABV	L7824ABV-DG				24 V
L7824AC	L7824ACV	L7824ACV-DG				24 V

8

with the collectors of the 2N3055s and the positive power supply test terminal. The two smaller terminals on the shunt are connected to the meter. These have to be connected to the meter terminals that move the needle in the correct direction when measuring the current flow. Determining which are the correct terminals used to connect to the shunt can be performed with a digital multimeter. Select the diode position on the multimeter to provide a small voltage at the test probes, and connect the negative lead to one terminal on the ammeter and the positive lead to the other. Note whether the ammeter needle moves forward or tries to move backwards. Reverse the multimeter leads on the ammeter terminals if necessary, so that the needle moves forward. There will only be a small amount of voltage from the multimeter and it will not damage the ammeter. The ammeter terminal that had the positive lead connected to it to make the needle go forward is to be connected to the shunt connection that is connected to the positive terminal of the battery test terminal. The other connection of the ammeter, which is connected to the other shunt connector, is wired to the collectors of the 2N3055s.

Stand Alone Option

If the tester is to be used for testing low voltage power supplies such as shack 13.8V and other 12V power supplies, the PP3 battery will not be needed and an input to a 5V regulator can be connected to the positive terminal of the power supply under test. The voltage from the power supply (up to max 35V) to be tested will also supply 5V to TR1 via the regulator, therefore no internal battery will be needed. The LM7805 datasheet indicates that 35V is the maximum input voltage. Keep within that range and the regulator will be working normally.

Fake Voltage Regulators

It is generally taken for granted that semiconductors, and especially the 'common or garden' 78XX series of regulators, are genuine types, but unfortunately there are fakes circulating on the internet. Most of our Oriental friends are honest dealers but there are some, in the minority, that are not. The main difference, although the output voltage may be correct, is that the current 'folds over' at around 600mA to 700mA, whereas the genuine ones are capable of passing up to 1.5A. There is not usually any physical difference but it is worth mentioning


9

that there are two different heatsinks (tabs) used on these TO-220 types, even on the genuine regulators. The two tabs are different in thickness with the thicker one between 1.23mm and 1.32mm whereas the thinner tab is 0.51mm to 0.6mm. Both types on the genuine regulator are available and are referred to as 'single gauge' for the thinner one and 'double gauge' for the thicker one.

The part number suffix is the only difference when ordering. A table extracted from the ST datasheet, **Fig. 8,** shows the ordering information for deciding the one wanted. The thicker tab (dual-gauge) has –DG after the part number. Order a L7805CV and you will get a regulator with a thin tab whereas order a L7805CV-DG and you will be supplied with a regulator that has a thicker tab. The thicker type can be used with a bolt–on type heatsink but the thinner one will need a more substantial heatsink fixed to the project casing etc.

Add-On Regulator Tester

Because there are fake regulators as mentioned, it will be prudent to test these before using in circuit. This can be done quite easily using a simple add-on unit, **Fig. 9**. This comprises a 1A (or 2A) moving coil meter, a copper strip and terminals for the input voltage from a power supply and output terminals to connect to the electronic load as shown in **Fig. 10**. The regulator under test is attached to the copper (or aluminium) strip or block as a heatsink and an M3 hole is tapped in it to provide a quick and easy way of mounting the regulator. The regulator pins are connected with flying leads with a connector (2.5mm spacing socket strip). The simple circuit at **Fig. 11** is shown with a 7805 regulator for testing but it can be any of the voltages in the 78XX series. The voltage input from the shack power supply is connected via an ammeter, 1A or 2A, to the input pin of

10

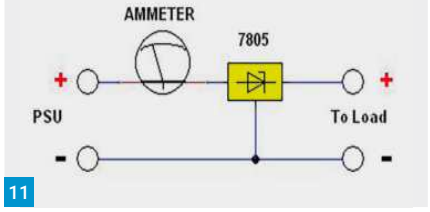
Parts List

PART	TYPE	QTY
TR1	BSW66 or BFY51 or similar	1
7805	5V Regulator	1
On/Off (9V) switch	toggle switch	1
Potentiometer	5kΩ Multiturn	1
Resistor	10Ω 1/4W	3
Resistor	0.33Ω	21 or less
Resistor	470Ω (2N3055 base current limit)	1
Transistor	2N3055 or similar (see text)	21 or less
Meter	Ammeter 50A FSD (50mV or 75mV)	1
Meter Shunt	50W, 50mV or 75mV	1
Meter	Voltmeter analogue or digital	If required
Heatsink	For 2N3055s	As required
Tagstrip	For mounting TR1	As required
Terminals	Load input Black and Red	1 each

the regulator and the regulator's output pin is connected to the load positive terminal. The negative input from the power supply, the regulator common (centre pin) and the negative terminal for the load are connected together.

References & Acknowledgements

2N3055 Datasheet
BFY51 and BSW66A datasheets
L78XX series datasheet (RS Components)
Proof Reading **Ray Koster G7BHQ**



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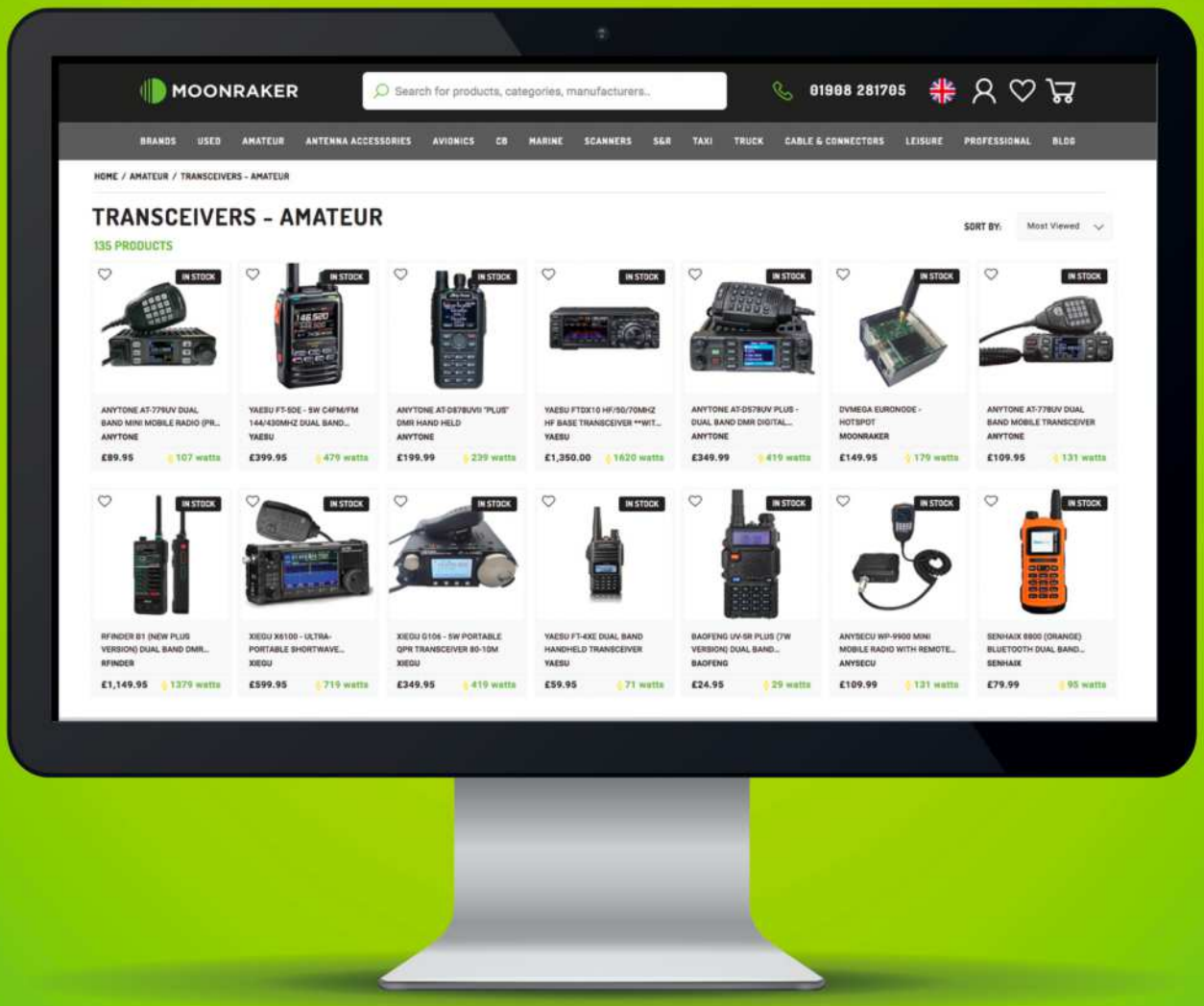

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SCAN TO SHOP

1

The B2 Spy Set

Tony Smith G4FAI describes the B2 Spy Set, its use, its users, and the dangers they faced in clandestine operations.

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The B2 spy set, or Type 3 Mk.II, to use its official designation, was one of a series of SOE (Special Operations Executive) clandestine sets designed in 1942 by **Captain John I. Brown G3EUR** at SOE Station IX, The Frythe, near Welwyn, Hertfordshire. It was the best-known of all the sets used for clandestine operations in WW2.

When used by agents and resistance groups operating in occupied territory, it was normally carried in a suitcase with all necessary accessories. When used by military personnel operating in the field with partisan groups, etc, it was packed in two watertight containers, dropped by parachute, and then carried as backpacks.

Danger from Detection

The function of a clandestine wireless operator was to keep in contact with a Home Station in Britain; to receive instructions, to send information on enemy activities, and to arrange parachute drops or landings of other agents, or supplies, as required.

In a transmission to a Home Station, using a B2 or other clandestine set, operators, having sent a message, would have had to wait for an hour or more for a reply confirming that the message had been received and understood.

They were advised to limit transmission on a given frequency to no more than five minutes, but complicated coding and decoding procedures sometimes meant that messages were quite lengthy and had to be transmitted over longer periods of time.

During these transmissions, according to **Pierre Lorain**, in *Secret Warfare, the Arms and Techniques of the Resistance* (1984), German DF (direction finding) stations in France were monitoring all frequencies up to 30Mc/s; and when an unauthorised or suspicious signal was detected they were able, by triangulation, to identify an area, roughly 10 miles long on each side, within which the suspect station was operating.

Disappear into the Night

Local units were alerted, and detector vans often disguised to resemble civilian vehicles, were dispatched to each corner of the identified triangle to obtain a more precise location of the target transmitter.

If the triangle could be reduced to a much smaller, identifiable area, armed foot patrols, with portable radio-detection equipment, could identify an individual building and find the illicit station, often with fatal consequences for its operator if captured.

Apart from limiting transmission time, operators were also advised to use a battery supply whenever possible as use of a mains supply could be a factor in their detection.

Once a suspect transmitter was located in a particular area, a tracking team sometimes cut off the mains electricity supply to that location. If the monitored transmissions

suddenly stopped, the team knew they were getting near to the transmitter. A sudden cut in power also provided a warning to operators that the enemy were not far away. If they were wise, they would pack up their radio and disappear into the night before the Gestapo found them.

QUG

According to **Prof. Juliette Pattinson**, writing in *Secret War* (2001), operators sensing trouble sent QUG to their Home Station, meaning *"breaking off transmission. I am in imminent danger."* It has not been possible to find any other reference to the use of this signal but, as Prof. Pattinson interviewed many surviving members of the SOE for her book, there seems to be no reason to doubt it.

In the official Q-code, QUG means *"I am forced to land immediately"* and use of this by an agent in danger seems to be a reasonable adaptation of the original meaning in the absence of any specific code for the purpose.

The time taken from the detection of a suspect signal to the dispatch of vehicles to the approximate area of transmission, as described, was about 14 minutes. By early 1944, according to Pierre Lorain, the Germans had developed an automated DF system that would have enabled a transmitter to be located within a circle of a half-mile radius, after simply hearing an agent's three-second acknowledgement sent to the Home Station.

The operation of clandestine radio transmitters was fraught with danger due not only to the success of the enemy's DF operations but also betrayal by Nazi collaborators, unexpected security checks or simple errors. Although there were exceptions, the overall result was that the average life of a clandestine wireless operator was only about six weeks.

Home Stations

The SOE Home Stations in the UK were manned by men and women of the Royal Corps of Signals, the FANY, and the Women's Services. FANY, the First Aid Nursing Yeomanry, was founded in 1907 as a small unit of nurses on horseback providing a link between the battlefield and field hospitals. In the Great War its members drove ambulances and ran field hospitals. In WW2, some 4,000 of them served with the SOE and ATS (Auxiliary Territorial Service) in Communications, Signals and Cipher departments.

Many were posted to SOE Home Station 53a at Grendon Underwood, Buckinghamshire, where they monitored, received and acknowledged messages from agents in the field who were using B2 and other sets.

Some of them, including 11 wireless operators, went into the field. Of the 50 women agents parachuted into occupied Europe, 39 were FANYs, of whom 13 were captured and executed by the Gestapo. More information about their invaluable contribution to the war effort can be found at:
www.fany.org.uk/history

2

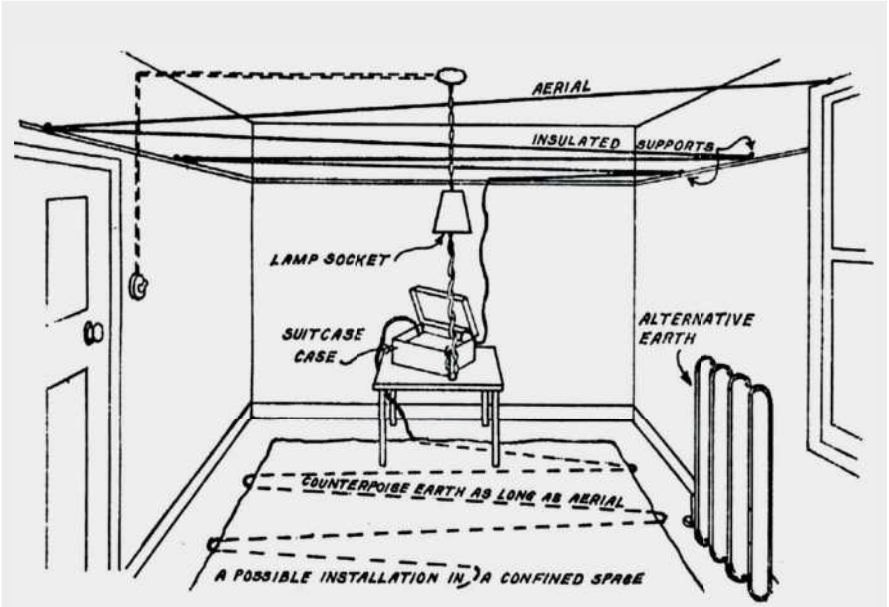
3

Security Lapse

Security was all important but eventually grew lax. To avoid the need for repetition, all messages received were recorded. 'Fingerprinting', a comparison of pre-recorded operator's Morse sending styles, or 'fists', with the styles of the recorded messages received, was used to verify that the sending operator was not an enemy substitute.

