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70MHz Contest  
Announcement



September 2017 £3.99 ISSN 0141-0857



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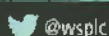
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December 2013



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# Keylines

Don reflects on the recent IARU Radiosport Championship event, ponders on a new data mode and looks at the variety of articles in this month's issue.

**M**y on-air activity during July was confined mainly to taking part in the IARU Radiosport Championship. One strong element of this contest nowadays is the part played by so-called Headquarters stations representing the various national radio societies. In the UK, a large number of amateurs were involved in operating GR2HQ on behalf of the RSGB and UK amateurs were encouraged to work GR2HQ on as many bands as possible. From modest beginnings, these HQ stations have become major affairs and GR2HQ is no exception.

A number of amateurs throughout the UK make their stations available, perhaps on just one band where they are particularly well equipped (for example, with a high multi-element monoband Yagi). The stations are then fully networked over the internet so that, for example, the 20m SSB station always knows just what frequency the 15m CW stations is on and can 'pass' callers, asking them to work GR2HQ on a different band and/or mode. This year the plot was extended by asking other, perhaps less well-equipped amateurs simply to take part as listening stations, noting callers on, say, 80m SSB and passing the callsigns to the 80m SSB location. A real team effort and an interesting technological challenge all round! Even so, the Germans, for example, seem to be able to recruit significantly more volunteers than the UK while the Spanish and Italians, again as examples, enjoy the benefit of southern European propagation. But it's all good fun and a learning experience for those who get roped in as helpers.

## FT8

In last month's *Keylines* I talked about how the use of JT65 has grown dramatically this year, especially on the 6m band during the sporadic E season. This is a rapidly moving field, though, and in the past few weeks a new WSJT-X

variant, FT8, has appeared and taken the bands by storm, even while still in beta testing. It cannot copy down to the same low signal levels as JT65 but is significantly faster, allowing a 'QSO' in as little as a minute, which is about the same rate that contacts can be made on traditional RTTY but under much more marginal propagation.

Glen W0GJ, an early adopter, is reported as saying that the mode will be perfect for those with indoor or balcony antennas but, perhaps more significantly, is calling on next year's 3Y0Z Bouvet Island DXpedition to consider FT8 as an addition/alternative to RTTY. I can certainly see other DXpeditions starting to do the same thing before too long and I feel sure that VHF operators will use the mode regularly to extend their range under flat band conditions. The bad news on 6m, for example, is that the effect has been to denude much of the band of the usual SSB and CW contacts, with activity focusing on the digital calling channels.

Unfortunately, the other downside is that WSJT removes the personal exchanges (chats) from contacts, turning them into just another tick-in-the-box whereas digital modes such as PSK31 lend themselves well to old-fashioned ragchewing. Hopefully enough amateurs remain dedicated to the latter (see also **Roger Cooke G3LDI's** last *Morse Mode* column on much the same topic), rather than measure their amateur radio achievement purely as a number of contacts/squares/countries or whatever.

## This Month's Issue

It's another packed issue this month. We have two *Carrying on the Practical Way* items for you, quite different but both encouraging experimentation and hands-on learning. There are three reviews, again all quite different. **Vince Lear G3TKN's** ATU article is much more than just a review

because it talks about the benefits and disadvantages of various ATU configurations. We also have the announcement of our annual 70MHz Contest, which I hope many of you will take part in – equipment for the 4m band is much more readily available nowadays, even if you have to borrow something from a fellow club member! And **Tim Walford G3PCJ** rounds up his constructional project. No, it isn't state-of-the-art but is designed to be the sort of project that constructors with big fingers and ageing eyesight can manage to put together and enjoy.

I want to thank all our contributors, including, of course, our regular columnists. No one ever got rich writing for amateur radio magazines because we are very much a niche hobby. These folk do it out of their interest in and love for the hobby – do let them know from time to time that you appreciate them. An e-mail only takes a moment.

## Newark

Finally, as this is the September issue, let me encourage you to visit the National Hamfest at Newark at the end of September. *PW* will be there so make a point of saying hello. And a number of our regular advertisers will have special show offers. Do let them know how much you appreciate what they do for our hobby – many are small companies who, again, exist because they enjoy serving amateur radio rather than trying to make their fortune in the world of big business. I'm reminded of this by a reader who told me recently of the excellent service he had received from Icom UK when he had a problem with his ICR8500 receiver. I wonder how many vendors in other walks of life would go out of their way to help with a fault on a 15-year old product?

Don Field  
G3XTT



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## New Acom Products

Nevada Radio have announced the new A1200S (1200W) solid-state amplifier from Bulgarian manufacturer Acom. The output stage uses BLF188 MOSFET devices that can withstand high SWR and mismatch. They can be driven to full output with just 50W of RF drive power and were originally intended for aerospace and broadcast applications. The amplifier has a large high-resolution colour display. The A1200S is compatible with all radios currently on the market because it does not need any special control signals other than a simple 'ground on transmit' PTT. It senses RF and immediately tunes to the band in use. The price is £2795.

The ATU-D4AT 1.2kW Auto-ATU from Acom is designed to work seamlessly through a single coax connection with any of the new Acom solid-state amplifiers. Remote control is achieved by using a 60kHz bi-directional FSK



modem in both tuner and amplifier, fed through the coaxial cable. The tuner has a built-in four-way switch, with SQ239 sockets, that allows selection of four different antennas. A bypass switch is also included, for those broadband antennas that require no tuning. The unit is fully weatherproof and supplied complete with brackets for desk, wall or tower mounting. The price will be around £1099.

[www.nevadaradio.co.uk](http://www.nevadaradio.co.uk)



## Professional Grade Audio Equalisation for Amateur Radio

bhi have launched their new ParaPro EQ20 range of audio DSP products. The range features a 20W modular audio power amplifier with a parametric equaliser plus the option of having bhi's latest dual-channel DSP noise cancelling and Bluetooth technologies. The parametric equaliser allows any specific



## New Portable Antenna Covers 60m Band

With the decline in solar activity, 40m is getting to be hard work for more local HF contacts. A good choice when conditions are poor is often to use a lower frequency. In response, SOTabeams have introduced a version of their popular Band Hopper antennas to include 60m. The Midi Hopper is a full-size, full-performance antenna that covers 20, 40 and 60m. It is ready tuned, includes a balun, feeder and guying for a 7m telescopic pole.

[www.sotabeams.co.uk/band-hopper-iii-three-band-linked-dipole](http://www.sotabeams.co.uk/band-hopper-iii-three-band-linked-dipole)



part of the frequency range to be selected and adjusted in strength. The user is able to precisely select a frequency to boost or cut to suit your own hearing and environment. The EQ20 range can be used with you own passive speaker(s) and is supplied with a user manual and full accessory kit to suit most types of connection. For more information go to the bhi website or call bhi on 01444870333.

[www.bhi-ltd.com](http://www.bhi-ltd.com)

## Peterborough Club News



The May meeting of Peterborough & District ARC hosted a fascinating talk by **David MOVTG**, an ex-RAF cryptographer, about the LORENZ coding machine.

David talked briefly about Enigma before explaining that LORENZ was used only by German high command in Berlin to its Generals in the field. He explained how the 12-reel LORENZ machine sent coded teleprinter messages at high speed, from punched tape that was five holes wide. The configuration of the machine, using five reels on the input and five on the output side plus two reels for setting the code, made decryption very difficult. Originally, code changes were monthly but that increased to weekly and then daily. Each reel had different wiring and alignment but eventually Colossus at Bletchley Park broke the code as it had with Enigma.

The Club also took part in Museums on the Air on June 17/18th at Flag Fen Museum, on the site of a Bronze Age settlement discovered by **Francis Prior** (of Time Team fame). They set up two stations on Friday 16th in a public

lecture room on site. 48 HF contacts were made, of which six were with other museums, while 19 contacts were made on 6 and 2m, with two of these being with museums. Thanks are due to the staff and management of Flag Fen Museum for their help and cooperation.

## Worked All Britain Awards Group AGM

The Worked All Britain (WAB) awards group held its AGM at the Spalding Radio Rally on June 4th. An informal meal was enjoyed by 17 members on the Saturday evening.

The Founder's Trophy, for behind-the-scenes contributions to WAB, was awarded this year to **Geoff Darby G7GJU**. The President's Trophy is awarded to the overall 'single operator' winner of the WAB Contests and was won by **David Boyes 2E0KVJ**.

One of WAB's success stories of recent years has been the Trig Award. This has proved to be complementary to the SOTA awards programme and both groups have benefited from it. The new Trig Award is issued for 1,000 trigs worked and the first recipient was **Ken G0FEX**.

Another highlight of the meeting was the presentation of the Bound Skerry Award to **Steve Richards G4HPE** for his 'Decade in Two Days'.

WAB awards a beautiful crystal trophy, named after WAB benefactor **Norman**





**Marshall**, to the winner of the 50MHz Contest. There are two large silver cups for the winners of the 144MHz Contests and one for the 1.8MHz Contest. A replica is given in every case.

The generous bequest from **Norman G1NTW** has been used to renew broken and lost trophies, subsidise the cost of the scheme to WAB members and make regular large donations to charity.

Full details of the WAB award scheme can be found on its website:  
[www.worked-all-britain.org.uk](http://www.worked-all-britain.org.uk)

## More Product News from Dayton

We have recently learned of a couple of other interesting products that were on display at this year's Dayton Hamvention. RF-KIT, based in Germany, was exhibiting a legal-limit HF amplifier kit. The unit on display uses two LDMOS power devices and sports a 7in colour touchscreen for amplifier control and status. The kit includes everything necessary to build the amplifier except the Raspberry Pi 3 CPU and three fans. The company's literature states that it can be built in less than a day.  
<http://rf-kit.de/en/>

HobbyPCB, makers of the HARDROCK-50 HF Amplifier, were showing an RF Wattmeter Shield for the Arduino. The shield itself is capable of measuring 0.1mW - 2W, and could be a useful component in automated station monitoring.  
[www.hobbypcb.com](http://www.hobbypcb.com)

## MARTS Field Event

From August 16th to 27th the Medway Amateur Receiving and Transmitting Society (MARTS) will be holding their annual field event at Milton & District Scout Camp, Bexon Lane, Bredgar, Sittingbourne, Kent ME9 8HD. Over the two weeks the club will operate on 70cm to 80m using their three callsigns G2FJA/P, G5MW/P and G8MWA/P. Anyone who contacts all three callsigns on SSB, data or CW will receive a commemorative certificate either by eQSL or e-mail.

On the weekend of August 19/20th there will be specialised demonstrations at the field using microwaves, antennas, WSPRlite and data.

There are camping facilities with showers available for anyone wishing to stay overnight. For further updates please visit the MARTS website or contact **Pete M0DFM** via [m0dfm@mail.com](mailto:m0dfm@mail.com)  
[www.marts.org.uk](http://www.marts.org.uk)

## Torbay Show and Tell

The Torbay Amateur Radio Society once again had a very successful 'Show & Tell' evening, when the members have the opportunity to bring in amateur radio items of interest. One member is an avid model railway enthusiast who produces many interesting displays.

## Huntingdonshire Amateur Radio Society News

For the 11th year, HARS found themselves operating from Ramsey Rural Museum as GB2RRM (# 5166) for Museums on the Air but this year they had to share their location with the Ford Corsair Owners Club AGM and also a Donkey Derby on Sunday and therefore had to relocate to a new operating location within the museum site. In all, some 123 contacts were made, including 19 other museums.  
[www.ramseyruralmuseum.co.uk](http://www.ramseyruralmuseum.co.uk)

Another outing for HARS was to support Buckden Village Hall and their Village Fete. In the course of the day, they were visited by **Brian G8CHC**, **Phil G0AYX**, **Richard M6TXR**, **Clive G3NKG** (after working him on the key from his QTH in Perry) and **Stig G1MYF**. They even had a visitor from South Africa - **John ZR5ART** - who was staying with his son in Buckden.



He also brought in a homebrew valve amplifier, which proved very useful for the PA announcements. Valve transceivers were also explained, so time consuming when 'loading-up' to transmit compared to the switch-and-go that we have today, the latest KX3 proving a point, together with a Flex radio also on show. A demonstration of a handheld satellite antenna and transceiver using a satellite tracking App on a mobile phone also proved very interesting.

## RSGB Contest Committee News

The RSGB DX Contest takes place on Sunday October 8th. This year it is a single day event but has been expanded to 18 hours, running from 0500 to 2300UTC and now includes SSB and CW on the 3.5, 7, 14, 21 and 28MHz bands. The contest exchange is simply RS(T) plus serial number, starting at 1 and incrementing by 1, irrespective of band. All QSOs will score but points are higher for DX QSOs and higher band contacts.

Multipliers are the countries of the DXCC list on each band and mode for UK, Channel Island and Isle of Man stations and for other stations the first contact with each UK, Channel Island or Isle of Man callsign prefix, for example G3, GJ0 or MMD, on each band and each mode will be a multiplier.

The DX Contest is a development of a long established series of HF contests on 21 and 28MHz, which is now enhanced to accommodate a period of reduced propagation on the higher bands. It is always an excellent opportunity for UK, Channel Island and Isle of Man stations to have DX QSOs and for other stations to work UK, Channel Island and Isle of Man stations on multiple bands and modes.

The contest is held near to the autumnal equinox, which can deliver excellent worldwide propagation. The full rules can be found from the RSGB HF Calendar page at:  
[www.rsgbcc.org/hf](http://www.rsgbcc.org/hf)

After 90 years, the RSGB Contest Committee is extremely pleased to be able to reuse the historic G6XX callsign on behalf of the Society. The callsign 6XX was first held by the RSGB in the 1920s and was used in

transatlantic tests with a special permit to use an input power of 1kW. This was before the prefix 'G' was added to callsigns in England, so G-6XX was used.

In the 1930s G6XX (now with the G prefix) was held by **George Lionel Seymour Dawson-Damer**, Viscount Carlow. Carlow was a flamboyant and gifted individual who was a close friend of **TE Lawrence** (Lawrence of Arabia). Carlow was RSGB Honorary Treasurer in 1939. He was an RAF pilot at the start of World War II, moving later into the Intelligence section. Having been on many diplomatic missions in Europe and South America, he was killed in 1944 while on his way to Yugoslavia.

Post WWII, G6XX was issued to **Don Scarr** of Howden in Yorkshire. Don was a DX enthusiast and continued to hold the callsign until his death in the 1980s. The Goole Radio & Electronics Society has memories of Don and the homebrew tower that he had in his garden.

Now that G6XX has eventually returned to its original holders, Contest Committee members aim to use this historic callsign to raise the profile of contesting within the RSGB and to represent the RSGB in international contesting. G6XX is now held as a club callsign by the RSGB Contest Club, which is an RSGB Affiliated Society within the RSGB.



## Kenwood UK Supports Amateur Radio at the BBC

On July 10th Kenwood UK Sales Director **Mark Haynes M0DXR** donated a Kenwood TS-590 HF transceiver to the recently formed



London BBC Radio Group, callsign G8BBC. Group Chairman, and Radio 4 announcer/newsreader, **Jim Lee G4AEH** received the donation in the new club shack at the top of BBC

Broadcasting House where test transmissions are now in progress, ahead of the official opening by BBC Director

General **Tony Hall** in October. The station has been dormant for four years since leaving BBC Television Centre in 2013. G8BBC is active on HF and VHF and now has 25 members of BBC staff, some with amateur licences and some shortwave listeners.

There has been an amateur radio operation at BBC Broadcasting House since 1949 under various BBC special callsigns, the most recent being G8BBC. The QSL and logbook archive is due to be donated to the care of the RSGB National Radio Centre at Bletchley Park. Perhaps the group's finest hour was when BBC reporter **Laurie Margolis G3UML** contacted the Falkland Islands in 1982 and broke the story of the Argentinian invasion for BBC News. Laurie is now a senior news editor at BBC News.



## GB8CCG

On Saturday June 17th, special event station GB8CCG was on the air with operators **Jon Kempster M5AEO** and **Jim Lee G4AEH** as part of the London Open Garden Squares weekend. The station was located in the garden shed at Cordwainers Community Garden in Hackney, east London. [www.opensquares.org/detail/Cordwainers.html](http://www.opensquares.org/detail/Cordwainers.html)

Sadly, HF radio conditions were poor but about 30 contacts were completed, many around London on VHF, and event organiser **Kate Poland** (a former BBC World Service journalist) passed greetings messages over the air to several stations. Members of the public visiting the garden were introduced to the amateur radio service and showed great interest.

## CHOTA Time Again

Churches & Chapels On The Air is on Saturday September 9th, 1000 to 1600 (local). But how did it all begin? In 2006, it occurred to **John G3XYF** (a Christian farmer living in East Yorkshire) that it was high time the amateur radio world had Churches & Chapels On The Air to complement all those other '... on the Air' awards and activities. Every second Saturday of September the York Historic Churches Trust (YHCT) hopes all churches and chapels will be open to take visitors on a sponsored basis for their Ride & Stride activity. The YHCT gives grants to help repair Christian buildings. Any money raised is divided equally between the YHCT and the church or chapel hosting the event.

John thought it would be a good idea to establish an amateur radio station in his church on that day for the benefit of visitors. This would be a double 'advertisement' – for the church hosting the event and for amateur radio. Setting up the antennas shouldn't be a problem – most churches after all, have a suitable high point for rigging the antennas!

Now, over ten years later, some year 30 to 40 churches across the UK permit their local radio amateurs to set up stations in aid of this good cause. For details of churches and chapels taking part see WACRAL's website: [www.wacral.org/CHOTA.htm](http://www.wacral.org/CHOTA.htm)

This year WACRAL are issuing a certificate in connection with CHOTA. Again, details can be found on the website.

## RAOTA AGM

RAOTA (the Radio Amateur Old Timers' Association) is holding its AGM on Wednesday September 6th at the Brunswick Inn, 1 Railway Terrace, Derby DE1 2RU. This is almost opposite the railway station car park.

The meeting will commence with an informal Get-Together at noon and the AGM will commence at 1330 (local). They expect the AGM to take no longer than an hour and will then revert to the Get-Together.

For more information contact **Ian Brothwell G4EAN**: [GenSec@RAOTA.org](mailto:GenSec@RAOTA.org) or 0115 926 2360 or 56 Arnot Hill Road, Nottingham NG5 6LQ. Membership of RAOTA is open to anyone with an active interest in amateur radio. [www.RAOTA.org](http://www.RAOTA.org)

## GBOHMG

Over two weekends in June, Harlow and District Amateur Radio Society (G6UT) operated as GBOHMG from their club QTH for Museums on the Air. The museum is housed in a converted stable block with a walled garden. It is a general museum covering items from the Stone Age to the present day.

The club QTH (the Barn) is adjacent to the museum and was once part of the same large estate. Operating on 40, 20, 10, 4 and 2m a total of 266 contacts was made.

## More Countries on 5MHz

Belize, Cyprus and the Philippines have all recently received 5MHz allocations. The Philippines National Telecommunications Commission has permitted access to the new WRC-15 Amateur Secondary 60m allocation of 5351.5 – 5366.5 kHz under ITU footnote 5.133B, with a maximum power limit of 15W EIRP. Belize gains the same allocation with a maximum power limit of 25W EIRP. Cyprus too gains those frequencies with a maximum power limit of 15W EIRP and also the Amateur Secondary MF allocation of 472 – 479kHz, with a maximum power limit of 1W EIRP.

## Bittern DXers

The Bittern DXers have recently received a National Lottery grant and are busy putting a number of programmes in place. The £10,000 grant is earmarked for continuing work on their Educational Outreach initiatives. They make it a priority to teach the public about radio science and getting on the air by taking equipment to community events. Their radio demonstrations have enabled members of the public to listen in as the team receive signals from weather satellites and the ISS. See the latest news on their website: [www.bittern-dxers.org.uk](http://www.bittern-dxers.org.uk)

## A Successful Lamfest

LAMFEST 2017, run by Lam Communications, was a great success, with over £800 raised for Yorkshire Air Ambulance. Several prizes were donated for the raffle by Icom, Kenwood, Yaesu, bhi, Cross Country Wireless and LAMCO themselves.



Do you have a passion for radio? We have the following vacancies



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# The Gurney Slade Part 2

**Tim Walford G3PCJ continues with last month's project, looking this month at the transmitter.**

**L**ast time I explained that using amplitude modulation (AM) is the simplest way to get on the air with phone signals and then explained the design and construction of the simple Slade regenerative tuned radio frequency (TRF) receiver that can receive AM, CW or SSB modes on either the 80 or 160m bands. In an electrical sense, the Gurney transmitter is mostly 'separate' from the receiver but both are on the same PCB, work closely together (albeit with separate tuning controls) and share the control and transmit/receive changeover circuits, so I reckon they can be just about called a transceiver! In this article I will explain the Gurney's design and construction. As before, there are discounts for PW readers and Clubs - see the side panel.

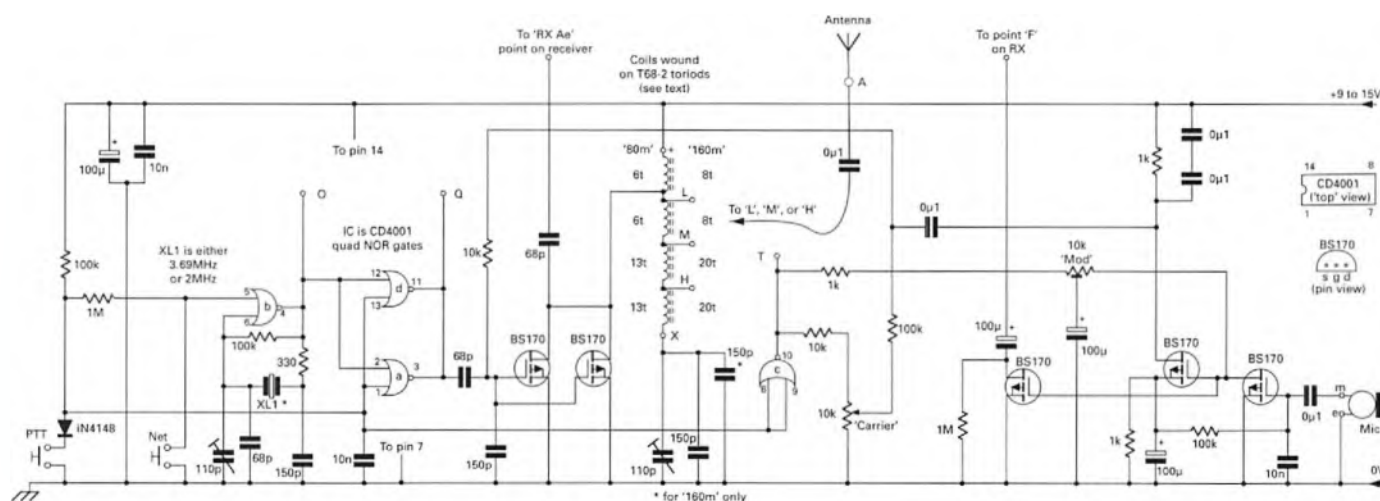
## MOSFET Gate Modulation

The generation of AM signals needs a plain RF carrier from an output stage similar to a CW transmitter but with extra circuits to alter the amplitude of the RF output in response to the microphone's audio signal. The modern (and simple) approach to generating AM is to apply the modulation to the gate of a MOSFET used for the final RF amplifier. In this scheme, the supply voltage to the RF stage is not altered by the audio so the maximum RF output on modulation peaks cannot be any higher than a similar stage run for plain CW – as defined by supply voltage and load resistance. This means that the 'no speech' carrier level for conventional AM has to be reduced to half the maximum RF output voltage (a quarter of the power) that the stage could deliver as CW. This allows the extra applied audio bias to double the RF output voltage (quadruple the power) so as to be fully modulated (100%) when it is delivering the very maximum possible. Small MOSFET

transistors (such as BS170s) are very cheap, so a couple of them producing about a watt of RF should be sufficient for ground wave contacts between members of a local radio club, even with less than ideal antennas!

## Transmitter Circuit Design

In essence, we need a CW transmitter and a speech amplifier, with some control circuits. The Block Diagram of the Gurney transmitter was shown in Fig. 2 of last month's article. The full circuit of the transmitter appears this month as **Fig. 1**. Given the need for simplicity, the transmitter uses a 'crystal' oscillator to make sure the frequency does not drift or get interfered with by feedback from the higher power output stage. Ceramic resonators can be used instead of actual crystals for 80/160m – their Q is high enough to avoid the above troubles but low enough to allow some frequency pulling by changing their 'load' capacitance with a trimmer. The standard 3590 and 2000kHz resonators are suitable. Much of the transmitter is actually digital using a plain CMOS quad two-input NOR gate, which can run directly off the incoming supply over the desired 9 to 15V range. The RF oscillator uses one gate, which is enabled when either the PTT switch (of the microphone) or the separate Net switch is grounded. The other three NOR gates are enabled only when the PTT switch is grounded so that closing the Net switch doesn't activate the whole transmitter. The second pair of NOR gates buffer the RF oscillator and are wired in parallel to lower the driving impedance for the RF output stage. The fourth NOR gate is used to turn on the speech amplifier and



**Fig. 1: Circuit of the Gurney transmitter.**



to provide the DC bias that controls the no-speech RF stage carrier output level.