A further precaution was the inclusion of security checks in the messages sent by the operators, or the sending of deliberate errors, if they had been captured and were being compelled to send false messages under duress.

Photo 1: FANY operators at a Home Station. Photo 2: Complete B2 set in a suitcase. Photo 3: B2 set in two watertight containers. Used by military personnel working with partisan groups, etc. Photo 4: Installation of a clandestine aerial to avoid visual detection. From B2 Operating Instructions. Photo 5: Miniature Morse key used with the B2 set. (Photo, courtesy John Snell G0RDO, morsemad.com) Photo 6: B2 Operating Instructions included with the set.



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Later in the war, Home Station staff were instructed to ignore any errors on the assumption that the messages were being sent by the operators under pressure in conditions of great danger, and that it was inevitable that some errors might be made in their keying. This led to occasions when it was not noticed that a captured operator was trying to warn the Home Station that a resistance network had been infiltrated.

Operation Englandspiel

In March 1942 the German counter-espionage service achieved its greatest success, and the SOE its greatest setback. For the next two years, in an operation called Englandspiel (England game), the Germans controlled the entire Dutch SOE network. They operated a dozen W/T links back to the UK, deceiving the SOE into sending additional agents, weapons and supplies to Holland, to be captured by German welcoming parties.

54 SOE agents were captured and 50 were executed. Other losses included 400 members of the Dutch underground, arrested or killed, twelve RAF aircraft and 84 aircrew.

It ended in April 1944 when the Germans closed their operation, sending a mocking message in plain language, addressed by name to the head, and his predecessor, of Section N of the SOE (which was responsible for Dutch operations) saying, *"We are aware that you have been doing business in the Netherlands for some time now without our help. Since we have been your representative for a long time, we find this very unfair. But that does not rule out that, if you decide to come and visit us on a large scale, we will prepare you the same welcoming reception as your agents"*.

With the Partisans

The Balkan Air Force (BAF) was an Allied air group, operating mainly over Yugoslavia from June 1944 until July 1945, in support of partisans fighting the occupying German forces. The Balkan Air Terminal Service (BATS) was formed by the BAF to plan and co-ordinate supply dropping to the partisans.

BATS teams parachuted or flew into Yugoslavia to set up and maintain remote landing strips for aircraft flying in supplies, flying out wounded partisans, or transporting SOE and OSS (US Office of Strategic Services) operatives.

Len Key MBE G0FQX, writing in *Morsum Magnificat* (MM) in 1989, described his experiences using the B2 set as a member of a BATS party in 1944.

His team comprised an officer, a sergeant, two wireless operators (including Len) and a medical officer. Their radio equipment was not the usual B2 field set but the suitcase version, with a petrol driven generator, and batteries. The original miniature key was used throughout the entire operation.

The generator ran almost continuously to keep the batteries charged as the B2 was in constant use. It was operated to schedule several times a day and transmitted many special reports as required.

Len described it as the ideal equipment for the operation. When asked to change frequency by his Base station, this could be done in a matter of minutes. The set was lightweight and could be packed away quickly when the group were under attack and had to move. It was robust, and the padding inside the suitcase absorbed any shocks from heavy handling.

Indo-China

The B2 was also used in later theatres of war. **Francisco Marinesco F6EQC** served in the French Army in Indo-China, now Vietnam, from 1947 to 1959. He recalled that the wireless networks he worked with used mainly B2 sets. Despite some limitations – no break-in or audible sidetone – the sets worked for years practically without maintenance, handling dozens of messages a day. He said that in many ways it was just like working a small homebrew amateur radio station of that time.

Miniature Morse Key

The miniature key provided with the B2 set was produced by the Multitone Electric Company Ltd for various SOE sets designed by Captain John Brown G3EUR. Writing in *MM* in 1987, John wrote: *"A flex-pigtail was added soon after first production to reduce 'key-bounce' caused by cathode current passing through the hinge-screw. The key's main merit was that it could be fitted into the cramped spares-box.*

"It was not popular with the users who knew what a good key should be, and many preferred the extra size and weight of Army/RAF keys. It speaks volumes for those heroes who used the key under stressful conditions, in various countries around the world, that many thousands of groups of five-letter cipher were sent and successfully decoded."

Today, examples of this key are difficult to find. They are popular with collectors although they may not be fully aware of the uses they were put to and the dangers experienced by those who used them.

Post-War Release of B2 Sets

In 1947, a limited number of surplus B2 sets were made available for members to purchase through the Radio Society of Great Britain (RSGB). Articles were published in the society's *Bulletin* on how to modify them in various ways for amateur use, including conversion to AM working and bandspreading. In 1948, *Short Wave Magazine* published modifications for topband use, commenting,

"There seems to be no limit to the versatility of the B2."

Some of the sets occasionally appear on the market today, modified or unmodified, and fetch high prices, sometimes in the several thousand-pound range. In a BBC *Antiques Roadshow* (July 2021), a B2 found in a metal toolbox in an old barn, was valued at ten to fifteen thousand pounds.

Originally the property of **Sgt F.L. Church, Royal Signals, G3CUW**, it appeared to have been set up as an amateur station. G3CUW was last listed in amateur callbooks in the late 1960s/early 1970s so the set had probably been sealed in its box, and preserved in good condition for around 50 years. It caused a sensation and attracted widespread press coverage. A BBC clip featuring the valuation can be seen at:
https://tinyurl.com/59rv66ru

Memorials

Those who are privileged to own B2 sets, or other clandestine sets from the same era, should be aware that they are not just WW2 curios. They are surviving artefacts, memorials to the incredibly brave operators who risked or lost their lives as a direct result of operating them in the deadly environment of enemy occupied Europe and elsewhere.

The Commonwealth War Graves Commission has made a short film about the B2 as part of an educational pack about **Noor Inayat-Khan**, the first woman wireless operator to be parachuted into occupied France during WW2.

Close-ups of the set show its various features in fine detail; and **John Ellerton G3NCN** at the RSGB National Radio Centre, Bletchley Park, describes how it was used and how it was operated. The film can be seen at:
www.youtube.co/watch?v=U3ZZUJmltSU

B2 Specification

- Transmitter: Crystal controlled. CW (Morse) only, with plug-in tank coils, covering 3.0 to 16.0Mc/s, which were reversible to obtain the highest possible efficiency in transmission.
- Range: up to 1,000 miles or more.
- Power Output: 15-20 watts, depending on frequency used.
- Receiver: Four-valve, seven-stage superhet, IF 470 kHz, covering 3.1-15.5Mc/s in three bands.
- Tuning: 50-1 slow motion vernier dial, graduated 0-150.
- Audio output: 50mW to 120Ω headphones.
- Power Supply: Combination power pack. For AC operation a mains supply of 97-140V or 190-250V was required. For DC operation, a 6V car battery of the highest capacity obtainable was required to provide a current of up to 10A when transmitting. When packed in the military containers, two 6V batteries were included with a hand generator for charging the batteries.
- Weights: Fully equipped suitcase set, 34lbs (14.7kg). Fully equipped set in two watertight containers, 47lbs (21.32 kg).
- Spares Box: Containing 60ft of aerial wire; 10ft of earth wire; miniature Morse key; headset; fuses; four spare valves; screwdriver; two brass pins to convert mains plug to Continental wiring; ES/BC adaptor; four tank coils for the transmitter covering 3-5.5, 4.5-7.5, 6.5-10.0, and 9.0-16.00Mc/s; and four crystals for designated transmitting frequencies.
- Maker/Date: SOE Station VIIa, located at Bontex Knitting Mills, Beresford Avenue, Stonebridge Park, North-West London, 1942.
- Comprehensive instructions included with the set provided information and advice on operating; maintenance; fault-finding; receiver alignment; suitable aerial systems for various situations and locations; how to confirm that available mains supplies were suitable for the equipment; and instructions on the care and charging of batteries. **PW**

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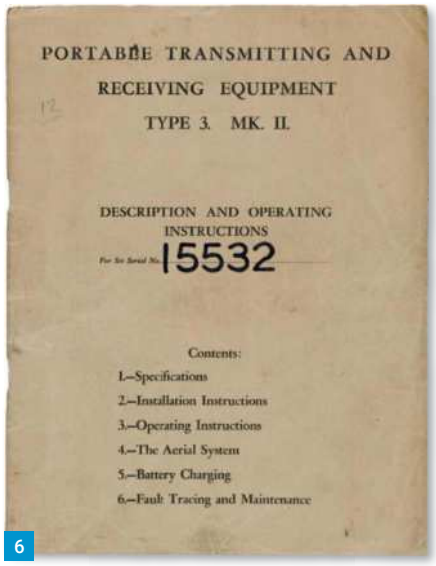

6

Answers to the Christmas Quiz

1. 3 pence (1.25p in decimal currency). (1 point) **2.** (b) In 1932 amateur licences were issued in the series G2, G5, or G6, followed by two letters. (G3, G4 and G8 two-letter callsigns were introduced later in the 1930s.) (1 point) **3.** (c) 1755. (1 point) **4:** (d) Edwin Armstrong (1890 – 1954: he also invented the superhet receiver. Clever guy!) (1 point) **5.** (b) 1937. (1 point) **6.** (b) 1906. SOS was officially adopted at an International Radiotelegraph Conference, the precursor to today's ITU World Radiocommunication Conferences. Prior to then, 'CQD' had been used for distress signals. (1 point) **7.** 1991. (1 point) **8:** HRH the Duke of Edinburgh, Prince Philip, (1 point) **9.** 3 metres (or just under 10 feet). (1 point) **10.** One which works or two or more bands by using an additional close-spaced element or elements not physically connected to the feeder. (1 point) **11.** A beam antenna with full-wave quad-type elements for the driven element and reflector, but half-wave Yagi-type directors. (1 point) **12.** 20 metres (14MHz). The antenna, originally designed by G5RV in 1946, is 102ft / 31m long: three half-waves on 20m. (1 point) **13.** (c) A wire 6 wavelengths long has about 5dB gain over a dipole. (1 point) **14:** Manually tuning a valve transmitter, transceiver or linear amplifier for proper operation or maximum output. (1 point) **15.** A station is receiving on a frequency slightly different from the frequency on which it is transmitting, typically 1 – 3kHz higher on CW or 5 – 15kHz higher on SSB. (1 point) **16.** (c) 1200. (1 point) **17.** EU-120. (1 point) **18.** (d) DPRK (North Korea), P5. (The other three entities are at positions 4, 3 and 2 respectively.) (1 point) **19.** 500 watts PEP. (Manufactured by KW Electronics in the late 1960s / early 1970s, primarily for the export market, the KW Atlanta was an SSB, CW and AM transceiver covering the 80, 40, 20, 15 and 10m bands and using two 6LQ6 valves in the PA.) (1 point) **20.** Continuous Wave – which is ironic, since its meaning is not that of a continuous wave but rather one that is split up into short and long periods of transmission: the 'dits' and 'dahs' of Morse code. (1 point) **21.** (a) Newcomers who have recently "made significant progress in HF DXing". (b) The first 2m-band traditional mode (phone or CW capable of being read without machine assistance) two-way contact across the Atlantic. (c) The "First Amateur Radio Two-Way Communication [between] Earth and Mars" (the cup was presented to the ARRL in 1929 and needless to say it is still waiting to be awarded!) (d) For outstanding and consistent DX work: ROTAB stands for 'Royal Order of Trans-Atlantic Brasspounders' (4 points) **22.** (a) 100 watts (ERP), (b) 100 watts, (c) 15 watts (EIRP), (d) 25 watts (EIRP). (4 points) **23.** (a) Digital Signal Processing, (b) Digital Mobile Radio, (c) Double Sideband, (d) Digital Radio Mondiale. (4 points) **24.** (a) The Netherlands, (b) the USA (Federal Communications Commission), (c) Germany (Bundesnetzagentur), (d) Finland (the Finnish Transport & Communications Agency). (4 points)

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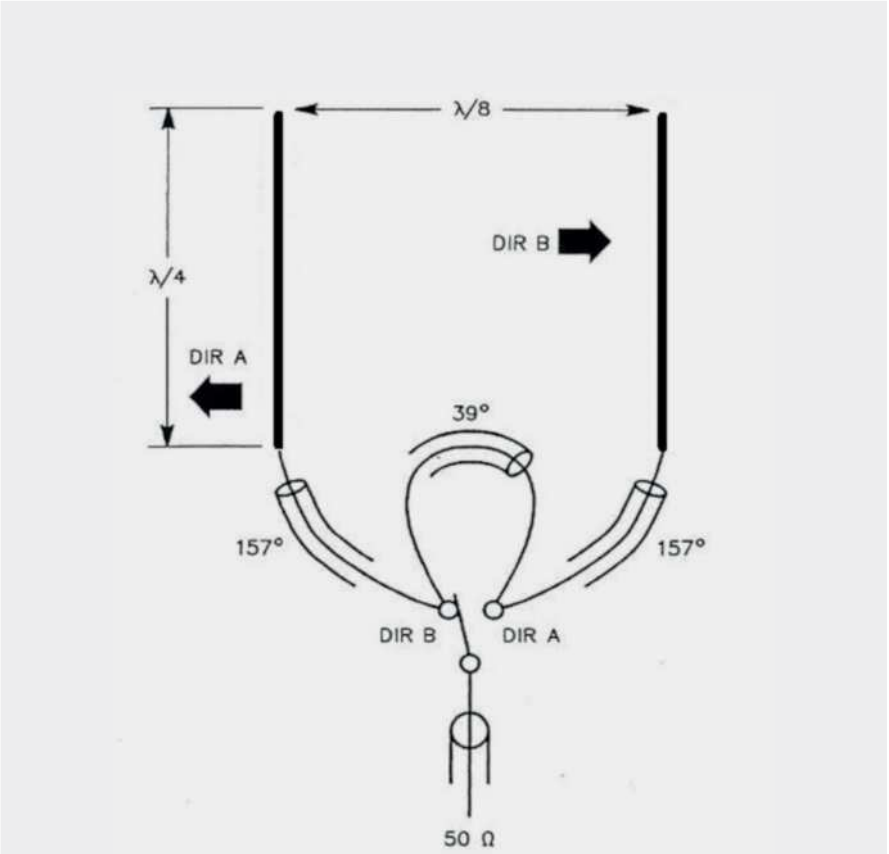


1

That's Phasing Fantastic!