The speech amplifier uses another pair of BS170 MOSFETs with DC feedback (similar to the receiver audio amplifier) to set their bias levels but only when turned on by the fourth controlling NOR gate! Audio gain, which determines the modulation level, is adjusted after the first transistor by decoupling a variable portion of its drain load. The second stage provides more audio gain up to about 3kHz, with the output superimposed on the output stage DC bias that sets the carrier level. The drain of the first speech amplifier stage provides a convenient higher control voltage to turn on the muting transistor very hard, thus shutting down the receiver audio amplifier when transmitting.

The RF output stage is designed for a maximum RF output of about 1.5W into 50Ω on a 12V (nominal) supply. This implies a carrier level of about 350mW, which can be easily handled by a pair of BS170s wired in parallel. (On a 9V supply, the output levels are about 800mW maximum and 200mW carrier.) A capacitive RF voltage divider is used at their gate to avoid any output (due to the large voltage swing of the CMOS stages) when there should be zero output on 100% modulation troughs. The longwire type antennas often used on 80 or 160m are likely to be less than a quarter wave long; consequently they will have higher load impedance than the ideal 50Ω when no antenna matching unit (AMU) is being used. To provide a simple alternative, the rig has a parallel-tuned RF output circuit with extra taps for direct connection of such 'random' length wires, the L, M and H taps being nominally suited to loads of 50Ω, 200Ω or 1kΩ. During reception, the transmitter output circuit is still resonant, allowing it to filter and feed signals to the receiver without any limiting from the back-to-back diodes that protect the receiver when transmitting.

### Building the Gurney Transmitter

It is best to start with the RF oscillator stage by fitting the quad CMOS NOR gate that also provides the control aspects. The oscillator frequency can be adjusted over a small range (predominantly down) from the nominal figure for the ceramic resonator. The output of the oscillator at point O (with the Net switch closed) should be a near ideal square wave between zero and supply volts at the band

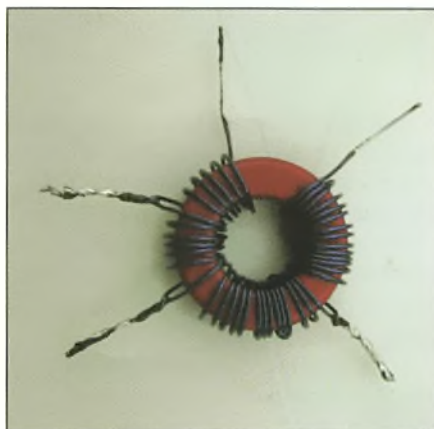


Fig. 2: 80m RF output inductor.

frequency – this can be checked with a DC voltmeter, which will indicate the average value, or near half the supply voltage. The voltage on point q should be zero but if the oscillator was enabled by the PTT switch (point P grounded), then point q should have the same reading on it. Grounding P should also make point T change from zero to supply volts, which activates both stages of the speech amplifier as well as turning on the RF output stage DC bias that sets the carrier output level. Add the muting parts after those of the speech amplifier. The DC voltage on the drain of the first speech amplifier stage is close to 4V, which is large enough to ensure that the muting transistor stays turned on hard so preventing any feedthrough of microphone audio to the receiver. You also need to add the short wire links between ground tracks that help make up for the absence of a proper PCB ground plane.

Winding the RF output inductor on the red T68-2 toroid is easy when done in separate sections. Join these together to form the three L, M and H taps before mounting it on the PCB. It is essential that all sections of the inductor are wound in the same direction, or threading sense, through the toroid's hole so that the turns combine to make one big inductor. Start with the two smaller sections – these both need six turns for 80m or eight turns for 160m. The third and fourth sections need 13 turns for 80m, or 20 turns for 160m. Pile wind a few turns if you need to better match the spacing of the L, M, H holes on the PCB. See the photo, Fig. 2, of the 80m inductor ready for inserting into the PCB. Point X is the RF 'hot' end of the inductor, to which are connected the fixed tuning 150pF capacitor (with an extra one for 160m) and a trimmer that is adjusted for resonance. After fitting the RF output stage bias parts and transistors, connect your multimeter in the positive lead to measure the supply current. Set the carrier preset right back, then switch on

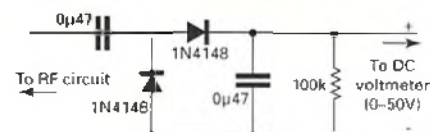


Fig. 3: Circuit of voltmeter for measuring AM pk-pk RF voltages.

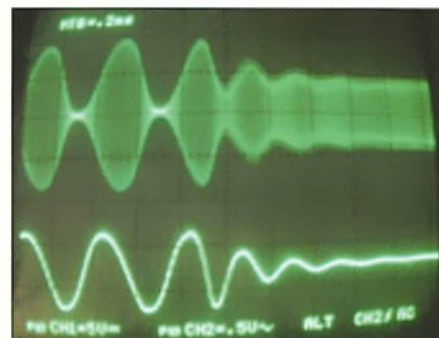


Fig. 4: A burst of AM and plain carrier, seen on the oscilloscope screen.

and close the PTT switch. As you gingerly increase the carrier preset to obtain some RF output, you should be able to find a dip in the supply current as you tune through resonance with the trimmer. Fit the 100nF antenna output capacitor to tap point L initially, so that connecting a 50Ω dummy load will smooth out most, but not all, of that dip.

With the modulation preset right back, the carrier preset should allow you to obtain a maximum of about twice supply volts of peak-to-peak RF output, or about 1.5W maximum into a 50Ω dummy load when using a nominal 12V supply but nearer 800mW on 9V. However, because this has to be the maximum when audio is applied, you need to reduce the carrier preset for half that maximum RF voltage (or quarter power) and then increase the modulation preset so that on speech peaks the RF level swings between zero and twice the supply volts. The easiest way to do this is with a peak-to-peak reading AC voltmeter, which must have long time constants so that it can measure over the RF peaks of the audio cycles – the circuit in Fig. 3 is suitable and is so simple you don't need a special PCB. If you have access to an oscilloscope, the RF output voltage should look like Fig. 4 when adjusted properly. The left part is a burst of single tone audio with 100% amplitude modulation, the right part is just the plain carrier.

### Using the Gurney Slade

Having set up the transmitter as above for a 50Ω dummy load, ideally you would use a resonant AMU to provide extra filtering and obtain a good match to



whatever antenna you can manage to accommodate. For longwire antennas, the general advice is to get out as much wire as possible and as high as possible. It's unlikely that you will have a fully balanced system so you may find that an 'RF earth' connection to nearby metalwork (water pipes or similar) will provide an alternative earth instead of extensive ground mats or a counterpoise. But without an AMU, if the antenna wire approaches a quarter wave in length, then use the L tap, or the M or H taps, for progressively shorter wires. After altering the tap connection capacitor, you should check the setting of the output resonating trimmer by checking for a dip in supply current at resonance. For an alternative antenna, a lot of fun can be had over shorter distances with small loop antennas made of 15mm malleable water pipe. Four 'turns' (spaced apart 25mm) of about 0.75m diameter can be resonated with a 350pF twin gang air variable adjusted for best received signals. Matching is most easily done by connecting the transmitter's coaxial outer to the capacitor frame, with the inner to the point on the loop where the VSWR

is least when using the 50Ω L tap on the transmitter output inductor. Start with it about a quarter turn round the loop from the capacitor frame and see whether the VSWR goes up or down as you move either way round the loop. The photo, Fig. 5, is my portable 80m loop with rig and battery for /P operation.

For a local net, the operating frequency will be prearranged, so that you can probably get others to assist (with a counter or general coverage receiver) to set your transmitter's RF oscillator to that club frequency using the oscillator trimmer. (Your club might consider obtaining a batch of actual crystals to use instead of the ceramic resonator. This will much reduce the tuning range and make it easier to 'find' each other on the net.) If you need to adjust your transmitter frequency to that of a distant station, listen carefully for the weak whistles between the incoming carrier and your transmitter oscillator with the Net switch closed and then tune your transmitter for zero beat. The alternative of just advancing the Regen control so it beats against the incoming carrier, and then beating your

### Kit Availability

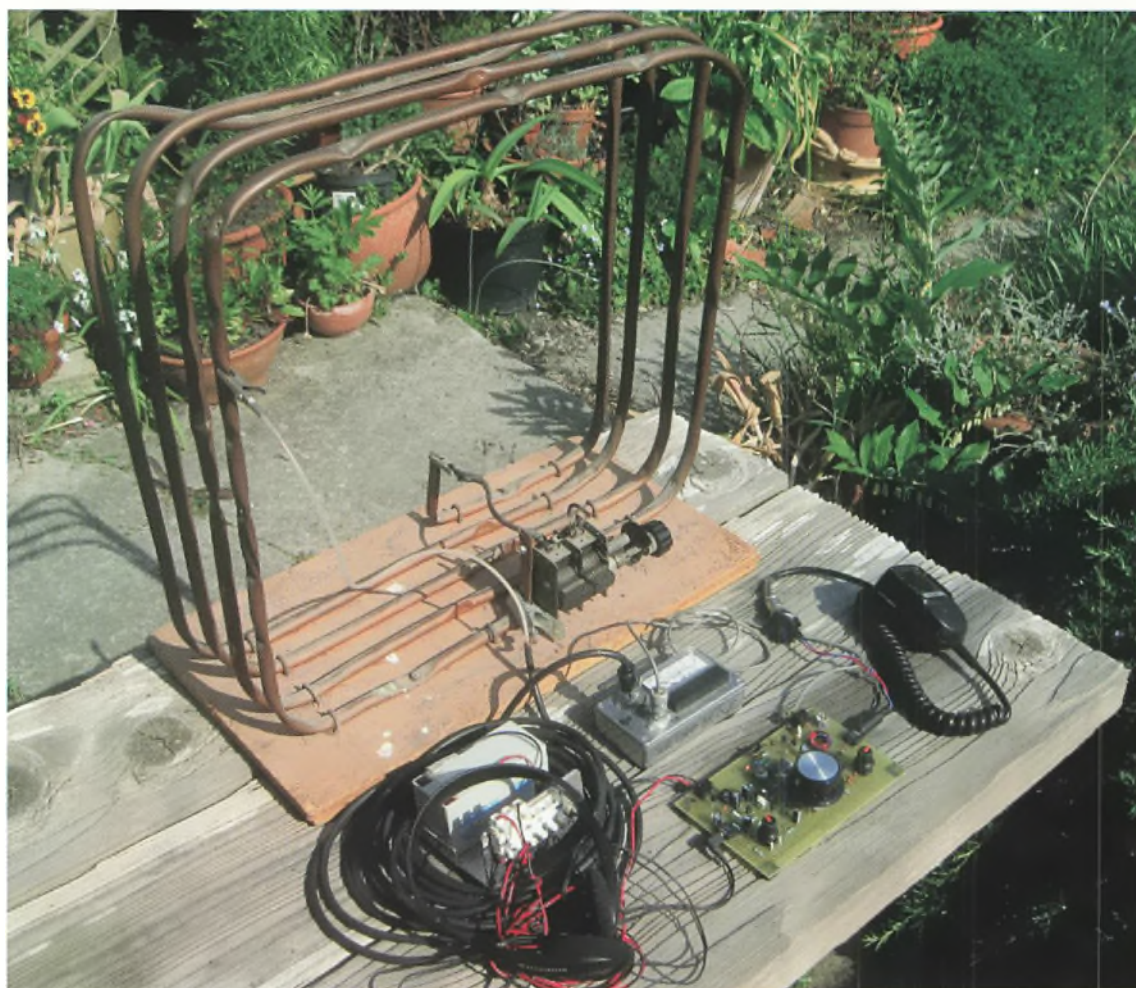
Complete kits of parts, with extensive instructions, to build the Gurney Slade in the open physical format shown here can be ordered direct from Walford Electronics Ltd using the Paypal facilities on their website: [www.walfords.net](http://www.walfords.net)

There is a small discount for *PW* readers ordering single kits, who should enter the code PWGS1 and a price of £37. If the order is for four or more kits as a single club order, please enter PWClubGS and work out the price at £35 each. (Advance warning to me at [electronics@walfords.net](mailto:electronics@walfords.net) would also be prudent!) £6 is automatically added to each order for packing, first class post and Paypal fees.

TX oscillator against the Regen, is tricky because the Regen oscillations will be swamped by the transmitter oscillator. This means you only hear the whistle as the frequencies approach each other before they then suddenly lock together and disappear! So you have to adjust the

transmit trimmer from both sides and leave it halfway between the lock points. This sounds complicated but it comes with practice and, of course, because you are using AM the tuning is less critical than for SSB (no missing carrier to reinsert).

I trust this project will eventually give many of you the pleasure of being able to say "I built this rig" to those you work and that you will then move on to greater things. As ever, I will be delighted to hear how you have got on.



**Fig. 5: The Gurney Slade out portable!**





# The LAMCO DU1500 ATUs

Vince Lear G3TKN takes a look at a couple of high-power ATUs from Lam Communications.



Fig. 1: Lamco DU1500L L-Match Tuner.

In the past there always seemed to be a good range of commercially made antenna tuning units (ATUs) on the market. Names such as Dentron, Drake and Ten-Tec come to mind. In addition, manufacturers such as Yaesu and Kenwood produced ATUs to go with their various equipment lines. In the 1960s, the UK company KW Electronics made the KW Supermatch and KW E-Zee Match ATUs to go with their line of equipment. More

recently Linear Amp UK used to manufacture both a high power Transmatch and a Z-match ATU.

However, these days there appear to be very few manufacturers of high quality, high power ATUs. If any of the older models I have mentioned above do come up for sale, they generally command a high price and are much sought after.

It was therefore interesting to have the opportunity to review the range of LAMCO DU1500 ATUs that are available from Lam Communications based in Barnsley, South Yorkshire.

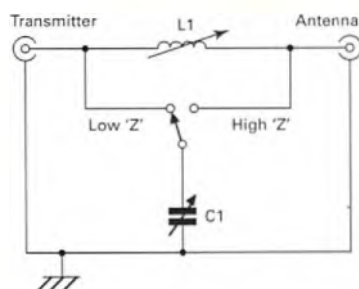


Fig. 2a: The reversible L-match circuit.

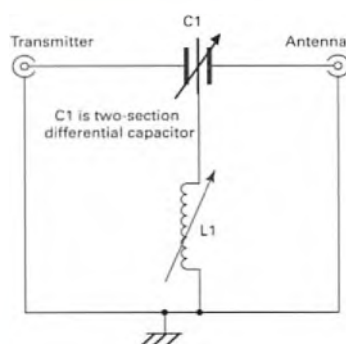


Fig. 2b: The differential T-match, using a differential capacitor.

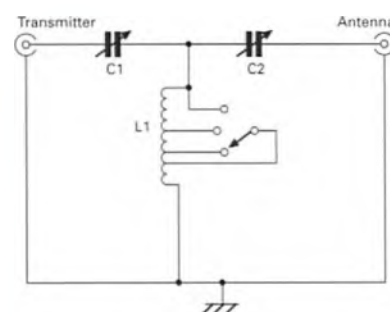


Fig. 2c: The switched coil T-match circuit.

## The DU1500T and DU1500L Tuners

Lam Communications offer three 1.5kW rated tuners that cover 160m to 10m. The variable capacitors are rated at 4.5kV on all units. All have antenna switching and bypass facilities as well as a cross-needle VSWR/power meter, although the latter is not of the 'peak hold' type. The power meters all have two ranges: 200W and 2kW. Forward and reflected power as well as VSWR can simultaneously be read from the cross-needle display. All the units can be used with single-ended antennas (such as end-fed wire or coaxial fed) as well as balanced-feed antennas. A heavy-duty 4:1 voltage balun is included in each unit for balanced feed.

The DU1500L, Fig. 1, uses a switched reversible L-match circuit, Fig. 2a, and is capable of matching impedances lower than  $50\Omega$  (using the 'LOW Z' position) or impedances greater than  $50\Omega$  ('HIGH Z'). When using an L-match circuit to match low impedances, high values of capacity are often required. The DU1500L has five high voltage doorknob capacitors that can be separately switched in, so as to increase the overall capacity of the variable capacitor when required. A heavy-duty roller inductor provides precise inductance for the L-network.

The DU1500T (Differential-T network), Fig. 3, is a T-network tuner but instead of using two separate capacitors, it uses one differential capacitor and a roller inductor, Fig. 2b. As the differential capacitor is adjusted, one section increases in capacity while the other section of the capacitor decreases. The advantage of this configuration is that there are only two controls to adjust – the variable (differential) capacitor and the roller inductor.

The DU1500T (Switched coil T-network), Fig. 4, variant uses a conventional T-match, Fig. 2c, with two independent variable capacitors. However, it doesn't use a roller inductor but instead has a nine-position switched coil (two





Fig. 3: Lamco DU1500T Differential T-Match Tuner



Fig. 4: Lamco DU1500T (switched coil) T-Match Tuner.

separate coils in fact) with the individual amateur bands marked. This is very easy to use, since it is only necessary to switch to the required band and then adjust both capacitors for minimum VSWR. However, for maximum efficiency with a T-network, the output capacitor should always be adjusted for highest capacity, consistent with lowest VSWR. The top and bottom ends of the 160m and 80m bands are covered by separate switched positions marked 1.8MHz and 2MHz as well as 3.5MHz and 4MHz. It is always advisable to use the position with the least inductance to obtain a match because this will give better efficiency. Although there is no switch position for the 5MHz band, I had no difficulty using the ATU on 5MHz by simply switching to the 7MHz position.

### An Economical Alternative

My review did not include the 'base' model, DU800T, which is rated at 800W. However, I feel it is worth mentioning this model for those that require a basic ATU with none of the additions offered by the DU1500 series. This is a standard two-capacitor T-match with switched coil, the switch positions being marked in amateur bands. The capacitors in this unit are rated at 2.5kV. The DU800T doesn't include any antenna switching, VSWR/power meter, or internal balun for balanced feed. However, it would be easy to make up a simple balun if balanced feed were required with this unit. The DU800T costs £100 less than the DU1500 series of ATUs.

### What is Important in a High Power ATU

If high impedance loads are presented to an ATU, then the capacitors must be able to withstand the high RF voltages likely to be produced. The magnitude of these voltages will depend not only on the magnitude of the impedance but also on the power applied. This situation might occur with an end fed wire that is a half-wave (or multiple half waves long) or near to this. This is why it is not a



Fig. 5: Internal View of the DU1500L.

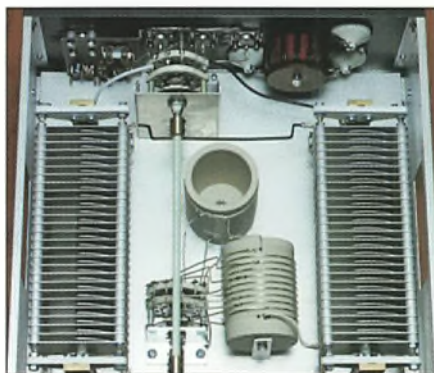


Fig. 6: Internal view of the DU1500T.

good idea to feed an end fed wire that is a half-wave (or multiple of half waves) in length. A length should be chosen such that exact half waves (high impedance and hence high RF voltages) are avoided if possible. The same thought should be given when feeding balanced line – the length of the balanced line should be such as to avoid high impedances. However, with multiband doublets this is not always possible on some bands and the ATU will almost certainly need the capability to handle high RF voltages in these circumstances.

A very short end-fed wire is likely to have a low resistive impedance but offer a very high reactive impedance. If the wire is less than a quarter wavelength long, the reactance will be capacitive. Although the resistive impedance (especially at LF) may be 10Ω or less, the high reactance (which might be many hundreds of ohms) will produce a high reactive RF voltage. It

is therefore essential for the vanes in the variable capacitors to have wide spacing. All of the DU1500 series of ATUs have variable capacitors rated at 4.5kV.

It's not just the capacitors that we have to be concerned with in a high power ATU. The wire thickness and the spacing of the turns on the coil should be such that there is no arcing between turns if high voltages are encountered. When trying to match very low impedances, large currents can flow in the coil and if the wire is not of sufficient diameter (and hence very low resistance), then the coil can start to heat up. This will result in loss and take the form of heat dissipation in the coil.

Two of the DU1500 series ATUs use roller inductors. From inspection, these appear to be well made and certainly of heavy-duty construction. All the connections, including the roller inductor mechanism, appear very robust. The DU1500T T-match (with switched coil) uses a pair of coils that are switched. The connections to each coil are well made and the coils themselves are space-wound on large robust ceramic formers.

Any switches in a high power ATU must be capable of carrying high RF current and withstanding high RF voltages. All the DU1500 range have in-built antenna selection and bypass facilities. I was very impressed to see that all these switches were of a high quality construction and used ceramic wafers. The DU1500T (switched coil) also had an additional high quality ceramic switch that was used to select the correct tapping point on each of the two coils. The photos, Figs. 5 and 6, show the internal construction of the two basic types (with and without roller inductor), while Fig. 7 shows the rear panel connections of the DU1500L.

### Matching Range

Some of the early commercial ATUs manufactured to complement a particular line of equipment were only meant to 'flatten' out the VSWR when antennas were





Fig. 7: Rear panel view of the DU1500L. The layout is representative of all three tuners.

**Table 1: Impedance Measurements presented to DU1500 ATUs at shack end of double-sized G5RV via 25m coax connected to matching stub.**

| Frequency (kHz) | Impedance ( $R \pm jX$ ) ohms |
|-----------------|-------------------------------|
| 1850            | 100.1 - j30.1                 |
| 1900            | 34.4 - j33.6                  |
| 1950            | 16.6 - j12.2                  |
| 3650            | 17.8 + j13.9                  |
| 5300            | 17.7 + j69.4                  |
| 7100            | 21.8 - j17.4                  |
| 10100           | 54.3 + j33.2                  |
| 14150           | 107.2 + j89                   |
| 18100           | 36.8 + j6.8                   |
| 21200           | 23.8 - j24.5                  |
| 24900           | 19.9 - j4.4                   |
| 28500           | 45.6 + j59.2                  |

Impedance presented when double sized G5RV is fed directly to ATU via 30m of 300Ω ladder line via 1:1 DX Engineering current mode choke balun.

| Frequency kHz | Impedance ( $R \pm jX$ ) ohms |
|---------------|-------------------------------|
| 1850          | 89.2 + j278.6                 |
| 1900          | 157.2 + j402.1                |
| 1950          | 311.3 + j669.3                |
| 3650          | 101.6 - j438.3                |
| 5300          | 12.5 - j48.5                  |
| 7100          | 60.5 - j60.5                  |
| 10100         | 93.9 - j227.7                 |
| 14100         | 41.4 - j135.5                 |
| 18100         | 27.6 - j90.6                  |
| 21200         | 8.4 - j34                     |
| 24900         | 44.1 - j25.9                  |
| 28500         | 7.1 + j3.5                    |

operated off resonance. I used to own one such ATU and it did an excellent job. However, due to its circuit configuration it did not have a wide matching range, so it wasn't always possible to provide a match to all antennas on all bands.

In some reviews, the ATUs are tested with a series of resistive loads from maybe 10Ω up to a couple of hundred or more ohms. However, in the real world, our ATU has to deal with loads that are both resistive and reactive.

For my test of matching range I used my 63m (204ft) double-sized G5RV. The matching stub is fed with about 25m of RG213/UR67 coax via a 5kW DX Engineering 1:1 ratio current mode choke balun. I took a series of impedance readings (at the shack end) for each band between 160m and 10m using a RigExpert AA54 antenna analyser running the Antscope software on my laptop. A table of the various impedances can be seen in **Table 1**. These are written in Cartesian form ( $R \pm jX$ ).  $R$  is the resistive component of the impedance while  $-jX$  indicates a capacitive reactance and  $+jX$  indicates an inductive reactance.

All three models reviewed matched all these impedances to a 1:1 VSWR as indicated on not only the in built VSWR/power meter but also on a Hansen FS500H peak reading power/VSWR meter, as well as on the main station transceiver's own VSWR indicator.

Both models that use a roller inductor should of course be able to handle virtually any impedance on any frequency between 1.8MHz and 30MHz inclusive. However, the DU1500T (switched coil) ATU did not have any markings for the 60m (5MHz) band on its switch position

so I was interested to see how it would tune 5MHz. I was pleased to see that by using the 7MHz position, it had no trouble finding a 1:1 match on the double-sized G5RV at 5MHz.

Rob G3RCE also tried the DU1500 differential T-match with roller inductor and the DU1500 T-match with switched coil, on his 28m (90ft) doublet fed with a random length of 300Ω ladder line. He found that both ATUs would match this antenna on any band between 160m and 10m including 60m. The only problem he found was that using the switched-coil T-match on 17m, the VSWR would not go right down to 1:1. After a bit of experimenting, he discovered that by using the 24MHz switch position, the ATU was able to tune the antenna to a 1:1 match at 18MHz.