Billy McFarland GM6DX describes the principles and practice of phasing two vertical antennas.

One of the simplest antennas that can be constructed is the quarter-wave vertical. These provide a low angle take-off and are great for working that DX. One disadvantage is that they are omni-directional in nature. So, although these can be great for that beach portable operation, they are limited in the ability to concentrate the received or transmitted signal in a set direction. One method to overcome this is to use them in a phased installation.

The Theory

Let us look at the most common method of phased vertical antennas, the two-element phased array. Two vertical antennas spaced apart and fed with a particular length of coax will allow us to switch between directions giving gain on receive as well as transmit. Using **Fig. 1** as reference you can see two vertical antennas both one quarter wave in length spaced one eighth of a wave apart. Now you can use quarter wave spacing but this has a bigger footprint and performance is almost identical so I no longer use the quarter wave spacing and stick to one eighth wave spacing. The next thing you notice is that each vertical is fed with 157° of coax and that a delay loop of coax of 39° goes between each antenna feed. I see you scratching your heads, so what are these degree (phasing) lines. Well basically they cause the RF to be delayed to one vertical which then causes that antenna to act like a reflector causing gain in a particular direction. Add a switch and then you have the ability to switch directions. With some simple maths we can work out the exact length to cut these coax lengths.

300/f (MHz) = wavelength (m) > 300/14.175MHz = 21.16m

So, the physical wavelength of 14.175MHz is 21.16m. One wave is a total of 360° so 21.16m/360 = 0.0587m per degree. Now we know the length per degree we need to work out the total length of 157° and 39°.

0.0587 × 157 = 9.2159m

0.0587 × 39 = 2.2893m

These are not the final lengths as we need to multiply these figures by the velocity factor (VF) of the coax used (because electromagnetic waves travel more slowly in cable than they do in free space). I stay away from RG213 as I have found 0.66VF too low and use Messi and Paoloni which is 0.83VF (check online for the velocity factor of the coax you have, the higher the better).

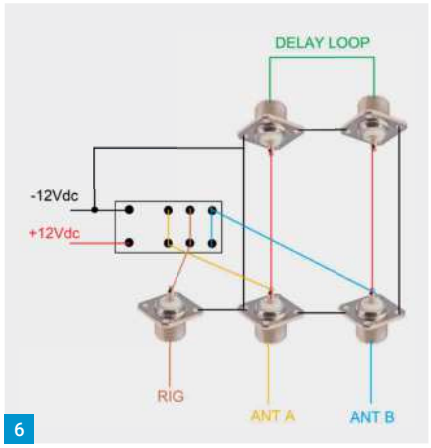
So, 9.2159m × 0.83 = 7.649m and likewise 2.2893m × 0.83 = 1.900m

That is the actual length of coax from tip of PL259 to PL259. Cut two lengths of 50Ω coax at 7.649m, which will feed each vertical, and then cut one at 1.9m which is the length of the delay loop.

Practicalities

That's all the complicated theory out the way. Now onto a few practicalities of the install. This eighth wave spacing is designed for antennas to have 50Ω impedance. If you are using quarter wave verticals with ground radials, then you will likely need to match the feedpoint to give you as close to 50Ω as possible. As I use the array in a portable setting, I use quarter wave verticals that utilise a raised feedpoint with angled radials (which also double up as guy wires) giving the antenna a 50Ω impedance by design, saving on any matching. **Fig. 2** shows the feedpoint assembly from one of the phased elevated verticals. **Fig 3.** shows the SWR scan of each elevated vertical antenna used in the phased array. When setting up the vertical think of the direction that you want to switch between, say North America to EU, and draw a line on the ground. Place one antenna in situ and secure. Thereafter measure one eighth of a wavelength (300/14.175 = 21.16m, 21.16m/8 = 2.6m) along the line and install the second vertical. Once you have both in place it should look similar to the setup as seen in **Fig. 4**.

The magic works in this antenna design when we can switch between directions. The electrical connection of the switch, whether manually or electrically, is simple. You are switching inline the coax run from the rig to each antenna. However, one end of the delay loop will go to one antenna connection and the other end of the delay loop goes to the remaining antenna connection. **Fig. 5** shows the simple wiring modification that can be made inside a manual switch. Position 1 centre is connected to position 2 centre. Likewise position 3 centre is connected to position 4 centre. Position 1 and 4 is the coax feed of 157° going to each vertical. Alternatively, you can make an electrical switch using a DPDT relay, which will allow switching inside the shack without going to the antennas. A simple drawing



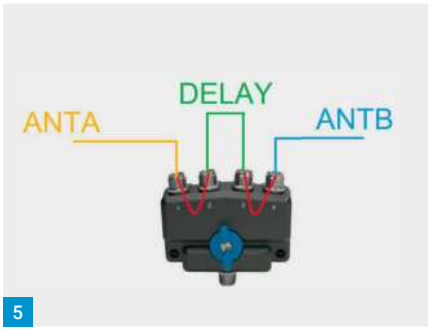


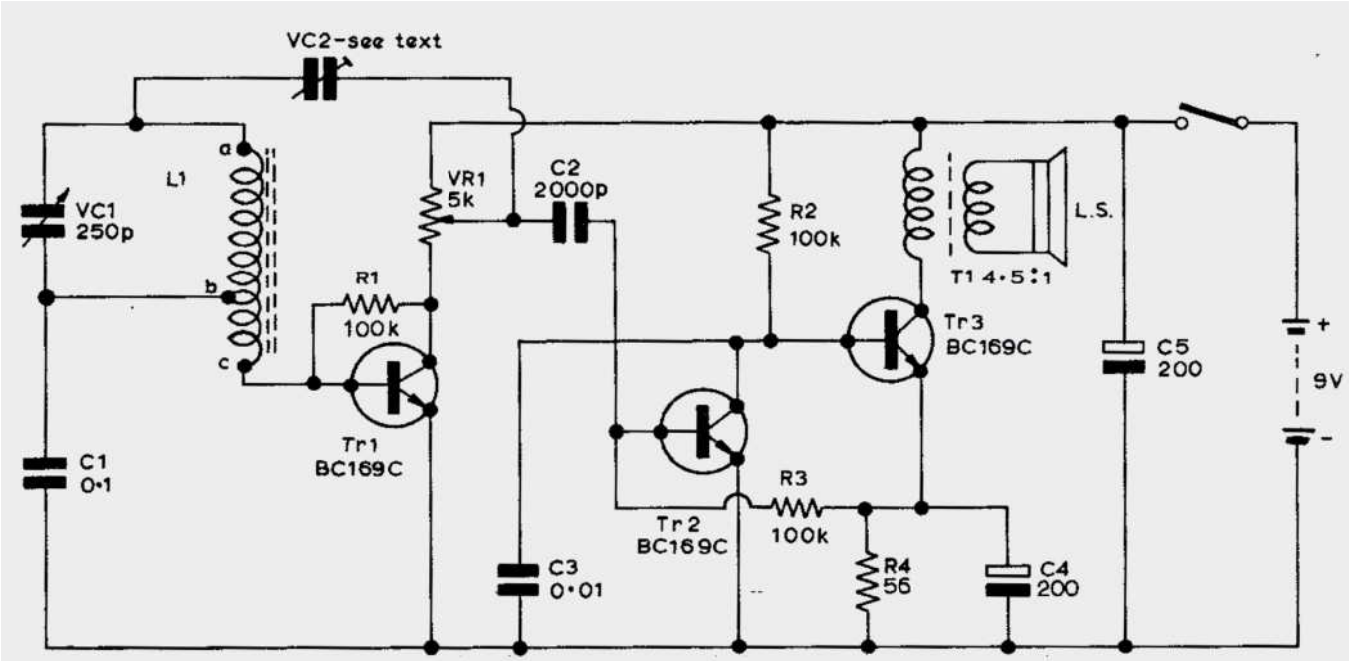
Fig. 1: The basic arrangement.
Fig. 2: Feedpoint arrangement.
Fig. 3: SWR scan of each vertical.
Fig. 4: The author's vertical array.
Fig. 5: Using a coax switch to switch directions.
Fig. 6: Remote switching using a relay.
Fig. 7: The author's switching box, incorporating the ability to 'end fire'.

of connections using a DPDT relay is seen in **Fig. 6.** When no voltage is applied to the relay the antenna transmits in one direction. When voltage is applied to the relay the antenna will switch to the opposite direction.

One additional modification that you can do is 'end fire', that is where the antenna transmits in the direction using the same principle as a dipole (say north and south). To do this you simply just need to short out the switch so that both vertical antennas are getting fed with RF at the same time (i.e. in phase with each other) from the rig. This would allow you to have directional gain say East and West but the ability to transmit like a dipole North and South (end fire). **Fig. 7** shows my homebrew electrical switch and relay unit that incorporates 'end fire' ability.

There, a lot to take in but the principle and theory is very basic. It just requires you to get your hands dirty and give this phased vertical antenna setup a go. If you would like to watch the performance of this antenna setup under test, then watch my video here:
https://tinyurl.com/yy69pt8y

As always, any questions please drop me an email at
gm6dx@outlook.com



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Take 20 – a Three Transistor Radio

Julian Anderson has a design for a three-transistor radio under the banner of the Take 20 series.

This month's special Christmas project describes a three transistor radio which is highly selective together with a good output level. By careful 'shopping around' among the advertisers the complete radio may be built for under 20s; as usual less than twenty components are used

A few months ago our project was a one transistor radio which did not require an external aerial and operated a loudspeaker; however this design did have limitations – especially volume which was mentioned in the text. With Christmas just around the corner there must be many readers who would like to take advantage of their interest in electronics and knock up something for the children, and it was with this specifically in mind that this month's project was planned.

First, the radio had to have decent selectivity and volume, and as it is intended primarily for children it had to be able to get Radio Luxembourg well. The circuit had to be reliable and quickly built. (To this end three prototypes were built to ensure the circuit was reliable.) Building of the prototype shown in the photographs took under three hours including the cabinet. Also the radio had to have a presentable but cheap case.

The Circuit

There is nothing particularly unusual about the circuit. The first transistor acts as an r.f. amplifier with VR1 as its collector load. Positive r.f. feedback (regeneration) is taken from the slider of VR1 and connected via VC2 to the top of the aerial coil.

The r.f. signal is fed to the base of Tr2 which is biased in such a way as to detect the r.f. signal, the output is smoothed by C3. The audio output is d.c. connected to Tr3, the output transistor. The emitter resistor is bypassed by C4, the base bias for Tr2 being taken from this circuit via R3, 100kΩ. The 200µF capacitor, C5, decouples r.f. and a.f. from the positive rail.

Components

Care will have to be taken in the purchase of components to come within our 20s, maximum. Whereas aerial coils can be bought, it is far cheaper and very simple to wind your own. For this L1 should consist of about 70 turns and L2 of 5 turns on a four to six inch length of 3/8in. or 1/4in. ferrite rod. VC1 may be any type of tuning capacitor between 200pF and 350pF. For economy the loudspeaker should be a 6 x 4in. size removed from old TV sets.

This article appeared in the January 1970 issue and was the ninth to appear under the Take 20 banner. See my editorial for more about Take 20.

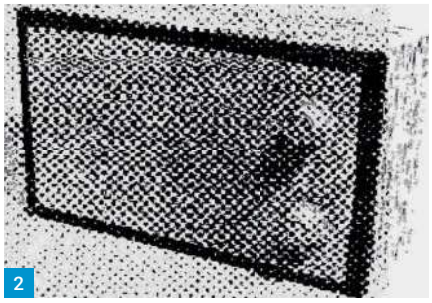


Fig. 1: The circuit of the three transistor radio.
Fig. 2: The Take 20 three transistor radio.
Fig. 3: The components are mounted on an eleven way tag-board. Compare this with the photograph, Fig. 4.
Fig. 4: An interior view of the prototype.

Construction

All components apart from the speaker, VR1, VCI and the battery are mounted on an eleven-way miniature tag board as shown in **Fig. 3**. The ferrite rod is secured to this board by tying one end to the top of the tag board as shown in the photograph.