It might be worth noting that when using the DU1500T (switched coil) ATU, selection of an alternative band position might provide a better match. However, the general 'rule of thumb' with any T-match circuit is to always use the minimum amount of inductance that will provide a match.

### Matching Balanced Feed

All three DU1500s have an in built 4:1 voltage balun. As the photographs show, these use very robust cores.

However, it is generally accepted that if feeding balanced line into a single ended ATU, it is better to use a 1:1 ratio current mode choke balun. I don't want to go into the full technical reasons for this because they are outside the remit of this review. There is plenty of information on the correct use of baluns on W8JI's website (below) for those who want to read up on the subject. [www.w8ji.com](http://www.w8ji.com)

If the impedance seen by the ATU is very low, then by feeding it into a 4:1 voltage balun, the overall impedance will be made even lower. This can result in higher circulating currents and hence more loss within the ATU. My own tests have shown that when using a 4:1 voltage balun, proper impedance transformation only occurs when the load seen is purely resistive. My own experimentation did show that there was a general lowering of the overall impedance but certainly not in the way expected by the ratio of the voltage balun.

Despite my own reservations I decided to investigate the way that the internal 4:1 voltage balun would handle a balanced line. I extended the 300Ω balanced feed from the matching stub on the double-sized G5RV so that it fed directly into the ATU's balanced terminals.

I used an RF ammeter to check current magnitude in each leg of the feeder when using the internal 4:1 voltage balun. I then did the same using my DX Engineering 1:1 current mode choke balun to provide the balance-to-unbalance conversion and fed the output from the 1:1 current mode choke balun into the single-ended coaxial input on the ATU.



## Specifications

### DU1500T Differential T-Match.

#### Front Panel Indicators and Controls

One differential 330pF + 330pF differential capacitor, 4.5kV.  
Power Range Switch: Two position – 200W/2kW; on 1.8MHz for SWR worse than 1:3 MAX 800W!!

#### Other

Output impedance: 25-600Ω and longwire up to 2000Ω  
Weight: 4.5kg

### DU1500T Switched Coil T-Match

#### Front Panel Indicators and Controls

Input Tuning: Continuous rotation 4.5kV capacitor 330pF  
Antenna Tuning: Continuous rotation 4.5kV capacitor 330pF  
Power Range Switch: Two position – 200W/2kW; on 1.8MHz for VSWR worse than 1:3 MAX 800W!!

#### Other

Output impedance: 25-600Ω balanced; longwire up to 2000Ω  
Weight: 4.5kg

### DU1500L L-Match

#### Front Panel Indicators and Controls

Tuning: Continuous rotation 4.5kV capacitor 330pF + 5 HV doorknob capacitors selected as required.  
Power Range Switch: Two position – 200W/2kW

#### Other

Output impedance: 25-600Ω balanced; longwire up to 3000Ω  
Weight: 5.5kg

## Common to All Three Models

#### Front Panel Indicators and Controls

Cross needle Power and VSWR meter.  
Antenna Switch Selector: Five position ceramic switch – COAX 1 Tuned, COAX 2 Tuned and BYPASS, COAX 1 DIRECT, COAX 2 DIRECT

#### Rear Panel Connectors

Coax 1: SO-239 Teflon connector  
Coax 2: SO-239 Teflon connector  
Balanced Line: Dual high voltage ceramic terminal  
Include 4:1 balun

#### Other

Frequency Coverage: 1.8-30MHz, continuously tuneable  
Power Maximum: 1500W, max 2kW  
Input impedance: 50Ω  
Dimensions: 120 x 330 x 330mm

I found that both current magnitude and balance were the same using either the external 1:1 current mode choke balun or the internal 4:1 voltage balun. The results may have been different had I presented it with some very low impedances but my practical test didn't show any observable difference under the conditions I used for the test. The only difference when using the two baluns was that the ATU settings were different, since the internal 4:1 voltage balun was obviously lowering the impedance. My earlier experiments showed that the reactance could change from inductive to capacitive (or vice versa) when using a 4:1 voltage balun that was looking into a reactive load.

A more elegant solution to feeding balanced line would be to terminate it in a 1:1 current mode choke balun mounted just outside the shack and bring a short length of high quality coaxial cable (no less than RG213/UR67 and preferably higher quality) into the shack. Mismatched line loss on the coax should be minimal at HF provided the coax is very short; say no more than 3 to 5m. The coax can then be connected straight to the coaxial input of the ATU.

When using a current mode choke balun, it's important that its common mode impedance is sufficient, at all the frequencies of interest, to prevent common mode currents from flowing.

## Which Model?

When any reviewer is reviewing more than one product, and each of those products does basically the same job, it becomes very difficult not to be subjective. However, I will try my best to be as objective as possible in my discussion of the three ATUs. All are priced the same, which in some ways keeps a more level playing field.

## DU1500L

As far as I know, the DU1500L is the only commercially manufactured high power ATU to use a reversible L-network. This is probably the simplest and most efficient network but not necessarily the easiest and quickest one to set up. However, once settings are noted then it is easy to return to those settings.

The only other high power ATU that I know of that used such a network was the US manufactured Ten Tec 238. These ATUs command a high price if and when they come on the second-hand market.

When testing the DU1500L on 160m, which resulted in it 'seeing' a low

impedance, it became apparent that it was slightly more efficient than the other two. Some detailed on air tests with a local amateur, **Howard G3YZY** (who used a spectrum scope to accurately monitor signal levels), showed the DU1500L to offer a 2dB advantage. This same figure was quoted in an internet article when comparing the L-match and T-match in terms of very low impedance matching at LF.

By coincidence, Howard also has a Lamco DU1500L and used it very successfully to match a loop antenna that offered a very low impedance on topband. He actually fitted a larger doorknob capacitor so that its matching range was extended down to around 5Ω.

The DU1500L is a very efficient ATU, especially when dealing with low impedances at LF. The downside is that it is more challenging to adjust. However, it does have the advantage of offering a wider bandwidth than the other T-match configurations. This means that quite often very little adjustment of the controls is required when changing frequency within bands. I found that switching across 160 and 80 to 40m did not require a large number of turns variation on the roller inductor. It's important to set it up correctly and record the settings since in addition to the roller inductor and variable capacitor settings, there is also a choice of five fixed capacitor settings on the 'Low Z to High Z' or 'High Z to Low Z' positions!

## DU1500T Differential-T Match

The main advantage with the differential T-match configuration is that there is only one capacitor to adjust in addition to the roller inductor. This means that there is only one position where the VSWR will go to a minimum, when the differential capacitor and roller inductor are set correctly.

However, when changing bands it is sometimes necessary to rotate the roller inductor a number of times, depending on how far apart the bands are. As with any ATU, it is always useful to keep a note of different settings for each band.

The differential-T is a commonly used circuit in a number of other commercial ATUs and like the standard two-capacitor T-match has a wide matching range.

## DU1500T Switched-Coil T-Match

The DU1500T with its switched coil is probably the quickest and easiest ATU to use since no time is taken up turning a roller inductor. You only need to turn



the bandswitch to the appropriate band and tune the two capacitors for minimum VSWR. As I mentioned earlier, it's important always to use the maximum amount of capacity on the output capacitor with a T-match circuit, if it is to give highest efficiency.

To my knowledge, there are not many switched-coil T-match high power ATUs on the market at present. Nearly all I have come across use a roller inductor in combination with the two variable capacitors.

As a general purpose, easy to use ATU, this configuration has a lot of merit. If you are not so keen on turning a roller inductor, then this would definitely be the one to consider.

### Manual

A short manual made up of pages in a folder, is included with each ATU. It includes pictures of the front and back panels, detailing clearly the function of each control and terminal on the back panel. It also explains how to set up the tuner for best results.

### Summary

The build quality of the LAMCO DU1500s is excellent, as are the components used in them. This was evident when I first removed the top covers of each unit. All three ATUs matched whatever impedances were presented to them. All three ATUs handled high power when used with my Acom 1000 amplifier.

Despite my reservations about the use of the internal 4:1 voltage balun for balanced feed, in practice it worked well, although I do feel an external 1:1 current mode choke balun may be better when matching very low impedances.

The vernier markings on the variable capacitors are very clear and precise and allow for easy recording. However, I feel the inclusion of slow-motion drives may have been a useful extra. The advantage to not having slow-motion drives is, of course, that the capacitors can be more quickly set to the required values.

The power meter appeared accurate given that it agreed with both my Hansen FS500H and the internal power readings on the station transceiver. This is not a

scientific test but I have no reason to believe that the readings shown are not representative.

It would have been nice to have a peak reading facility on the power meter, but this would add to the cost of the unit. Maybe this might be offered as an option in future.

The LAMCO DU1500 range of ATUs offer good value for money when compared to other high power ATUs presently on the market.

### Acknowledgements

I would like to thank G3RCE and G3YZY for their help in the testing of these ATUs. I decided to buy the review DU1500L and G3RCE bought the DU1500T switched coil model. G3YZY already owns a DU1500L!

I would also like to thank Lee M0LAM at Lam Communications for the loan of the three models. All models are presently priced at £549.95 (inc. VAT) from Lam Communications, 5 Doncaster Road, Barnsley, South Yorkshire.

[www.hamradio-shop.co.uk](http://www.hamradio-shop.co.uk)





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# The QYT KT8900D 144/432MHz FM Mobile Transceiver

Tim Kirby G4VXE takes a look at a very cost-effective dual-band mobile with the benefit of an optional Bluetooth microphone unit.



**A** couple of years ago when I changed my car, I found I had much less space for a rig than I'd had before and domestic management 'discouraged' the drilling of holes in my new car! For a few weeks, I used a simple handheld and hands-free kit in the car. During the course of one of our 'morning-commute' conversations, Baz GB8DOR suggested I look at one of the Chinese QYT mobiles, which were starting to appear on eBay. Not only were they excellent value but they were suitably small and would easily fit in the space in the car's centre console. Ever since, I have used one and have been very pleased with the rig's performance. I've been meaning to review it for *PW* for ages!

However, a few weeks ago, Martin Stokes of Mirfield Electronics contacted Don G3XTT and asked if we would like to review the latest model of the rig, the KT8900D. Naturally, the answer was yes, please.

Features and specifications of many of the Chinese rigs are often quite hard to come by, but a quick spin around the internet resulted in finding details of the feature set, side sidebar.

Martin also kindly supplied the Bluetooth enabled microphone/speaker unit, which I'll cover separately to the main rig.

## First Impressions

Unboxing the rig, the first impression is of a good quality, solid unit. It is quite pleasing to the eye and, all-important to me at least, it easily fitted in the car. Martin had very kindly programmed some of my local repeaters and the main simplex channels into the rig to get me started. Despite this,

I found it was hard to tell which channel had what repeater in it because the labels for the memory channels seemed to be the same. I was pretty sure that this was just a matter of adjusting some settings so decided to explore the programming software.

Although Martin had supplied a CD of software with the rig, he did say that he had never used it and had always used the programming software and drivers downloaded from [miklor.com](http://miklor.com)

A difficult half-hour ensued trying to get the software talking to the rig, on a variety of Windows operating systems, as well as using the excellent CHIRP software: <http://chirp.danplanet.com/projects/chirp/wiki/Home>

For some reason, I just kept getting a message saying that the rig was not responding, despite the correct communication port being selected and visible in Device Manager in Windows. I was on the point of giving up, when I tried connecting 'one more time' and it all sprang into life and has continued to work flawlessly ever since! I am hesitant to blame the rig or software because working in IT, I am fully aware of how quirky software can be in conjunction with the environment/operating system, so don't take this as a negative comment. Just be prepared that you might have some fun and games connecting to the rig from your computer.

Once it was working, I found the CHIRP software to be the easiest way of programming the rig and tweaking settings. I was able to set up some different repeaters and simplex channels, as well as some marine band channels to listen to (channel 16, 156.800MHz, for example). I was also able to turn off beeps from the rig, programme a welcome message and so on. If you are so minded, you can also change the colour of the display screen. All very flexible.

## Installation and Use

With all this done, it was time to put the rig in the car and see how it worked. This was very simple. The rig fitted in the centre console and the supplied power lead runs from the cigar lighter socket. I connected up my dual band mobile antenna.

You can see from the pictures of the rig that four frequencies can be displayed and indeed, there is a 'quad watch' feature, meaning that you can monitor four frequencies for activity. Initially I wondered what I'd do with four different VFOs, but of course, it didn't take much imagination to come up with a scheme. The first VFO, I set up in memory mode to scan the various channels that I had set up. VFOs 2 and 3 were set up on 145.500MHz and 433.500MHz respectively so with a quick touch of the VFO change button on the microphone, I could move to a simplex frequency (you can easily move up and down channels using the microphone buttons) and finally VFO 4 was on any other frequency that I decided to monitor, be it the International Space Station, Marine band or whatever.

On my first journey with the rig in the car, I was delighted to hear Dom 2E0WHQ put a call through GB3WH. I responded to him and was pleased to get a good report, both in terms of RF as well as audio quality. It was useful to know that there was plenty of audio from the rig. I am quite often accused of having low audio on FM despite, as far as I am concerned, bellowing at the rig! With the KT8900D this was not the case and, in fact, I had to remember to back off from the microphone somewhat. Other stations joined our QSO, Ken G0PPM, who knows me well and confirmed it sounded like me, as well as Steve GW8SPX, travelling down the M4. It all seemed to be working well.

I found the rig's display nice and easy to read at a glance, even in some strong





The regular microphone.



The Bluetooth microphone.

Rear view of the KT8900D.



sunlight. There's no S-meter as such but there's a bargraph displayed at the bottom of the screen that indicates relative signal strength of the station being received. I can't say I used it much, preferring to give reports, where needed, by ear.

Over the next two to three weeks, I had the rig in the car and used it routinely for many contacts. It worked very well. In towns and built up areas (and around buses) I felt the rig picked up a fair amount of noise. Doubtless the filtering is not as good as some of the established brand mobile rigs at three or four times the price. It runs 25W on 144MHz and 20W on 432MHz, which I found covered most eventualities. It's also easy to turn the power down, if you need to. Using the standard microphone, I became quite adept at starting and stopping the rig scanning, switching VFOs and moving up and down the band as well as punching in a frequency. The rig worked well, though, and it was a pleasure to have in the car.

During our summer holiday in south-west Wales, I used the rig to scan the marine band and found the receiver very good there, hearing a wide variety of stations from Cornwall to Ireland to North Wales.

If you are in the market for a low-cost, good value mobile, then you should definitely consider the KT8900D. If you spend much of your time in urban or noisy environments, you may find that the filtering isn't quite good enough and may have to wind the squelch setting up a bit to avoid being overwhelmed by noise but this is nothing new with low cost rigs and you will know what works for you.

I thoroughly enjoyed using the KT8900D and will consider upgrading my existing rig to this latest model, primarily because of the improved display and quad VFO features, making it much easier to move to simplex frequencies when needed.

### Bluetooth Speaker/Microphone

Setting up the Bluetooth speaker/microphone to work with the KT8900D couldn't have been easier. Simply charge up the speaker/microphone using the supplied USB charger or one that you have already. You need to make sure that Menu 51 on the rig is set to CARRI (mine was by default). Disconnect the standard microphone, insert the Bluetooth receiver stub into the rig's microphone socket and turn on the microphone. Bluetooth pairing was painless and the speaker/microphone reported when this was successfully completed.

Audio reports were good on transmitted audio, although I found the received audio a little more tinny than on the rig itself but more than acceptable.

If you are operating in the car, you will probably want to use the standard microphone because this allows a wide variety of operating features not all of which are available from the Bluetooth microphone. However, if you need to operate away from the car, then Bluetooth will allow you to do this readily. I found I could easily be 20 to 30 feet away from the car and use the speaker/microphone successfully. I can see this could be useful

in RAYNET type situations, allowing the operator much greater mobility without being tied to their operating position. In a more leisurely setting, you can use your mobile installation while relaxing in the garden or even in the house. It's a useful addition to the KT8900D, though, and one that may appeal to many.

Finally, my thanks to Martin Stokes of Mirfield Electronics for his kind loan of the rig and microphone and for his excellent communication and speedy response to my questions. Prices are £89.95 for the radio and £39.95 for the Bluetooth microphone. The two are available together for £119.95

[www.mirfield-electronics.co.uk](http://www.mirfield-electronics.co.uk)

### KT8900D Features

Frequency Range: 136-174MHz (RX & TX), 400-480MHz (RX & TX).  
RX Only: 220-260MHz.  
RX Only: 350-390MHz.  
Output Power: VHF 25W, UHF 20W.  
5Tone/2Tone/DTMF/CTCSS/DCS.  
Dual Band, Quad-Standby.  
Dual Display.  
Cooling Fan.  
25W Output Power (VHF).  
External speaker/PTT.  
Mini Size Portable.  
PC Program.  
FM Radio.  
Channel Capacity: 200.  
Channel Spacing: 25kHz/20kHz/12.5kHz.  
Frequency Stability: 2.5ppm.  
Operating Temperature: -20 to +60°C  
Operating Voltage: 13.8V DC  $\pm$  15%.  
Dimension: 98 x 43 x 126mm.  
Weight (Without Accessories): 448g.  
Colour: Black.

## MIRFIELD ELECTRONICS

### QYT KT-8900D Mobile Radio

- 2/70 FM Base/mobile 13.8v
- 25/20w Hi, 10w Lo power, ideal for novice license
- 200 memory channels
- CTCSS, DCS, etc
- PC or program via DTMF microphone
- Programming lead and software included
- Bluetooth operation from BT89 add-on
- £89.95 each or with Bluetooth unit £109.95



6 Moorland View  
Otley Road, Bingley,  
West Yorkshire BD16 3AY

Tel: 07825 549430  
Web: [www.mirfield-electronics.co.uk](http://www.mirfield-electronics.co.uk)  
Email: [martin.stokes@hotmail.com](mailto:martin.stokes@hotmail.com)

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## “NEW” Moonraker HT-5000 DMR Dual Band Transceiver

Dual Band DMR has arrived with twice the fun with the MOONRAKER HT-5000 Dual Band DMR Digital & Analogue hand held Radio!

The HT-5000 takes the experience of DMR to a new level with features designed for the amateur radio user. The MOONRAKER HT-5000 Operates in analogue and digital modes 400-480MHz frequencies on UHF and 136-174MHz VHF at up to 5 watts of power. It uses Time-Division Multiple-Access (TDMA) digital technology to double the number of users on a single 12.5kHz channel.

The Audio on DMR is excellent in both transmit and receive ensuring dependable communications. The HT-5000 boasts 3000 channels, 10000 contacts, built-in CTCSS/DCS (analogue mode only), single call, group call and all call, remote kill/shut/activate, transmit interrupt, VOX, and lone worker function. It is compatible with MOTOTRBO™ Tier I and II.

Amazing value £199.99!

## Moonraker MT-270M Dual Band Mobile Transceiver ... £79.95

A lovely small compact Dual Band Transceiver but still with a 25W punch at a remarkable price – see our reviews on our website from some of the 1 thousand sold !!!

MOONRAKER

## LEXION

### VV-898S Dual Band Mobile Transceiver

New VV-898 “S” version now with 25W as standard – comes complete with keypad microphone, radio bracket all in a compact size with an amazing compact price of just £69.95!



### “NEW” Lexion VV-898SP Portable Dual Band Transceiver

Introducing the Lexion VV-898SP, the mobile backpack transceiver you can take virtually anywhere you need it! Lexion combined their micro-compact, 25 watt Dual Band UHF/VHF Mobile Radio with a powerful 12A Li-Ion rechargeable battery and put it all in a sturdy chassis you can fit in your pack or emergency bag for use anytime, anywhere! All for an amazing £149.95!



## BAOFENG 寶鋒

Authorised dealer

### Handheld

|                                                  |        |
|--------------------------------------------------|--------|
| GT-3 136-174/400-480MHz transceiver.....         | £44.95 |
| GT-5 (right) 136-174/400-520MHz transceiver..... | £39.95 |
| UV-5RC 136-174/400-480MHz transceiver.....       | £29.95 |
| BF-888S 400-470MHz transceiver.....              | £14.95 |



### Accessories

|                         |       |
|-------------------------|-------|
| Speaker microphone..... | £9.95 |
| Software cable.....     | £9.95 |

bhi

### Noise cancelling products

|                                                        |         |
|--------------------------------------------------------|---------|
| bhi NES10-2 Noise eliminating speaker.....             | £99.95  |
| bhi DSPKR Amplified DSP noise cancelling speaker.....  | £129.95 |
| bhi Desktop speaker.....                               | £179.95 |
| bhi Dual in-line noise cancelling unit.....            | £179.95 |
| bhi NEIM1031 MKII noise eliminating inline module..... | £149.95 |
| bhi Radlomat compact keyboard for FT-817/857/897.....  | £89.95  |



## RM Amplifiers

The BLA 600 is a wideband compact linear amplifier for the HF bands and 6m, from 1.8 to 54 MHz Using Freescale MRF6V6P5600. Output 500W. Dual MCU Control. Fast PIN Diode RX-TX TX-RX switching enables QSK operation. 2x16 LCD Display for Amplifier Status. Separate LED displays for power and antenna VSWR, input drive from 1W to maximum of 40W, 3 user configurable Antenna Output connectors. Dual large diameter MCU controlled, multispeed cooling fans for efficient cooling..... £1999.95

BLA350 1.8-30MHz 300W mains powered solid state amplifier..... £659.95

HLA305V 1.8-30MHz 250W professional amplifier with LCD..... £599.95

HLA300V+ 1.8-30MHz 300W all mode amplifier with fans..... £429.95

HLA150V+ 1.8-30MHz 150W all mode amplifier with fans..... £349.95

LA250V 140-150MHz 200W professional amplifier with LCD..... £499.95

ULA100 420-440MHz 100W compact linear for 70cms..... £399.95



LDG ELECTRONICS

### Tuners

LDG Z-817 1.8-54MHz ideal for the Yaesu FT-817..... £129.95

LDG Z-100 Plus 1.8-54MHz the most popular LDG tuner..... £169.95

LDG IT-100 1.8-54MHz ideal for IC-7000..... £179.95

LDG Z-11 Pro 1.8-54MHz great portable tuner..... £179.95

LDG KT-100 1.8-54MHz ideal for most Kenwood radios..... £209.95

LDG AT-100 Pro II 1.8-54MHz..... £244.95

LDG AT-200 Pro II 1.8-54MHz..... £259.95

LDG AT-1000 Pro II 1.8-54MHz continuously..... £519.95

LDG AT-600 Pro II 1.8-54MHz with up to 600W SSB..... £394.95

LDG YF-1200 1.8-54MHz 100W for FT-450D, FT-DX1200 & FT-DX3000..... £244.95

LDG YF-100 ideal for your Yaesu FT-8570..... £199.95

LDG AL-100 1.8-54MHz 100W designed for the Alinco range of transceiver..... £139.95



## MFJ

### Antenna Tuners

See our website for full details.

Automatic Tuners

|                                                             |         |
|-------------------------------------------------------------|---------|
| MFJ-925 Super compact 1.8-30MHz 200W.....                   | £199.95 |
| MFJ-926B remote Mobile ATU 1.6-30MHz 200W.....              | £319.95 |
| MFJ-927 Compact with Power Injector 1.8-30MHz 200W.....     | £309.95 |
| MFJ-928 Compact with Power Injector 1.8-30MHz 200W.....     | £249.95 |
| MFJ-929 Compact with Random Wire Option 1.8-30MHz 200W..... | £259.95 |
| MFJ-991B 1.8-30MHz 150W SSB/100W CW ATU.....                | £279.95 |
| MFJ-993B 1.8-30MHz 300W SSB/150W CW ATU.....                | £309.95 |
| MFJ-994B 1.8-30MHz 600W SSB/300W CW ATU.....                | £409.95 |
| MFJ-998 1.8-30MHz 1.5kW.....                                | £729.95 |

### Manual Tuners

|                                                                         |         |
|-------------------------------------------------------------------------|---------|
| MFJ-1601B 1.8-30MHz 20W random wire tuner.....                          | £79.95  |
| MFJ-902B 3.5-30MHz 150W mini travel tuner.....                          | £134.95 |
| MFJ-902H 3.5-30MHz 150W mini travel tuner with 4:1 balun.....           | £149.95 |
| MFJ-904 3.5-30MHz 150W mini travel tuner with SWR/PWR.....              | £149.95 |
| MFJ-904H 3.5-30MHz 150W mini travel tuner with SWR/PWR 4:1 balun.....   | £184.95 |
| MFJ-901B 1.8-30MHz 200W Versa tuner.....                                | £119.95 |
| MFJ-871 1.8-30MHz 300W portable tuner.....                              | £139.95 |
| MFJ-945E 1.8-54MHz 300W tuner with meter.....                           | £149.95 |
| MFJ-941E 1.8-54MHz 300W Versa tuner.....                                | £184.95 |
| MFJ-948 1.8-30MHz 300W deluxe Versa tuner.....                          | £174.95 |
| MFJ-949E 1.8-30MHz 300W deluxe Versa tuner with DL.....                 | £189.95 |
| MFJ-934 1.8-30MHz 300W tuner complete with artificial GND.....          | £229.95 |
| MFJ-974B 3.6-54MHz 300W tuner with X-needle SWR/WATT.....               | £229.95 |
| MFJ-969 1.8-54MHz 300W all band tuner.....                              | £249.95 |
| MFJ-962D 1.8-30MHz 1500W high power tuner.....                          | £339.95 |
| MFJ-986 1.8-30MHz 300W high power differential tuner.....               | £399.95 |
| 1.8-30MHz 1500W high power roller tuner.....                            | £439.95 |
| MFJ-976 1.8-30MHz 1500W balanced line tuner with X-Needle SWR/WATT..... | £589.95 |

### Analysers

MFJ-259C 530 KHz to 230MHz..... £299.95

World's most popular SWR analyser is super easy-to-use. It gives you a complete picture of your antenna's performance. You can read your antenna's SWR and Complex Impedance 530 KHz to 230 MHz continuously with no gaps.