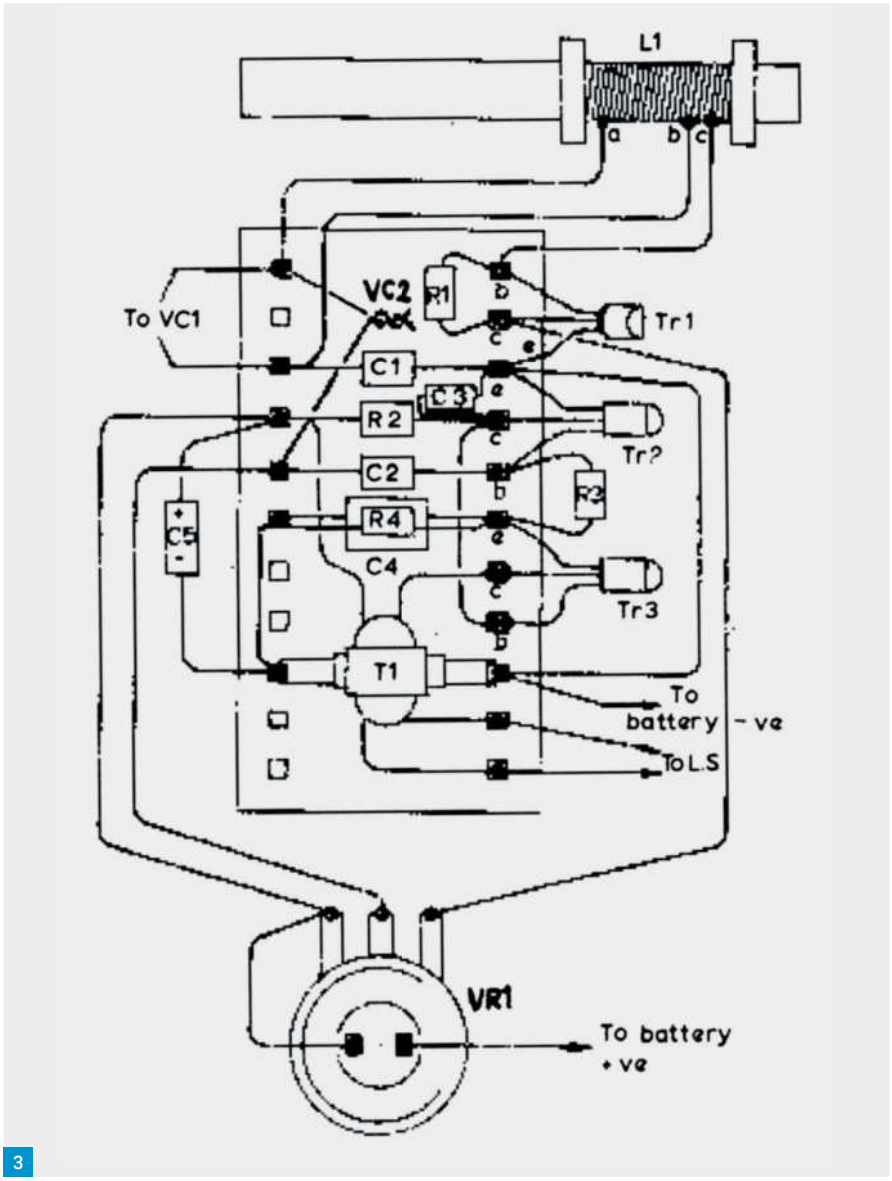
The cabinet front is made from a piece of hardboard 9 x 5in. to which are fixed the sides made from 2¼ x ½in. planed softwood. These sides should be glued and nailed together and nailed with hardboard pins to the side framework. Holes must of course be drilled for the speaker and the two controls. The tag board is held inside the case by making a small bracket, one end of which is bolted to one of the holes in the tag board and the other screwed to the inside of the case ensuring that the ferrite rod is not too close to the speaker magnet.

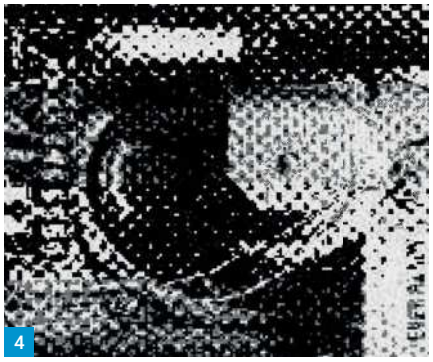
The cabinet front can be covered with speaker fabric or any reasonably strong material. This should be cut exactly to size and glued. The sides and the back of the cabinet are covered in self-adhesive plastic covering such as Fablon. The junction of the speaker fabric and plastic covering may be hidden by using black plastic tape.

Conclusion

Assuming everything has been wired up correctly the only adjustment is that of VC2 and this, being frequency selective, should be peaked so that the set just fails to break into oscillation on Radio Luxembourg. VC2 consists of two lin. lengths of wire twisted together.

Incidentally the gain of the first stage is so high that unless the general layout is carefully followed there is a danger of the set continually oscillating. Because of the fairly high capacitance of Veroboard it is not to be recommended for this particular project. **PW**





Components List

Resistors

R1 100kΩ
R2 100kΩ
R3 100kΩ
R4 56Ω
All 1/8 1/4 watt, 10% miniature types
VR1 5kΩ log pot, with switch

Capacitors:

C1 0.1µF
C2 2,000pF
C3 0.01µF
C4 200µF 9V
C5 200µF 12V
VC1 250pF variable – see text
VC2 see text

Miscellaneous:

Tr1, Tr2, Tr3 BC169C; Ferrite rod with windings – see text; T1, transistor output transformer, approx. 4.5:1; Loudspeaker 3Ω; Battery PP7 or equivalent; Eleven-way tag board; Hardboard and softwood for case – see text; Speaker fabric; Self-adhesive plastic covering.

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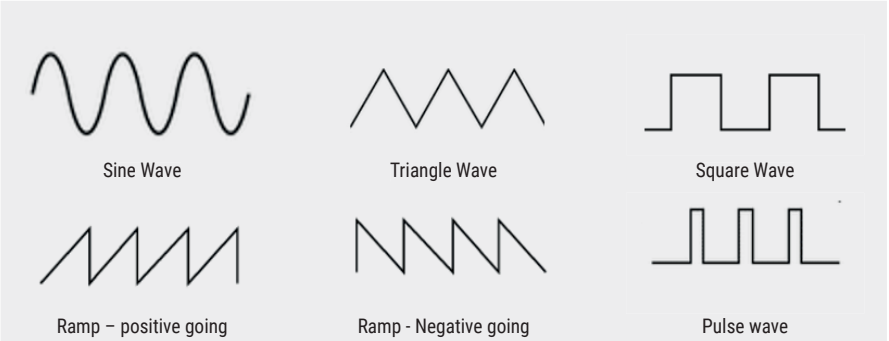

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Waveforms

Jeff and Natalie return to discuss waveforms.

It was Wednesday lunchtime in the electronics lab and Jeff and Natalie had just finished their lunches. Natalie wandered over to Jeff's desk ready for the usual electronics lesson that she got from Jeff on Wednesdays, typically based around what she had learned at college the previous day. *"So what's our topic this week?"* Jeff asked. *"Waveforms"*, Natalie replied, *"And things like frequency, peak, and RMS values"*.

"OK", said Jeff. *"Explain to me what an electronic waveform is then"*. *"Well"*, Natalie replied, *"An electronic waveform is basically a signal that can represent an electrical quantity such as voltage or current. They are two dimensional and like a graph, have a vertical and a horizontal axis from which we can derive information about the waveform. From the horizontal, or X axis, we can determine what the frequency or time period is and from the vertical or Y axis what various values of voltage or current are"*.

"I see", said Jeff, *"Can you give me some examples?" "Well"*, said Natalie, *"Perhaps the most common waveform is the Sine wave. And there are others such as Square waves and Triangular waves"*. *"Yes, OK"*, Jeff replied. *"Can you draw them for me?"* Natalie drew some waveforms on a sheet of paper while Jeff continued. *"There are a few more like Ramp or Sawtooth waves and Pulse waves. Ramp waveforms are similar to Triangular waves and can be either positive or negative. I'll draw them so you can see the difference and Pulse waveforms are similar to Square waves"*, **Fig. 1**. *"Sawtooth, or Ramp waveforms used to be used in the timebases for old televisions and oscilloscopes"*, Jeff explained.

"As you say", Jeff said, *"the most common waveform is the Sine or Sinusoidal wave, probably because most electricity supplies throughout the world are sinusoidal in nature." "Yes, I know that"*, said Natalie. *"But before we go any further"*, Jeff stressed, *"Let's just revisit the difference between a direct current or voltage wave form and an alternating current or voltage wave form. Just because a waveform is sinusoidal or a square wave for example doesn't mean that it is an alternating current."*

"I've heard this before", said Natalie, *"But could you just remind me?" "OK"*, Jeff replied, *"A direct current or voltage always has the same polarity, which may be positive or negative. The level of voltage or current may vary but it never changes direction. A typical example is the signal that you might find on the collector of a common emitter transistor amplifier. The signal level varies but it is superimposed upon a direct current level. Whereas an alternating current or voltage at some point, which may be periodically or random, swings from being positive, through zero to negative and in most cases back again repeating the pattern. Let me sketch them for you"*, **Fig. 2**. *"OK, I remember now"*, said Natalie.

Waveform Parameters

"Alright", Jeff went on. *"Let's have a look at some of the characteristics or parameters of waveforms that you mentioned. Let's look at frequency etc first and we'll use a Sine wave in our examples. If we take two points on a sine wave, the most common being from where it starts going positive from zero and returns to zero from its negative going excursion, this will represent one complete cycle. Depending on what we know about the waveform there are other things that we can calculate. If, for example, we know the frequency, we can calculate the time taken for one cycle and vice versa. I'll write the formula's down for you"*:

Time (t) = 1 / frequency

and Frequency (f) = 1/time (t)

"So, if we have a sine wave with a frequency of one kilohertz, the time period will be one millisecond. Likewise, a sine wave with a time period of one microsecond will have a frequency of one Megahertz."

t = 1/1000 = 0.001s = 1ms

f = 1/0.000001 = 1000000Hz = 1MHz

"Yes, got that", said Natalie. *"Now, another thing that we can calculate from this information is the wavelength of the signal"*, Jeff continued.

$\lambda = 3 \times 10^8$ / frequency

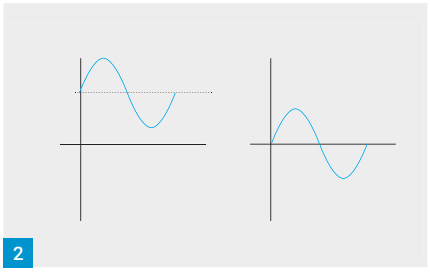
or if frequency is in MHz $\lambda = 300$/frequency

"We can also manipulate the formula to find the frequency from the wavelength. Let's say we know that the wavelength is eighty metres. Then the frequency will be three point seven five Megahertz, which from your radio studies you will know is in what is known as the eighty-metre band."

$f = 3 \times 10^8$ / wavelength

$f = 3 \times 10^8/80$ f = 3.75 MHz

"In fact", Jeff continued, *"Most of the textbooks for people studying for the radio amateurs exams contain a graph of frequency against wavelength, which enables you to easily deduce one of them when the other is known. They can't be used for highly accurate readings however because they're logarithmic, like what we talked about for decibels last time, but they are useful for getting an estimate. For example, it is easy to see that a wave with a wavelength of thirty metres has*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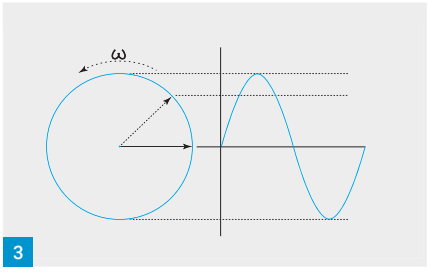

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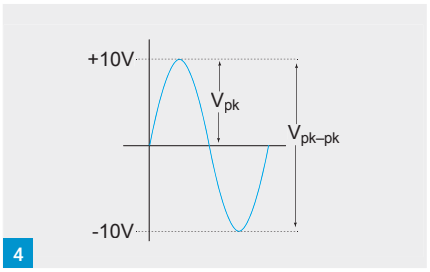

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a frequency of ten Megahertz." "Yes, I've seen those. I think that you are provided with a copy for the Foundation exam", Natalie replied.

"Well, here's one for you to have a go at", said Jeff. *"Calculate the wavelength of the fifty Hertz mains supply in the UK." "OK"*, said Natalie picking up her calculator, *"I get that to be six million metres. Hang on that can't be right". "Yes, it is"*, Jeff replied. *"And if you consider that as the crow flies the distance from London to New York is about five point five million metres you can get some idea of how large it is. And if you consider that microwave ovens use a frequency of about two point five Gigahertz, which has a wavelength of twelve centimetres, you can get an idea of the vast range of wavelengths of the waveforms that we use in our everyday lives".*

Angular Velocity

"Right, OK", Jeff went on. *"So far we've talked about how many cycles of a waveform occur in a given time – usually one second in terms of frequency measured in Hertz. But there is another way of expressing frequency by what is known as angular velocity". "Yes, Archie told us about that and we'd already covered it with Arthur in Engineering Science"*, said Natalie. *"But can you go over it for me anyway?" "Yes, OK"*, said Jeff. *"We won't go into all of the maths but we'll have a quick look at it". "Fair enough"*, said Natalie.