### Power Supplies

PS305WH 30A peak switching power supply provides 13.8 VDC at 20 Amps continuous, 30 Amps surge. The output voltage is adjustable from 9 to 15 VDC. Red and black terminals on are the rear panel (30A)..... £79.95 £69.95

PS305WV switching power supply provides 13.8 VDC at 20 Amps continuous, 30 Amps surge. The LCD digital panel meter simultaneously displays voltage and current. There is a Noise Off-Set control that can be adjusted to eliminate pulse noise from the power supply..... £79.95 £69.95

PS30SWH 25A continuous switch mode PSU with variable output voltage and cigar socket also includes noise offset function..... £99.95 £89.95

QJ1830SB 30 AMP Linear PSU, no noise issues with the great old school power supply unit, nice digital display and heavy as you like, so you feel like you bought something and on offer this month..... £129.95 £119.95

QJE QJPS30H 30 AMP Switch Mode Power Supply Unit Includes noise offset control to eliminate the pulse noise of the switching circuit. This patent pending function is specially designed for communication equipment use. Its effectiveness may vary depending on the frequency and mode..... £79.95 £69.95

QJE QJPS50H 50 AMP Switch Mode Power Supply Unit Same as above but in a 50amp version..... £129.95 £119.95



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- 4 Pack your equipment securely and wait for the door bell
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## MOONRAKER

### Yagi Antennas

All Yagis have high quality gamma match fittings with stainless steel fixings! (excluding YG4-2C)

|                                                                |         |
|----------------------------------------------------------------|---------|
| YG27-35 Dual band 3/5 element 3.5/12.5 dBd gain with one feed! | £79.95  |
| YG4-2C 2 metre 4 Element (Boom 48") (Gain 7dBd)                | £29.95  |
| YG5-2 2 metre 5 Element (Boom 63") (Gain 10dBd)                | £69.95  |
| YG8-2 2 metre 8 Element (Boom 125") (Gain 12dBd)               | £99.95  |
| YG3-4 4 metre 3 Element (Boom 45") (Gain 8dBd)                 | £79.95  |
| YG5-4 4 metre 5 Element (Boom 104") (Gain 10dBd)               | £99.95  |
| YG3-6 6 metre 3 Element (Boom 72") (Gain 7.5dBd)               | £99.95  |
| YG5-6 6 metre 5 Element (Boom 142") (Gain 9.5dBd)              | £119.95 |

### ZL Special Yagi Antennas

The ZL special gives you a massive gain for the smallest boom length ... no wonder they are our best selling Yagis!

|                                               |        |
|-----------------------------------------------|--------|
| ZL5-2 2 Metre 5 Ele, Boom 95cm, Gain 9.5dBd   | £69.95 |
| ZL7-2 2 Metre 7 Ele, Boom 150cm, Gain 11.5dBd | £79.95 |
| ZL7-7 70cm 7 Ele, Boom 70cm, Gain 11.5dBd     | £49.95 |
| ZL12-7 70cm 12 Ele, Boom 120cm, Gain 14dBd    | £59.95 |

### HB9CV

Brilliant 2 element beams ... ideal for portable use

|                          |        |
|--------------------------|--------|
| HB9-70 70cm (Boom 12")   | £24.95 |
| HB9-2 2 metre (Boom 20") | £29.95 |
| HB9-4 4 metre (Boom 23") | £39.95 |
| HB9-6 6 metre (Boom 33") | £49.95 |

### Halo Loops

Our most popular compact antennas, great base, mobile, portable, or wherever!

|                                          |        |
|------------------------------------------|--------|
| HLP-2 2 metre (size approx 300mm square) | £24.95 |
| HLP-4 4 metre (size approx 600mm square) | £39.95 |
| HLP-6 6 metre (size approx 800mm square) | £44.95 |

## MOONRAKER

### QRP Antennas

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

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

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

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

## MOONRAKER

### Base Antennas

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

|                                                                             |         |
|-----------------------------------------------------------------------------|---------|
| GP2500 All Band 80-6M Vertical TX 80-6M RX 2-90MHz, Power 250W Length 7.13m | £199.95 |
| GPA-80 budget version of GP2500 80-6M Length 6.0M                           | £99.95  |

## MOONRAKER

### Portable HF Kits

Great dual band kits for portable use, two compact dipoles on an upto 14ft mast just requires coax

|                          |         |
|--------------------------|---------|
| PK1217 HF Kit for 12/17M | £149.95 |
| PK1520 HF Kit for 15/20M | £149.95 |
| PK3060 HF Kit for 30/60M | £154.95 |
| PK4080 HF Kit for 40/80M | £159.95 |

(please note each kit requires two feeds)

### Mobile Antenna Mounts

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

## MOONRAKER

### Multiband Mobile

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

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

## MOONRAKER

### VHF/UHF Mobiles

|                                                                                                    |        |
|----------------------------------------------------------------------------------------------------|--------|
| GF151 Glass Mount 2/70cm, Gain 2.9/4.3dBd, Length 78cm complete with 4m cable and PL259            | £29.95 |
| MAM-100 MICRO MAG 2/70cm, Gain 0.5/3.0dBd, Length 55cm, 1" magnetic base with 4m coax and BNC      | £19.95 |
| MR700 2/70cm, Gain 0/3.0dBd, Length 58cm, 3/8 fitting                                              | £9.95  |
| MR777 2/70cm, Gain 2.8/4.8dBd, Length 150cm, 3/8 fitting                                           | £19.95 |
| MRQ525 2/70cm, Gain 0.5/3.2dBd, Length 43cm, PL259 fitting (high quality)                          | £19.95 |
| MRQ500 2/70cm, Gain 3.2/5.5dBd, Length 95cm, PL259 fitting (high quality)                          | £26.95 |
| MRQ750 2/70cm, Gain 5.5/8.0dBd, Length 150cm, PL259 fitting (high quality)                         | £36.95 |
| MRQ800 6/2/70cm Gain 3.0dBd/5.0/7.5dBd, Length 150cm, PL259 fitting (high quality)                 | £39.95 |
| MRQ273 2/70/23cm Gain 3.5/5.5/7.5dBd, Length 85cm, PL259 fitting (high quality)                    | £49.95 |
| MRQ900 10/6/2/70cm Gain 10m (2.15dB) 6m(2.5dB) 2m (2.8dB) 70cm (5.5dB) Length: 125cm PL259 fitting | £49.95 |

## MOONRAKER

### Coax Switches

|                                                 |        |
|-------------------------------------------------|--------|
| CS201 2 Way Switch 3 X SO239, 2500W 1-1000MHz   | £19.95 |
| CS201N 2 Way Switch 3 X N-Type, 2500W 1-1000MHz | £24.95 |

### Lightening Arrestors

|                                                        |        |
|--------------------------------------------------------|--------|
| ST-1 SO239 to PL259 adapter with earth wire connection | £4.95  |
| CDX-1 Lightning Arrestor 2 X SO239 sockets 400W        | £19.99 |

### Dummy Loads

|                                            |        |
|--------------------------------------------|--------|
| DL-15 PL259 DC-800MHz 15W CW 20W 50 Ohms   | £24.95 |
| DL-15N N-Type DC-800MHz 15W CW 20W 50 Ohms | £29.95 |

### SWR Meters

|                                           |        |
|-------------------------------------------|--------|
| SWR-100 Frequency 26-30MHz 100W 50 Ohms   | £16.95 |
| SWR-270 Frequency 120-500MHz 100W 50 Ohms | £29.95 |

### Ferrites

|                                                      |       |
|------------------------------------------------------|-------|
| High quality ferrites to suit all the popular cables |       |
| FCS-S to suit 6mm cable such as RG58                 | £1.95 |
| FCS-M to suit 7mm cable such as MN18                 | £2.95 |
| FCS-L to suit 9mm cable such as RG213                | £3.95 |

## MOONRAKER

### GRP Fibreglass Base Antennas

Diamond quality - Moonraker pricing! These high gain antennas have been pre-tuned for your convenience, easy to use, easy to install, and a choice of connection ... look no further

|                                                                                |                              |
|--------------------------------------------------------------------------------|------------------------------|
| SQB8M100P 2/70cm 3.0dBd, 0.0dBd, RX 25-2000MHz, Length 100cm SO239             | £49.95 special offer £39.95  |
| SQB8M200P 2/70cm, Gain 4.5/7.5dBd, RX 25-2000MHz, Length 155cm, SO239          | £54.95 special offer £44.95  |
| SQB8M500P 2/70cm, Gain 6.8/9.2dBd, RX 25-2000MHz, Length 250cm, SO239          | £74.95 special offer £69.95  |
| SQB8M800N 2/70cm, Gain 8.5/12.5dBd, RX 25-2000MHz, Length 520cm, N-Type        | £199.95 special offer £99.95 |
| SQB8M1000P 6/2/70cm, Gain 3.0/6.2/8.4dBd, RX 25-2000MHz, Length 250cm, SO239   | £84.95                       |
| SQB8M223N 2/70/23cm, Gain 4.5/7.5/12.5dBd, RX 25-2000MHz, Length 155cm, N-Type | £79.95                       |
| SQB8M4010P Quadband 10/4/2/70cm Gain 2.5/3.2/3.6/5.5dBd Length 120cm           | £69.95                       |
| SQB8M6010P Quadband 10/6/2/70cm Gain 2.5/3.0/3.6/5.5dBd Length 120cm           | £69.95                       |
| SQB8M4060P Quadband 6/4/2/70 Gain: 2.5/3.0/3.6/5.5 Sdbi Length 120cm           | £69.95                       |

## MOONRAKER

### HF Wire Antennas

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

|                                                            |        |
|------------------------------------------------------------|--------|
| MDHF-80 3.5MHz balun matched mono dipole, length 40m       | £59.95 |
| MDHF-40 7.0MHz balun matched mono dipole, length 20m       | £44.95 |
| MDHF-20 14MHz balun matched mono dipole, length 10m        | £39.95 |
| OSHF-80 3.5-30MHz balun matched off set dipole, length 40m | £59.95 |
| OSHF-40 7.0-30MHz balun matched off set dipole, length 22m | £44.95 |
| OSHF-20 14-30MHz balun matched off set dipole, length 11m  | £39.95 |
| LWHF-160 1.6-50MHz unun match end fed antenna, length 42m  | £49.95 |
| LWHF-80 3.5-50MHz unun match end fed antenna, length 20m   | £44.95 |
| LWHF-40 7.0-50MHz unun match end fed antenna, length 10m   | £39.95 |

## MOONRAKER

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

### HF Mobiles

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

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

## MOONRAKER

### Baluns & Ununs

High quality TX, RX baluns, and Ununs all fully potted and weather protected with SO239 socket

|                                               |        |
|-----------------------------------------------|--------|
| MB-1 1-30MHz 1:1 Current Balun 400W 50 Ohms   | £29.95 |
| MB-4 1-30MHz 4:1 Current Balun 400W 50 Ohms   | £29.95 |
| MB-6 1-30MHz 6:1 Current Balun 400W 50 Ohms   | £29.95 |
| MB-1X 1-30MHz 1:1 Current Balun 1000W 50 Ohms | £39.95 |
| MB-4X 1-30MHz 4:1 Current Balun 1000W 50 Ohms | £39.95 |
| MB-6X 1-30MHz 6:1 Current Balun 1000W 50 Ohms | £39.95 |
| MU-9 1-50MHz 9:1 Unun 500W 50 Ohms            | £29.95 |
| LNB-1 0-40MHz Receive only 50 Ohms            | £24.95 |