"If we take a circle and draw a line from the centre to a point on the circumference, let's say a quarter of the way around in the clockwise direction, and take this as a reference point." **Fig. 3**. *"If we were to now rotate the line around the circumference at a constant velocity, which is called the angular velocity and has the symbol lower case Omega, ω, in the anti-clockwise direction and plot the magnitude against time, we would end up with a sine wave"*, Jeff explained. *"From what I've just drawn you can see that the maximum value appears at the top of the circle and the minimum at the bottom. At the three o' clock and nine o' clock points the value is zero. Now, as you know, there are three hundred and sixty degrees in a circle so one full cycle will equate to three hundred and sixty degrees. But there is another way of expressing angular measurements using what are called Radians where three hundred and sixty degrees equals two Pi (2π) radians. We can covert degrees to radians and vice versa like this"*:

Number of degrees × 180 / π = Radians and Number of radians × π / 180 = degrees

"Most modern calculators will allow you to work in either degrees or radians. So, we can deduce then that the time taken to complete one complete cycle will be two Pi divided by the angular velocity". Jeff wrote down the equation:

$t = 2\pi / \omega$

"Now", said Jeff, *"From what we said earlier we know that frequency equals the reciprocal of time so by manipulating what I just wrote down you can see that the angular velocity equals two Pi times the frequency. That is a term that you'll come across quite a lot in electronics so at least you now know where it comes from"*:

$\omega = 2\pi f$

The Y Axis

"But what else can we find out about waveforms in terms of the y or vertical axis?" said Natalie. *"Lots"*, Jeff replied. *"Mainly in terms of the values of voltage or current, but there are several different measurements or values that we may be interested in. Some can be determined quite easily by observation if we can display the waveform on an oscilloscope, but some we may have to calculate. By the way, I'll give you a tutorial on how to use an oscilloscope sometime. Again, let's use a sine wave as an example and we'll assume that it's symmetrical about zero volts. That is to say that the maximum excursion in the positive direction is the same as the negative going excursion like this. Let's look at a voltage waveform, and say that the maximum voltage in either direction is ten volts"*, **Fig. 4**.

"Now", Jeff explained, *"We can see that the maximum voltage that the sine wave reaches in either direction is ten volts. This is called the Peak value so in our example we have two peak values – plus ten volts and minus ten volts. Now if we add the two together, we find that the maximum voltage between the two peak values is twenty volts and this is known as the Peak-to-Peak Voltage. The same applies for current if that's what you're looking at. The Peak and Peak-to-Peak voltages or current are generally determined the same way no matter what the waveform but for other things that we may be interested in the numbers are different. Firstly, let's look at the average value of voltage or current – and again for a sine wave." "Well, if the positive and negative halves are the same, won't the averages be zero?"* Natalie pointed out. *"Exactly!"* Jeff said. *"So what we do is to take the average over one half of the cycle. It doesn't matter which. We won't do the maths but I'll explain how it's done." "Yes please"*, Natalie said.

"OK, let's go", said Jeff. *"As you know, to find the average or mean of a set of numbers we add them up and divide by how many values we have. So, to find the average value of a waveform we take instantaneous values at certain points, say every ten degrees over one half cycle. The more points, the more accurate the result will be. We then add them up and divide by the number of measurements taken – for every ten degrees it will be eighteen. For a sine wave the result will be nought point six three seven. So, to find the average value of a sine wave we multiply the Peak voltage by nought point six three seven"*:

$V_{Av} = V_{Pk} \times 0.637$

"Other waveforms will have different values, which I'll write down for you when we've looked at some other values that we may be interested in", **Fig. 5**.

"Another thing that we may be interested in is the Root Mean Square, or RMS value," Jeff explained. *"In fact, unless told otherwise we usually assume that figures for voltage and current are RMS values". "Yes, we've done Root Mean Square with Reggie in Maths,"* said Natalie, *"But please go over it again"*.

"OK", Jeff went on. *"You may remember from our discussions about direct current circuits that there are various formulas that we can use to calculate the power in a resistor. But these assumed that the voltages and currents were constant and steady. Now for alternating current this is obviously not the case and there will be occasions when they are zero for example." "Yes, understand that"*, Natalie replied.

"So to get around this we use what is known as the Root Mean Square (RMS) value. The RMS values of an alternating waveform are those that would produce the same amount of power in a resistor as direct voltages and currents would."

"To calculate them", Jeff explained, *"We again sample the waveform at several points and take the instantaneous values. By the way, when working with alternating current we use capital letters V and I to denote the maximum voltages and currents and lower case letters v and I to denote instantaneous values". "Yes, know that,"* said Natalie.

"So", said Jeff, *"Having obtained a set of measurements i1, i2 etc, we then take the square of the values, add them together and divide by the number of measurements to get the average or mean value. But note that because this time we are taking the square of the values, we can bring the negative half cycle into play. And, having found the mean value we finally take the square root of it. Hence the term Root Mean Squared"*, **Fig. 6**.

"For example, we are told that the mains voltage in the UK has a nominal value of 230 volts. This is the RMS value. Let's have a look at what this means. For a sine wave the root mean square value is nought point seven zero seven times the peak value, from which we can determine that the peak value will be the root mean square value divided by nought point seven zero seven."

Waveform	Average	RMS	Form Factor
Sine	$0.637\ V_{pk}$	$0.707V_{pk}$	1.11
Square	V_{pk}	V_{pk}	1.00
Triangle	$0.500V_{pk}$	0.577_{Vpk}	1.15

5

Fig. 1: Various waveforms.Fig. 2: Alternating current, either through zero or superimposed on a DC voltage.Fig. 3: Relationship between angular velocity and waveform.Fig. 4: Relationship between peak voltage and peak-to-peak.
Fig. 5: Variations across waveform types.
Fig. 6: Expression for root mean square.
Fig. 7: A square wave (typically, not perfectly square).

$V_{rms} = V_{Pk} \times 0.707$ so $V_{Pk} = V_{rms} / 0.707$

"From that we can calculate that in the UK the mains voltage will have a peak value of about 325 volts and a peak-to-peak voltage of about 650 volts. I'll write down the conversion factors for you for a sine wave", **Table 1**.

"So, for example", Jeff explained, *"If we know the peak-to-peak value and we want to know the RMS value, we multiply the peak-to-peak value by 0.353."*

"Right", said Natalie. *"Is there anything else that we can find out?" "There is another value that is sometimes useful called Form Factor"*, said Jeff. *"As we've already said different waveforms have different average and RMS values. We can find the Form Factor by dividing the RMS value by the average. I'll add them to our list"*, Fig. 5. *"Wow"*, said Natalie. *"Isla and Poppy will like that. We didn't cover that in class"*.

Square Waves and Harmonics

"OK", said Jeff. *"So far, we've looked mainly at sine waves but before we end our session let's just have a quick look at square waves and harmonics. Let's start with square waves as there is quite an important characteristic of square waves that we often need to know called rise time"*, Jeff said as he sketched a square wave on his notepad, **Fig. 7**. *"Any idea what that might be?"* Jeff asked. *"The time to reach the maximum voltage or current from zero"*, Natalie replied shrugging her shoulders. *"Nearly right. For square waves, the transition from zero to the peak values and back again are called rising and falling edges. Now, although these days we can get square waves that transition very quickly everything takes time and there will be a delay before the peak value, in either direction, is reached and this is called the rise time."*

"Is this something to do with ten percent and ninety percent of the peak value", Natalie asked. *"Yes exactly"*, Jeff replied. *"If we look at the square wave that I drew, you can see that I indicated the ten and ninety percent points". "That's how I guessed,"* said Natalie with a grin. *"Thought as much"*, said Jeff. *"Now if we measure the time it takes for the voltage or current to rise from the ten percent point to the ninety percent point, this is what we call the rise time. It's usually quite small down in nano seconds but it can be quite important, especially in high-speed digital circuits". "Yes, I've seen things like what you've drawn on component datasheets,"* said Natalie.

Harmonics

"Right" said Jeff looking at his watch. *"We've got a few minutes left so let's have a quick look at harmonics. Some waveforms can be quite complex and contain signals of more than one frequency which may, or may not be desirable. If we take a complex waveform and look at the lowest frequency, which let's say is one Megahertz, we call this the Fundamental. If we now find that the waveform contains exact multiples of one Megahertz at say two Megahertz, three Megahertz, and five Megahertz these are called harmonics. The second and fourth harmonics etc are called even harmonics and the third and fifth etc are called odd harmonics. Apart from the third harmonic the amplitude of the harmonics generally reduce as the number of the harmonic increases." "OK. I see,"* said Natalie. *"I've read about harmonics in my radio books"*.

"Yes" Jeff replied. *"Let's say you're transmitting on a particular frequency and your transmitter is also generating spurious emissions on frequencies that are exact multiples of your intended frequency, your fundamental frequency, these are harmonics and can cause interference to other stations. If for example you're transmitting on seven Megahertz and you get a third harmonic at twenty one Megahertz, that could interfere with someone operating on the fifteen metre band". "Oh"*, said Natalie, *"So harmonics are bad then"*.

"Not always", Jeff replied. *"Sometimes they can be useful. For example, we can use harmonics to create a square wave. If we take a sine wave with a fundamental frequency and then mix it with sine waves which are exact harmonics of and in phase with the fundamental we will end up with a square wave. So harmonics can be both a nuisance and of help"*.

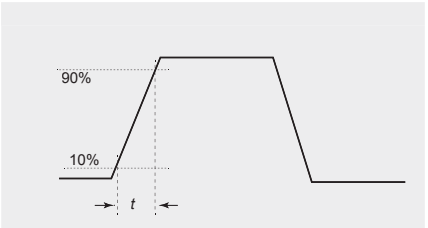
"OK, thanks", said Natalie. *"Can you write some questions for us please? These are what Archie gave us, look". "Sure, no problem"*, said Jeff.

Archie's Questions

1. A sine wave has a frequency of 100kHz. Calculate the time period. (10µS)
2. A sine wave has a time period of 400µS. Calculate the frequency. (2.5kHz)

$$V_{rms} = \sqrt{\left(\frac{i_1^2 + i_2^2 + i_3^2 ..... i_n^2}{n}\right)}$$

6



7

3. If a sine wave has a peak-to-peak value of 30V, calculate the peak voltage. (15V)
4. For the above question, calculate the averages and RMS values. (9.56V and 10.61V)
5. A sine wave current has an RMS value of 4.5A. Calculate the peak and peak-to-peak values. (6.63A and 12.73A)

Jeff's Questions

1. Calculate the time period of an alternating current with a frequency of 30MHz. (33nS)
2. A sine wave has a time period of 40mS. What is the frequency? (25Hz)
3. A sine wave has a time period of 10µS. Calculate the frequency and wavelength. (100kHz and 3000m)
4. Calculate the frequency and time period of a sine wave that has a wavelength of 0.5m. (600MHz and 1.67nS)
5. Calculate the average and RMS values of a sine wave that has a peak voltage of 18V (11.47V and 12.73V)
6. Calculate the average and RMS values of a triangle wave that has a peak value of 90V. (45V and 51.93V)
7. Calculate the Form Factors for questions 5 & 6? (1.11 and 1.15)
8. A square wave has an RMS value of 24V. Calculate the average and peak values and Form Factor. (24V, 24V, 1.00)
9, A sine wave has a fundamental frequency of 6MHz. What are the 2nd, 4th and 6th harmonics? (12MHz, 24MHz, 36MHz)
10. A complex waveform has a 7th Harmonic of 210MHz. Calculate the fundamental frequency and the 3rd harmonic. (30MHz and 90MHz) **PW**

Known Value	Wanted Value			
	Average	**Peak**	**Peak to Peak**	**RMS**
Average	1	1.57	3.14	1.11
Peak	0.636	1	2	0.707
Peak to Peak	0.318	0.5	1	0.353
RMS	0.9	1.414	2.828	1

Table 1: Conversion factors for a sine wave.

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Practical Wireless 2022 Index

Your Letters

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

★Star Letter★

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

The MCR 1

Dear Don,
The item by **Philip Moss** about the MCR 1 (November *PW*) made interesting reading as I also have one.

Several years ago, when working in the radio and TV trade we were called out to a customer we had known for many years. He was an SWL and wrote articles on aviation, monitoring, and radio related subjects for several magazines. He never had an amateur licence but he did have modern HF radio sets.

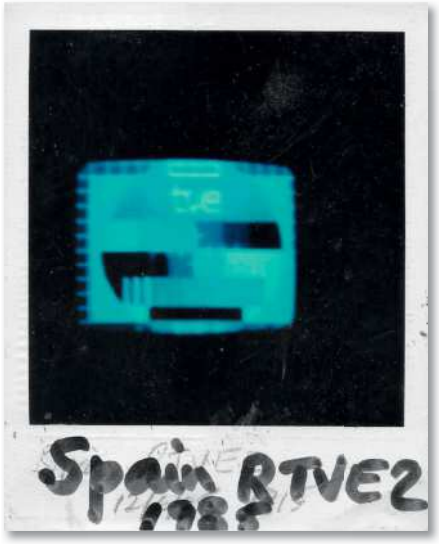
After completing the repair and drinking the tea (we got through lots of tea in that job) he handed me a box and said, *"Paul, I would like you to have it as I don't want anybody to get killed with it"*. It had been in his garage since the late 1950s!

I didn't know what it was till I got home and went on the internet when I could see what he meant. The set was still in the box with all the items included but the power supply could run on voltages AC and DC and the danger was that the mains lead had one side connected to chassis so the set became live if plugged in the wrong way!

No elf & safety then. For many years we have had a static display at the 1940s weekend on the North Norfolk Railway with 19, 62, 31, 38 and 88 sets, and the MCR 1, along with a pair of field telephone type F coupled back-to-back – the children liked that bit.

Paul G3VPT
Norwich

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



4m and 6m DX

Dear Don,

Your book *The Magic Bands, 6m & 4m* has many happy memories for me when I was TV DXing in the 1970s and 80s. (See pictures). At the time I was a TV Engineer working for a TV rental firm in Cardiff. My main job was the repair of 13 channel tuners, which were added to single channel TVs. The 6m band wasn't allocated to UK radio amateurs in those days because VHF TV occupied those frequencies. However, that's when I became interested in DX TV reception on frequencies between 48 and 70MHz. I remember the Wenvoe channel 5 TV frequencies were 66.75 vision carrier and 63.25 for sound. It was 3.5MHz spacing on the 405-line system. A book called *Long Distance TV Reception* written by **Roger Bunney** was published at the time. On the question of aerials, your book contains lots of useful info about 6m and 4m. However, there is only one aerial design given by G0KSC for a large Yagi for these bands. I would like to point out that this aerial is too large for the usual small garden, neither is it necessary to have such a gigantic array! This would put aspiring operators right off! I have two aerials for 4m, vertical and horizontal. One is a horizontal 'H' aerial (like one used to see on people's chimneys back in the 1950s & 60s). The other 4m aerial is a vertical 1/2 wave end-fed commercial design. I also have a full-wave loop with variable feedpoint, one for vertical, the other for horizontal polarisation. This is made of copper 'microbore' CH pipe. This has a co-tangent transformer to match the 100Ω of the loop to the 50Ω coax feeder. This consists simply of 35in of 75Ω twin wire known as 'bell wire' in the old days. With this setup I receive GB3BUX at Buxton from Cardiff in South Wales. There's not much reading on the meter, but it's there most of the time. By contrast, GB3MCB in South Cornwall booms in at S2 to 3 sometimes. I'm just saying that one does not need to go into hundreds of pounds on a large Yagi array to enjoy the delights of listening on 4m and 6m.

Brian Williams GW0GHF
Cardiff

*(**Editor's comment**: Thanks Brian. The 4m band was allocated to UK radio amateurs in 1956 but 6m was only allocated, as it says in my book, in January 1983, for experimental permits only, and then to all Class A licensees from February 1986. The antenna designs in the book are for 5-element Yagis for both 6m and 4m – while the former is, arguably, quite large, the latter (to my mind at least!) doesn't qualify as a 'gigantic array'. When I wrote the book, I felt these were middle-of-the-road antennas – serious DXers on either band would have something rather more substantial (such as a stacked array). But you're quite right insofar as during the Sporadic E season (when TV DXing would have been at its peak) European signals can be huge and easily receivable on a dipole or small array. But, as recent Sporadic E seasons have shown, multiple-hop openings to the US, the Far East and even as far as Hawaii are possible with decent antennas at both ends.)*

Access to Publications

Dear Don,

While trying to get up to speed again I found a publication I had written for Electronics Letters, published by the IEE, now IET on Snow and Microwave attenuation, in 1976. I wanted to read it again and do not have a copy. I found it will cost me £75 for someone to go to the library and copy it for me and send. Or I can get on a train to London IET library and then pay to copy for probably the same cost. The truth is unless published in the internet era nothing is available. It has effectively vanished, i.e. so much taxpayer's money gone, so much research lost. I know they are PDF'ing material but not this particular paper, at least not yet. So much knowledge and measurements effectively lost. I notice particularly that because of the web, available pages of more recent stuff are not even aware of previous work. So, they are duplicating it... Unless it is on the web, then it does not exist!

Ian Dilworth G3WRT
Ipswich

*(**Editor's comment**: Interesting one, Ian. I guess the IET as they now are want to make the most of their copyright material but, as I read what you are saying, the work was taxpayer funded in the first place. The Americans seem to be well ahead of the UK in making government and related material available on the internet, which is of course a wonderful resource but not always used to best advantage.)*

Your Signal Strength is in the Log(arithm) p44 PW Nov. 2022

Dear Don,

What an excellent piece by **Godfrey Manning G4GLM** (November *PW*) explaining why S9 is also –73dBm. Although I've generally used the dBm as the unit of strength on my WinRadio G31DDC SDR receiver Godfrey didn't cloud the issue. Better still there was no mention of the words Characteristic and Mantissa either.

I can quite easily find three slide rules and a copy of Castles Logs/Anti Logs and every other mid-school mathematical torture table in the shack but what Godfrey did was easily illustrate the relationship between the dBm, the S-point and logarithmic function.

An easy read and nothing like the late Mr Stagg's maths classes of the early 60s I suffered; thanks Godfrey!

Paul Beaumont G7VAK
London

PW 90 Years

Dear Don,

In preparation for moving home I have been slowly sorting out the attic and I recently came across a collection of old radio books given to me about 20 years ago by an elderly SWL friend who sadly died in 2005. I hadn't realised until today but included were four bound volumes of *PW*. One of them is what I think might be the first ever volume. It's a huge book weighing nearly 2kg, the binding is a bit worn and the front hardback cover is loose but inside are editions 1 to 26 of *PW* from September 1932 to March 1933.

On page 5 is the first editorial by **F J Camm** and he says that it will be the policy of *PW* to keep its readers abreast of everything new and cover various branches of the hobby. I thought it would be of interest for F J Camm to know that as *PW* enters its centenary decade 90 years later this is still true.

Gary Clark G0BKR
Beaconsfield

September 24th, 1932 PRACTICAL WIRELESS 5

Free Book "ALL ABOUT TUNING AND TUNING COILS" NEXT WEEK!

Practical Wireless

Vol. 1. No. 1. Editor: F. J. CAMM Sept. 24th, 1932.
Technical Staff:
H. J. Barton Chapple, Wh.Sch., B.Sc. (Hons.), A.C.G.I., Frank Preston, F.R.A., W. J. Delaney, W. B. Richardson.

ROUND THE WORLD OF WIRELESS

Introducing Ourselves

PRACTICAL WIRELESS makes its début in the confident belief that it will receive a hearty welcome from the large and ever-growing circle of wireless enthusiasts, more particularly those interested in home construction and the experimental side of wireless. Although in the brief space of a very few years the knowledge of this fascinating new world of the ether has grown to large proportions, we are still little more than on the threshold of the intriguing possibilities the future holds forth. Rapid as the advances have been, the near future will bring forth new discoveries, new ideas, and new technique just as certain as day follows night, and every wireless enthusiast, if he is to derive full pleasure and interest from his hobby, will require as an absolute necessity that his knowledge be kept right up to date.

Keeping Up to Date

IT will be part of the policy of PRACTICAL WIRELESS to keep its readers abreast of everything new. Writers, acknowledged as authorities in various branches of wireless and in touch with every new development, will contribute on every subject that has a practical value to the reader. Skilled designers, with many successful sets standing to their credit, will exercise their ingenuity in the design of new sets combining for the constructor and experimenter the essentials of novelty with efficiency, bearing in mind also the important question of cost. Everything that is new, when tested and proved in its practical worth, will find its way into the pages of PRACTICAL WIRELESS.

Simplicity of Treatment

AND, of great importance, particular care will be taken in presenting the contents in clear and simple language. Highly technical terms will be dis-

be thoroughly tested under varying and stringent conditions so that the reader may know that it will do all that is claimed for it. It is the intention also to cover every need of the home constructor in the sets featured. It will be explained how a set may be modified to suit particular conditions; how it may be adapted for use as a radio-gram or as a short-wave receiver; how flat dwellers with restricted space can adapt a set to meet these conditions. PRACTICAL WIRELESS plans to deal with each set adequately rather than to produce too many new designs, a policy which is apt to leave readers with difficulties to surmount after a set is made.

Our Laboratory

A WELL-EQUIPPED laboratory staffed by enthusiastic experts closely associated with the home constructor movement, will examine and test the latest

A Fine Souvenir for Regular Readers—

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See Pages 56 and 57 for full particulars

components, the results of which will be reviewed in PRACTICAL WIRELESS. This feature will be of invaluable help to the home constructor in planning and making up sets. Every component used in PRACTICAL WIRELESS sets will pass our laboratory tests, and our Advice Bureau will help readers

gadget you have discovered for yourself, it will be printed if approved and paid for at our usual rates. We shall also welcome suggestions and criticisms. They will assist us in carrying out our policy of fully satisfying the reader in the service we give him.

Our Presentation Volume

ONE word more. To signalize the appearance of our first number we are offering to all who become regular readers a most attractive Presentation Volume which will be of the greatest help to wireless constructors. Read about this wonderful offer for yourself. Particulars are printed on pages 56 and 57. It is an opportunity that should not be missed.

Radio Luxembourg

THE new 200-kilowatt Radio Luxembourg transmitter has started its preliminary tests on 1,275 metres, despite international protests regarding the choice of wavelength. A young German woman, who is a fluent speaker of five languages, has been specially engaged as studio announcer. The *Compagnie Luxembourgeoise de Radiodiffusion*, who are owners and operators of this super-power station, will devote the Sunday programme hours entirely to broadcasts sponsored by British commercial firms. Publicity transmissions are also to be carried out on week-days for French and German concerns. As no tax is payable by listeners in the Grand Duchy of Luxembourg the expenses of running the service will be entirely defrayed by revenues secured from advertisements.

Budapest May Change

THERE is a possibility that the 550-metre channel now used by Budapest may be abandoned in favour of a wavelength of 210 metres when the high-power station to be erected at Lakihegy (Hungary) is brought into being. Work has already been started on the plant which it is hoped may be completed before the

Dear Don,

It was a pleasure to meet you at the Hamfest. Just after seeing you, I came across twelve old *PW* mags.

At the top was the first *PW* given to me at school. Also, as a bonus was the one from the year I was born, all for 50p. It did not stop there. Amongst the pile was one from 1947, interesting to see that the price was 9d while by 1951 it was 1 shilling. (that's about 3.1/2p and 5p in new money).

It is hard to believe that this magazine started me off on a career in electronics. First a radio and TV service engineer, then a senior radio communications engineer.

Thank you for a great mag. It is hard to believe that it has been around for 90 years.

Malcolm G0ISX
Huddersfield

A Simple Radio?

Dear Don,

First, I did NOT change my name and callsign to be the writer of the Star Letter in the November issue, though I could well have written such a letter. It was a cry from the heart!

One of my sons, G6ENT [the others are G6ENS & G6ENU] has been hammering SDRs at me for months and this letter made me think. Was it the HRO which had removable coil packs?

What if a manufacturer made a basic SDR transceiver with the controls, display, IF and audio bits and one could buy the RF blocks to suit one's needs. One would buy, say a topband and an 80m and plug it in and a switch on the front panel allowed one to select from those fitted. All the controls needed for operation would be there on the front panel and all the twiddly bits, in software, would be available if needed when offline! It might answer Ian's needs and certainly mine also.

Alan Gordon G3XOI
Shoreham-by-Sea

Musings on Morse, Bluetooth and Santa's Red Sack

Dear Don,

Equipment manufacturers for amateur radio have done a marvellous job of tracking technical developments over the years, from radios which need to warm up, to those which it's better when they do not warm up too much.

We have incredible capability and performance in very small boxes, even now, as we approach a tipping point between traditional superhet radios with synthesised LOs, and all-DSP receivers, there seems a huge gap yet to be exploited.

Morse operators are very proud of being highly skilled, needing far less power than a phone operator to achieve a similar QSO, and being able to put the letter 'Q' in front of almost anything, yet still be understood.

It is many years since Morse ops were rewarded with a major technical development on the transmit side, so I feel I may have the answer: The Bluetooth Morse Key.

Bluetooth, being a digital stack, will obviously be welcomed by Morse operators, the 'original' W/T operators. What could be 'Morse' useful than a key which could be used from another room? No need to heat the shack, now you can operate from in front of a lovely warm fire. A special silent-mode key could even enable operation without disturbing other members of the household. Miniature keys could be strapped to the operator's leg, for a crafty QSO during xmas dinner.

Santa's Red Sack could be filled with these marvellous devices. Perhaps you could turn the might of *Practical Wireless* to promoting this marvellous idea.

Mark Kent G8PHM
Otford, Kent.

*(**Editor's comment**: Thanks for the suggestion Mark – now you can remove your tongue from your cheek!! Though, come to think of it, you may have a point …)*

Magnetic Loop

Dear Don,

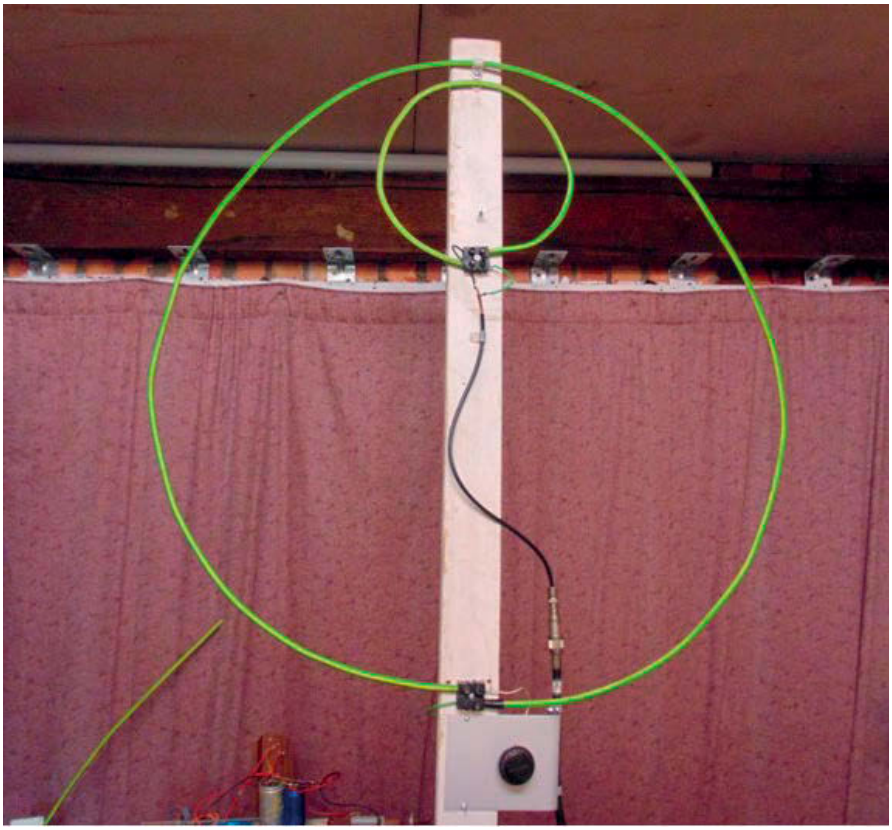
I would like to complement **Maurice Webb** on his Magnetic Loop article in the August 2022 issue. I have emailed Maurice to congratulate and thank him for his contribution and he suggested I write to you with my comments.

I am an 80-year-old pensioner and my home and gardens do not provide me with the opportunity to put up a suitable antenna system for reception on the amateur bands. I have a long wire stretching around the inside of my garage, which gives me limited reception on my Icom 7300, mainly on the 40 and 20 metre bands.

Having read many of the Magnetic Loop articles in various magazines I was particularly interested in your article, which seemed to stress the practical approach to construction.

Looking around my garage I used items readily available ie a length of 6mm earth cable, chocolate blocks and an old 500pF dual-gang capacitor. Spurred on by the article I made up a magnetic loop and I am amazed at its performance. I have attached a photograph, which shows a very rough and ready construction, but it was relatively easy to make and its performance has completely revolutionised my ability to receive and hear signals and conversations of other amateurs from all over the world.

I can now receive exceptionally good signals on the 20, 17 and 15m bands and it has opened up a new phase for me being able to listen to other amateurs from all over Europe and also the US. Absolutely fantastic and I have made another similar loop, which is slightly better made but using the same materials.



My next project is to make the tuning of the capacitor remote by using an Arduino with a servo or an ESP32 and stepping motor using a smartphone to operate the changes. Thank you for such a wonderful article.

David Nelson M0HBT
Bristol

Next Month

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

THE FACE BEHIND THE CALL: Roger Dowling meets Alan Florence, a studio engineer who has recorded the world's top artistes.

LOOP THE DX: Billy McFarland GM6DX looks at the Full-Wave Loop Antenna.

10m BAND ANTENNA: David Allen G8LHD has a design for a 10m band omnidirectional antenna.

ATTENUATORS: Michael Jones GW7BBY unearths the mysteries of attenuators.

THE SPLIT COAX ANTENNA: Rod Angel G4ZUP describes an instant antenna for VHF FM operation.

There are all your other regular columns too, including HF Highlights, World of VHF, Valve & Vintage and Data Modes as well as your Letters, the latest News and more.

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- "PRESET" Mode Function most suitable for FT8 Operation
- AESS: Acoustic Enhanced Speaker System with optional SP-40 creates the high-fidelity audio output
- External Display Connection Terminal (DVI-D)
- Built-in High Speed Automatic Antenna Tuner with 100 channel memory
- Support the FC-40 Auto Antenna Tuner
- SD Memory Card can be used to save the communication record, transceiver setting, the memory contents, screen capture images, and to update the firmware
- Two (2) USB Ports (Type-A and Type-B)
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YAESU

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- Effective QRM rejection by Dual-core DSP

*Multi-signal receiving characteristic: 14MHz band/2kHz separation
*TX Phase Noise: 100W, CW mode

- **AESS** (Acoustic Enhanced Speaker System) with included SP-40 speaker to create High-fidelity audio output
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- **VMI** (VFO Mode Indicator) shows the current operating mode
- "PRESET" Mode functions most suitable for FT8 operation
- Equipped with the External Display terminal

- Display is not included. The image is shown with an optional third-party external display that may be connected using a DVI-D digital cable.
- FT-710AESS includes External Speaker SP-40.

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The Blitz

IN COLOUR

THE BOMBING BLITZ 80 YEARS COMMEMORATIVE ISSUE

The story of Nazi Germany's failed bid to bomb Britain into submission during WWII

The Blitz IN COLOUR

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Welcome

The Blitz is an event in British military history which will forever remain embedded in the collective national consciousness. And, however doubtful the value or relevance of such a term might be in the 21st Century, the expression 'Blitz Spirit' has endured across the 80 years since the Blitz to suggest a spirit of resilience in the face of hardship and adversity. However inappropriate its application might have been to any event suffered nationally across subsequent decades, the fact that the expression is very much part of the English lexicon - and something which is universally understood – speaks volumes as to the impact that the events of the Blitz had upon the British psyche.

With the word's origins attached to the German word 'Blitzkrieg' (meaning Lightning War), the single term Blitz has evolved to be understood as the bombing of British cities by the Luftwaffe. Primarily, of course, the Blitz is associated with the German air assault on London between September 1940 and May 1941. However, it is important to recognise that the Blitz involved the majority of British cities: including Glasgow, Belfast, Southampton, Bristol, Coventry and Birmingham. That list, though, is not in any way exhaustive. It is also the case that a huge number of other towns and villages came in for attention by the Luftwaffe across almost the entire duration of the war, and not just the period of the September 1940 to May 1941 Blitz. Additionally, the nation was also attacked from the air and from the sea during the First World War, too.

In this publication, then, we have looked at the whole range and scope of attacks against the entirety of the British Isles (including the First World War) which largely targeted the civilian population and industrial or non-military objectives. During the Second World War, this also includes the devastating Tip and Run attacks against largely coastal towns as well as the fearsome V1 Flying Bomb and V2 rocket attacks.

Throughout the Second World War alone, a total of 60,595 civilians were killed as the result of air attacks. Putting this figure into perspective against Britain's total number of military fatalities during the war (376,239) it represents around 16% of that total.

While the very largest percentage of those civilian casualties were suffered in the big towns or cities, it is hard to find a single rural community across mainland Britain which did not suffer a fatality or casualty. Thus, the Blitz on Britain affected almost every single community. And the whole nation was on the front line. Or potentially so.

In this publication to mark the 80th anniversary of the main part of the Blitz, we have looked at a wide range of related topics, examined how Britain was defended, how it was attacked and how the civilian population withstood an extraordinary assault.

In compiling this record of the varied attacks on Britain, we have examined that period through a range of colour images, including photographs that have been colourised specifically for this publication.

We hope that you enjoy this unique look at one of the most dramatic periods in Britain's recent history.

This publication is dedicated to the memory of the 60,595 innocent civilian lives so cruelly taken during the nation's dreadful ordeal under fire.

Andy Saunders
Editor, The Blitz in Colour

The Blitz IN COLOUR

INSIDE THIS COMMEMORATIVE PUBLICATION

CONTRIBUTORS

Richard J Molloy

The colourisation artist for this project was Richard J Molloy who specialises in the digital colourisation of historic images. His particular interest is with military subjects and he is a regular art contributor to Iron Cross magazine, also by Warners Group Publications Plc.

Using research based on known colours, and sometimes using period colour charts, Richard constructs accurate representations of period images. His evaluation of those images often requires forensic research to properly represent the image being coloured.

This piece of work on the Blitz on Britain is Richard's second such project for Warners Group Publications Plc, his first being Battle of Britain in Colour published in 2020.

Samples of Richard J Molloy's work may be viewed by searching:- @colourbyRJM

Andy Godfrey

The aircraft colour profile artwork for this publication was by Andy Godfrey of the Teasel Studio.

Andy specialises in bespoke profile artworks for publication and commission.

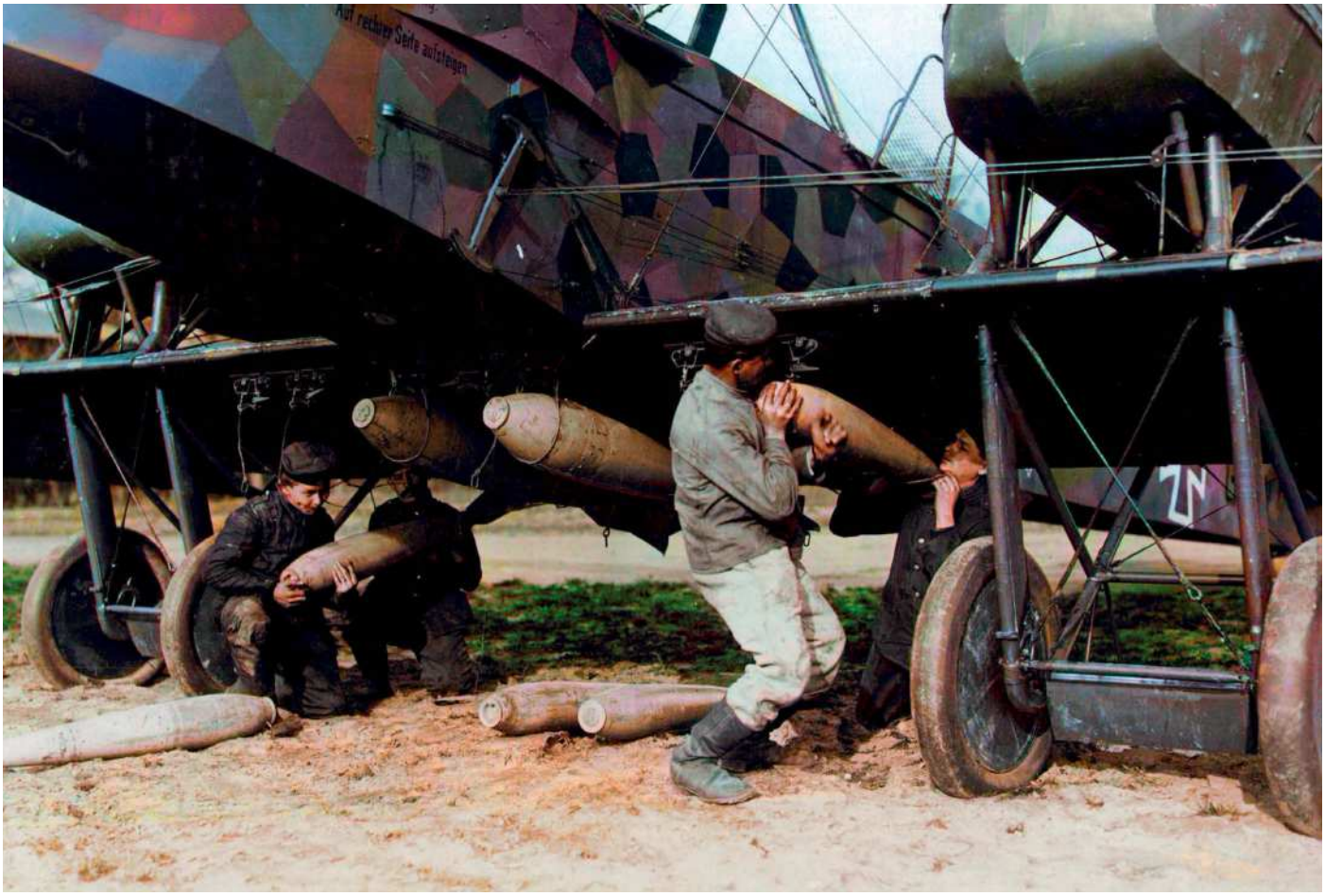
Working from his studio near Hastings, East Sussex, his work draws on an extensive reference collection, gathered over five decades, a deep fascination with aircraft and specialist knowledge of colours and markings.

For enquiries:- teaselstudio@yahoo.co.uk

Acknowledgements

The editor wishes to thank Ian Castle, Austin J Ruddy and Steve Hunnisett for their individual and valuable contributions to this publication.

Cover Story Focke-Wulf 190 fighter-bombers streak away from Eastbourne on 4 June 1943 after one of the devastating tip-and-run attacks endured by the town. **Artwork by Piotr Forkasiewicz**



‘No Longer an Island’

At the dawn of the 20th century, Britons slept soundly in their beds, safe in the knowledge that the Royal Navy protected the coastline from enemy aggression. However, advances in aeronautics soon exposed the country to assault from the air.

In July 1900, a retired German Army officer, Count Ferdinand von Zeppelin, launched his first eponymous airship using lighter-than-air gas, hydrogen, to lift its great bulk into the sky. Over the next years, von Zeppelin continued to experiment and by 1910 Zeppelins were operating regular flights over Germany. It was a fact not underestimated by the German military.

Six years later, aeroplane development had progressed slowly in comparison to airships, and when an aviation pioneer claimed a prize for being the first to complete a flight of over 100 metres in 1906 there was little reaction. However, a newspaper baron, Lord Northcliffe, recognised its stark significance, remarking:

‘England is no longer an island.’

Despite this early warning, Britain had little in the way of air defence when the country declared war on Germany in August 1914.

HATRED FOR GERMANY

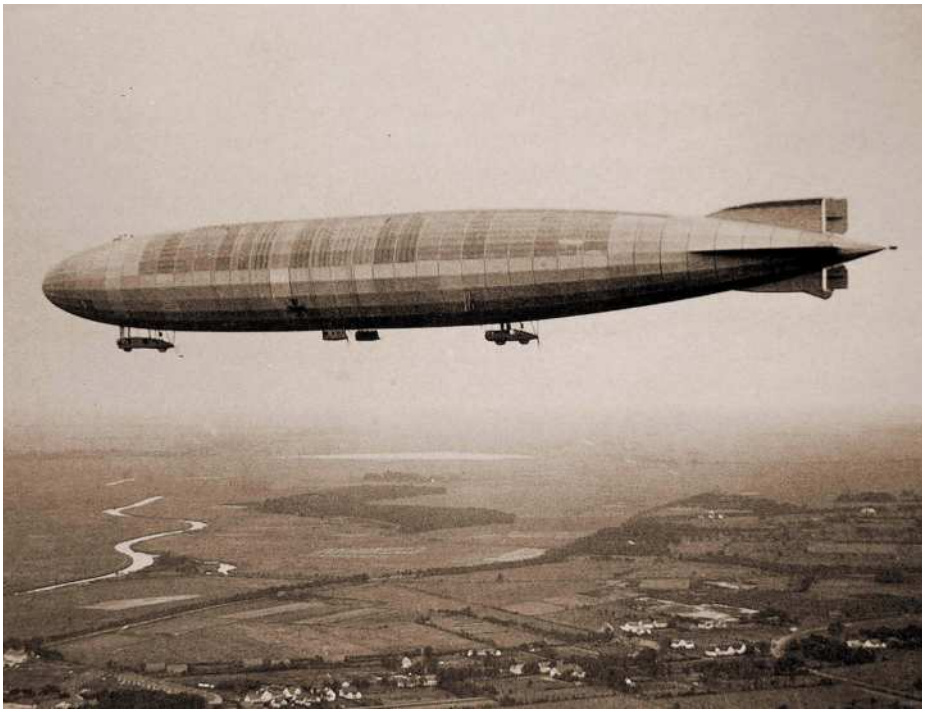
At that time, the Army and Royal Navy each had an air arm, the Royal Flying Corps (RFC) and the Royal Naval Air Service (RNAS). When the RFC accompanied the British Expeditionary Force to the battlefields of Europe, the RNAS accepted responsibility – temporarily – to defend Britain against aerial attack. Other than a diverse collection of 50 seaplanes and landplanes, there were just a handful of efficient anti-aircraft guns defending military installations. London only received its first guns – three ineffective one pounders – four days after the declaration of war.

There had never been a sustained aerial bombing campaign before and nobody could be sure what impact bombs falling amongst the civilian population would have on morale. In Germany, as early as August 1914, Paul Behncke, Deputy Chief of the Naval Staff, expressed his belief that attacks on London were likely:

‘...to cause panic in the population which may possibly render it doubtful that the war can be continued.’

Later, in October 1914, he warmed to his subject:

‘We dare not leave untried any means of forcing England to her knees, and successful air attacks on London, considering the well-known nervousness of the public, will be a valuable measure.’



Facing Page Ground personnel load 50kg bombs onto a Gotha G V, preparatory to an air raid against Britain.
Above Bomb damage in Great Yarmouth during the first Zeppelin raid on Britain. The bomb that wrecked this house in St. Peter's Plain also claimed the lives of the first two people in Britain killed by a bomb dropped from the air: Samuel Smith (aged 53) and Martha Taylor (72).

He was wrong. When bombs did start to fall across Britain there was no crumbling of morale but instead a hatred for Germany as its bombs killed innocent civilians as they lay asleep in their beds. And anger, too, that the British military appeared, initially at least, to have no effective means to oppose the raids.

AWE AND WONDER

The first significant raid took place in January 1915, when two Zeppelins bombed Great Yarmouth, King's Lynn and a number of Norfolk villages, claiming the lives of four and injuring 16 others. Something that seemed impossible just a few years earlier had become reality. And when those first bombs exploded, they opened-up a whole new theatre of war: The Home Front.

The experiences of those on the ground living through the raids varied enormously. Many people in Britain had not even seen an aeroplane before the war, and so when one of these huge airships passed over the blacked-out towns, cities and villages, illuminated by searchlights while moving serenely

on, they aroused widespread awe and wonder. Others, meanwhile, were simply – and understandably - terrified.

Air raid warnings were left to the discretion of local authorities and where such arrangements existed, they took the form of hooters or whistles sounded at factories or by the raising and lowering of gas pressure, which changed the brightness of lights in homes and workplaces. In London, though, there was no air raid warning system. Although debated, the government concluded

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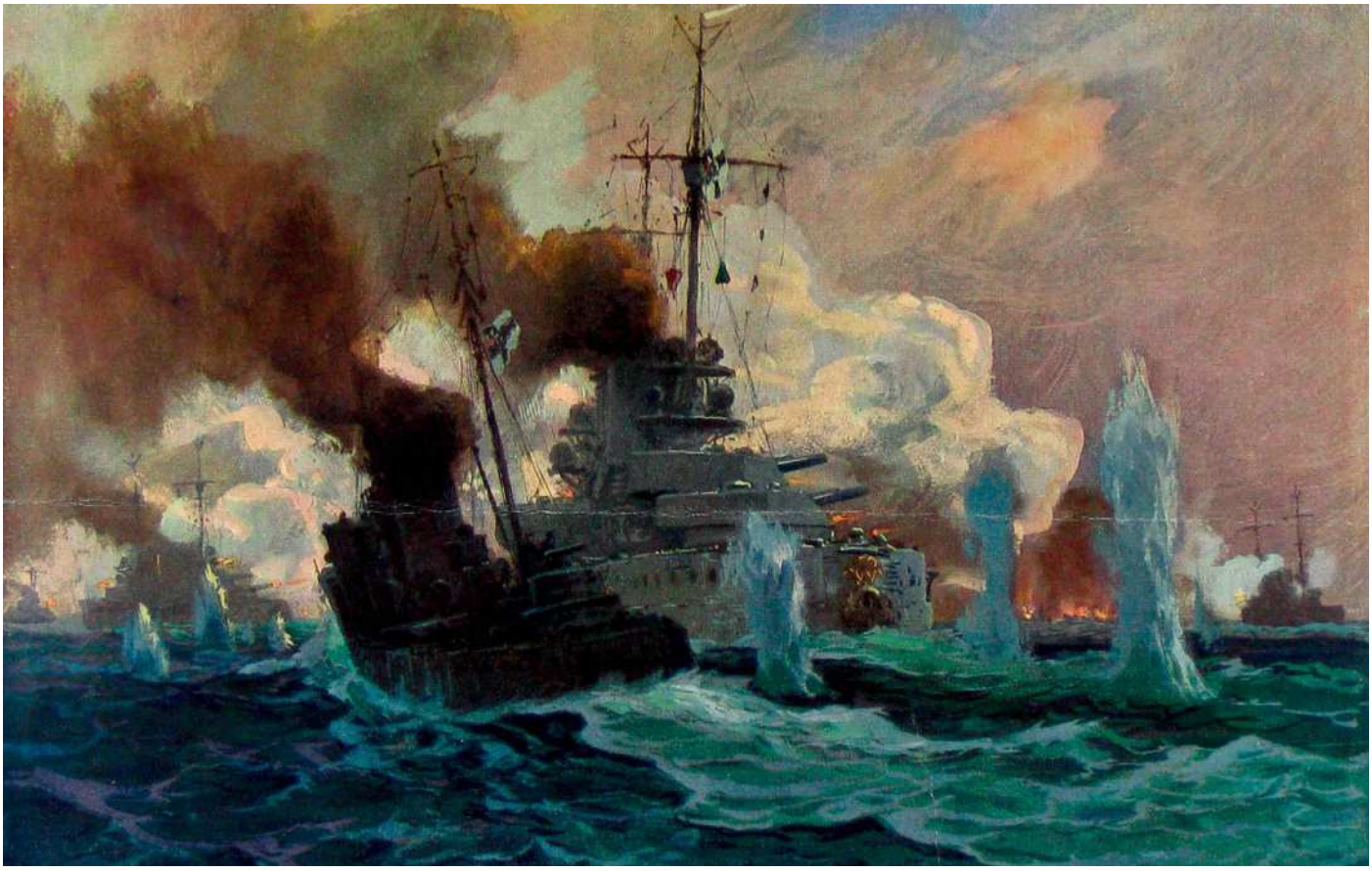

Beachfront Broadside

German raids against Britain usually involved air attacks, but during the First World War the German Navy also shelled several British towns from the sea.

Although geographically the closest town to Germany, the residents of Lowestoft were not particularly concerned that war would come to them in any real way when it broke out in August 1914. However, on the night of 15/16 April 1915 that complacency was dispelled when the town was raided by a Zeppelin. Terrifying though it was, the attack resulted in relatively little damage although it was a portent of things to come. War would arrive in Lowestoft with a vengeance just over a year later.

Plans to bombard towns on the east coast at daybreak on 25 April 1916, from the cruisers and destroyers of a battlecruiser squadron, along with Zeppelin raids the night before, were intended to entice the Royal Navy to battle. If successful, the High Seas Fleet might destroy significant elements of the British Fleet, reducing or eliminating the Royal Navy's numerical superiority. In addition, it was timed to coincide with an expected Easter Rebellion by Irish Nationalists.

As targets, Lowestoft and Great Yarmouth were selected because the former was a minelaying and minesweeping base, while Great Yarmouth housed submarines disrupting German movements. The destruction of harbours and military establishments there would assist the war effort - even if it failed to bait the British.

In a well thought out plan, with eight Zeppelins dropping bombs and providing reconnaissance, the ships could assist if an airship was lost over water. Two U-boats were also sent ahead to Lowestoft, while others laid mines against vessels despatched south to engage the German force.

'BOMBS UNLAWFULLY DROPPED'

At noon on the 24th, operations began with the intention of putting the bombardment group off Lowestoft and Yarmouth by daybreak to bombard them for 30 minutes. But, at 16:00, disaster struck as the battlecruiser *Seydlitz*, in the vanguard of the force, hit a mine and was forced to turn back with a 50 ft gash in her hull.

The British, aware that the German ships had sailed, received information at 20:15 they were heading for Yarmouth and at 15:50 the fleet was put on two-hours-notice, finally ordered south from Scapa Flow at 19:05. Around midnight, the Harwich squadron of three light cruisers and 18 destroyers was ordered north.

Meanwhile, the airships had dropped their bombs while reporting visibility over land as poor, the winds unfavourable and the towns better defended than thought. However, whilst causing widespread terror, the bombs only resulted in one death: 79-year-old Fanny Gaze at Hall Farm, Horning, with the coroner later recording:

Facing Page A German painting by the artist Professor Hans Bohrdt of the bombardment of Lowestoft on 25 April 1916.
Right This imposing house on the Esplanade was cut in two by one of the German naval shells.
Below Left A series of commemorative postcards were produced to mark the bombardment of Lowestoft, this card showing damage at Cleveland Road.
Below Right Bombardment of another of Britain's coastal towns had taken place in Scarborough on 16 December 1915, the devastating assault being used as a tool to encourage enlistment.

'Heart failure from shock endured by the terrifying effect of explosions produced by bombs unlawfully dropped from a Zeppelin aircraft.'

Finally, at 03:50, one of the German ships sighted British ships to the WSW which turned south, attempting to draw the Germans away from Lowestoft. Instead, the four battlecruisers opened fire on the town at 04:10, the terrifying bombardment lasting for ten minutes before the ships moved their attention to Yarmouth. Here, fog made targeting difficult and only a few shells were fired before reports arrived that a British force had engaged the remainder of the German ships, the battlecruisers then breaking off to join them. Yarmouth had had a lucky escape.

Unable to draw the Germans away, the Royal Navy turned towards the Lowestoft attackers, engaging the light cruisers and escorts but broke-off when outgunned by the battlecruisers which had caused severe damage to the cruiser HMS *Conquest* and destroyer HMS *Laertes* and slightly damaged a light cruiser. The Germans then ceased fire, turned NW and hoped in vain that the British cruisers would follow.

During the bombardment, the German light cruiser *Frankfurt* sank one patrol steamer, while the leader of a torpedo-boat flotilla sank another, the crews being rescued and taken POW. However, while battle at sea continued, havoc had been wreaked ashore in Lowestoft.

DEATH, DESTRUCTION & FAILURE

Fortunately, casualties were remarkably light amidst large-scale destruction and only three civilians lost their lives, despite the intensity of the attack: siblings Herbert and Annie Davey and eight-month-old Robert Mumford were killed while Robert's mother, along with Herbert and Annie's parents and their

two other children, were injured when a shell collapsed the upper floor of their home at 20 Sandringham Road. In addition, there was one service death: Petty Officer William Hollis being killed at North End House, the RN Anti-Aircraft HQ on Yarmouth Road.

Light though casualties were, damage was estimated at the then considerable sum of £25,000. Captain Jasper Mayne, East Suffolk's Chief Constable, reported:

'Damage as follows:- Convalescent Home and Porter's Lodge considerably; Headquarters RNAAS wrecked and gutted by fire; Swimming baths, London Road South, extensively; Claremont Pier land end extensively; South Pier, Naval Base, damaged; 40 dwelling houses extensively; 200 dwelling houses slightly; the telephone wires and tramway wires with part of London Road South near Swimming Bath were demolished, four shells exploded in the enclosure round the wireless station at North Lowestoft...shells were 11-inch and generally made cavities of about 10ft diameter x 3ft deep.'

The destruction would likely have been worse had the battlecruisers carried high explosive shells rather than armour piercing ones. In many cases, these merely created large holes and left unexploded ordnance lying in the streets.

For the Germans, the operation was a dismal failure, sinking only two patrol craft and a submarine by U-boat and damaging one cruiser and a destroyer. Meanwhile, the U-boats found no targets with one sunk and another captured after running-aground at Harwich. The Germans also took serious damage to a battlecruiser, only inflicted light damage to naval establishments at Yarmouth and Lowestoft and failed to take advantage of superior numbers to engage the British.

British casualties were 21 servicemen killed at sea and four persons killed and 19 wounded in Lowestoft. While the raid angered the British, the bombardment of towns and the killing of civilians cost the Germans dearly in world opinion. ■

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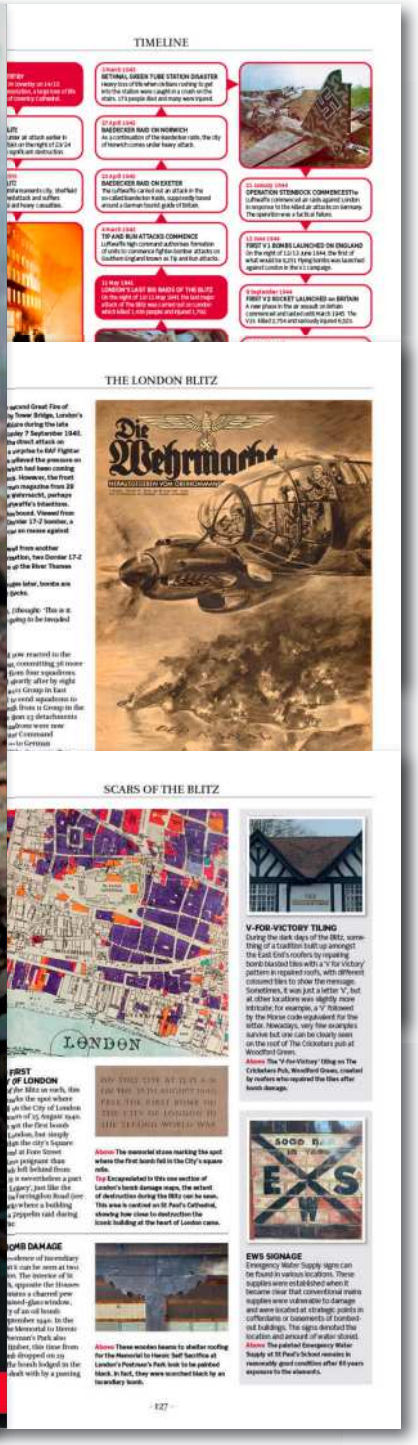

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