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### Cable

|                                                                        |         |
|------------------------------------------------------------------------|---------|
| RG58 Standard, 5mm, 50 ohm, per metre                                  | £0.35   |
| RG58-DRUM-50 Standard, 5mm, 50 ohm, 50m reel                           | £14.95  |
| RG58-DRUM-100 Standard, 5mm, 50 ohm, 100m reel                         | £24.95  |
| RG58M Mil spec, 5mm, 50 ohm, per metre (best seller)                   | £0.60   |
| RG58M-DRUM-50 new 50m reel of mil spec RG58 in a great handy size only | £24.95  |
| RG58M-DRUM-100 Mil spec, 5mm, 50 ohm, 100m reel                        | £44.95  |
| RGMIN18 Mil spec, 7mm, 50 ohm, per metre (amateur favourite)           | £0.75   |
| RGMIN18-DRUM-50 mil spec, 7mm, 50 ohm, 50m reel                        | £34.95  |
| RGMIN18-DRUM-100 mil spec, 7mm, 50 ohm, 100m reel                      | £64.95  |
| RG213 Vii spec, 9mm, 50 ohm, per metre                                 | £1.30   |
| RG213-DRUM-50 Mil spec, 9mm, 50 ohm, 50m reel                          | £58.95  |
| RG213-DRUM-100 Mil spec, 9mm, 50 ohm, 100m reel                        | £109.95 |
| 300-20M Ladder Ribbon, best USA quality, 300 ohm, 20m pack             | £17.95  |
| 300-DRUM Ladder Ribbon, best USA quality, 300 ohm, 100m reel           | £68.95  |
| 450-20M Ladder Ribbon, best USA quality, 450 ohm, 20m pack             | £19.95  |
| 450-DRUM Ladder Ribbon, best USA quality, 450 ohm, 100m reel           | £79.95  |

### Antenna Wire

|                                                                      |        |
|----------------------------------------------------------------------|--------|
| Perfect for making your own antennas, traps, long wire aeriels etc.  |        |
| SEW-50 Multi stranded PVC covered wire, 1.2mm                        | £19.95 |
| SGW-50 Enamelled copper wire, 1.5mm                                  | £24.95 |
| HGW-50 Hard Drawn bare copper wire, 1.5mm                            | £29.95 |
| CCS-50 Genuine Copperweld copper clad steel, 1.6mm                   | £29.95 |
| FW-50 Original Flexweave bare copper wire, 2mm                       | £34.95 |
| FWPVC-50 Original clear PVC covered copper wire, 4mm                 | £44.95 |
| FW-100 Original high quality flexweave antenna wire, 100m reel       | £59.95 |
| FWPVC-100 Original PVC coated flexweave antenna wire, 4mm, 100m reel | £79.95 |

### Rigging Accessories

|                                                                               |        |
|-------------------------------------------------------------------------------|--------|
| Get rigged up, for full list of all options visit our website!                |        |
| PULLEY-2 Adjustable pulley for wire antennas, suits all types of rope         | £24.95 |
| GUYKIT-HD10 Complete HD adjustable guying kit for up to 40ft masts            | £54.95 |
| GUYKIT-P10 Complete LV/portable guying kit to suit up to 40ft masts           | £39.95 |
| SPIDER-3 Fixed 3 point mast collar for guy ropes                              | £5.95  |
| SPIDER-4 Fixed 4 point mast collar for guy ropes                              | £6.95  |
| PTP-20 Pole to pole clamp to clamp up to 2" to 2"                             | £5.95  |
| DPC-W Wire dipole centre to suit either 300 or 450ohm ladder line             | £5.95  |
| DPC-S Wire dipole centre with SO239 to suit cable feed connections            | £6.95  |
| DPC-A Dipole centre to suit 1/2 inch aluminium tube with terminal connections | £7.95  |
| DPC-3B Dipole centre with SO-239 3/8th sockets to make mobile dipole          | £6.95  |
| DOGBONE-S Small ribbed wire insulator                                         | £1.00  |
| DOGBONE-L Large ribbed wire insulator                                         | £1.50  |
| DOGBONE-C Small ceramic wire insulator                                        | £1.20  |
| EARTHROD-C 4ft copper earth rod and clamp                                     | £24.95 |
| EARTHROD-CP 4ft copper plated earth rod and clamp                             | £16.95 |
| GSRV-ES In-line SO239 replacement socket for 300 or 450 ohm ladder line       | £6.95  |
| AMA-10 Self amalgamating tape for connection joints, 10m length               | £7.50  |

### Portable Telescopic Masts

|                                                                                                                               |        |
|-------------------------------------------------------------------------------------------------------------------------------|--------|
| LMA-S Length 17.6ft open 4ft closed 2-1" diameter                                                                             | £79.95 |
| LMA-M Length 26ft open 5.5ft closed 2-1" diameter                                                                             | £89.95 |
| LMA-L Length 33ft open 7.2ft closed 2-1" diameter                                                                             | £99.95 |
| CARPLATE-HDT brilliant drive on plate with tilt - ideal to be used in conjunction with the portable telescopic masts and only | £44.95 |
| CARPLATE-HD without tilt                                                                                                      | £24.95 |

### 20ft Swaged Mast Sets

|                                                                                                                                                                 |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| These heavy duty masts sets have lovely push fit swaged sections to give a strong mast set. Ideal for portable or permanent installations also available singly |        |
| MSP-125 4 section 1.25inch OD mast set                                                                                                                          | £39.95 |
| MSP-150 4 section 1.50inch OD mast set                                                                                                                          | £44.95 |
| MSP-175 4 section 1.75inch OD mast set                                                                                                                          | £49.95 |
| MSP-200 4 section 2.00inch OD mast set                                                                                                                          | £59.95 |
| MSP-200 heavy duty 2.65mm 2.00 inch OD mast set                                                                                                                 | £79.95 |

### Telescopic Masts

|                                                                                                  |         |
|--------------------------------------------------------------------------------------------------|---------|
| TMF-1 Fibreglass mast * 4 sections 160cm each * 50mm to 30mm * Approx 20ft erect 8ft collapsed   | £179.95 |
| TMF-1.5 Fibreglass mast * 5 sections 200cm each * 60mm to 30mm * Approx 30ft erect 8ft collapsed | £249.95 |
| TMF-2 Fibreglass mast * 5 sections 240cm each * 60mm to 30mm * Approx 40ft erect 8ft collapsed   | £299.95 |
| TMF-3 Fibreglass mast * 6 sections 240cm each * 65-23mm * Approx 50ft erect 8ft collapsed        | £349.95 |

### Patch Leads

|                                                      |        |
|------------------------------------------------------|--------|
| PL58-0.5 1/2mm Standard RG58 PL259 to PL259 lead     | £3.50  |
| PL58-10 10m Standard RG58 PL259 to PL259 lead        | £8.95  |
| PL58-30 30m Standard RG58 PL259 to PL259 lead        | £16.95 |
| PL58M-0.5 1/2mm Mil Spec RG58 PL259 to PL259 lead    | £4.50  |
| PL58M-10 10m Mil Spec RG58 PL259 to PL259 lead       | £12.95 |
| PL58M-30 30m Mil Spec RG58 PL259 to PL259 lead       | £27.95 |
| PL213-10 10m Mil Spec RG213 PL259 to PL259 lead      | £18.95 |
| PL213-30 30m Mil Spec RG213 PL259 to PL259 lead      | £39.95 |
| PL103-10 10m Mil Spec Westex 103 PL259 to PL259 lead | £29.95 |
| PL103-30 30m Mil Spec Westex 103 PL259 to PL259 lead | £69.95 |

### PAM Kit

A great portable freestanding tripod which can be extended to 4m. Perfect for field days at a perfect price. Just £59.95 complete

### Mounting Hardware & Clamps

|                                                                                               |         |
|-----------------------------------------------------------------------------------------------|---------|
| We have all the mounting brackets you could possibly want - for all options see our website   |         |
| TRIPOD-HDA Free standing, heavy duty, fold away tripod, which adjusts from 50-65mm            | £149.95 |
| TRIPOD-25L Free standing heavy duty tripod to suit masts 65mm or less                         | £79.95  |
| TRIPOD-20L Free standing heavy duty tripod to suit masts 2 inch or less                       | £74.95  |
| TRIPOD-15L Free standing heavy duty tripod to suit masts 1.5 inch or less                     | £69.95  |
| TK-24 Heavy duty galvanneal pair of T & K brackets, 24 inches total length                    | £29.95  |
| TK-18 Heavy duty galvanneal pair of T & K brackets, 18 inches total length                    | £24.95  |
| TK-12 Heavy duty galvanneal pair of T & K brackets, 12 inches total length                    | £19.95  |
| SD-9 Heavy duty galvanneal single stand off bracket, 9 inches total length                    | £8.95   |
| SD-6 Heavy duty galvanneal single stand off bracket, 6 inches total length                    | £6.95   |
| CHIM-D Heavy duty galvanneal chimney lashing kit with all fittings, suitable for up to 2 inch | £24.95  |
| CAR-PLATE Drive or bracket with vertical up stand to suit 1.5 or 2" mounting pole             | £24.95  |
| CROSS-2 Heavy duty cross over plate to suit 1.5 to 2" vertical to horizontal pole             | £14.95  |
| JOIN-200 Heavy duty 8 nut joining sleeve to connect 2 X 2" poles together                     | £19.95  |
| PTM-S Pole mounting bracket with SO239 for mobile whips, suits upto 2" pole                   | £19.95  |

### Connectors

|                                                             |        |
|-------------------------------------------------------------|--------|
| PL259-6mm Standard plug for RG58                            | £0.99p |
| PL259-9mm Standard plug for RG213                           | £0.99p |
| PL259-7mm Standard plug for Mini8                           | £0.99p |
| PL259-6C Compression type for RG58                          | £2.50  |
| PL259-9C Compression type for RG213                         | £2.50  |
| PL259-103C Compression type for Westflex 103                | £5.50  |
| NTYPE-6 Compression type plug for RG58                      | £3.95  |
| NTYPE-9 Compression type plug for RG213                     | £3.95  |
| NTYPE-103 Compression type plug for Westflex 103            | £6.00  |
| BNC-6 Compression type for RG58                             | £1.50  |
| BNC-9 Compression type for RG213                            | £3.50  |
| SD239-N Adapter to convert PL259 to N-Type male             | £3.95  |
| NTYPE-PL Adapter to convert N-Type to PL259                 | £3.95  |
| BNC-PL Adapter to convert BNC to PL259                      | £2.00  |
| BNC-N Adapter to convert BNC to N-Type male                 | £3.95  |
| BNC-SMA Adapter to convert modern SMA radio to suit BNC     | £3.95  |
| SD239-SMA Adapter to convert modern SMA radio to suit SD239 | £3.95  |
| PL259-3B Adapter to convert SD239 fitting to 38th thread    | £3.95  |

## Direct from the USA Direct to you from stock

### Alpha Antenna

|                                                      |         |
|------------------------------------------------------|---------|
| Alpha Antenna 10-80M Loop Tripod & Bag               | £399.95 |
| Alpha Antenna 10-40M Loop Tripod & Bag               | £299.95 |
| Alpha Antenna 6-80M Multiband Tuner Free HF Antenna  | £399.95 |
| Alpha Antenna 10-80M Promaster Base Antenna          | £329.95 |
| Alpha Antenna 10-80M Military 2.0 Tuner Free Antenna | £369.95 |

### Tarheel Antennas

**BABY TARHEEL II** When properly installed on your vehicle this antenna will provide continuous coverage from 7.0 to 54 MHz with the supplied whip. The Baby Tarheel antenna like all of our motorized antenna models are built to meet the highest standards but in a smaller size

**LITTLE TARHEEL II** The Little Tarheel II antenna like all Tarheel motorized antenna models are built to meet the highest standards but in a more user friendly size. This antenna comes with the sensors already pre-installed so if you decide to add one of the auto controllers (SDC-100 Simple Controller, SDC-102 Programmable Controller, Turbo Tuner, Antenna BOSS and BOSS II) now or later everything is ready

£449.95

### Chameleon Antenna

|                                                                                                                                                                                                                              |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| <b>Loops</b>                                                                                                                                                                                                                 |         |
| CHA P-LOOP This antenna was designed with portability, ease of use, simplicity, ruggedness and high performance in mind. 40-10M                                                                                              | £349.95 |
| CHA F-LOOP This antenna was designed with weight, durability, portability, versatility and cost in mind. The antenna is built to last. The unit covers everything between 10M to 60M (or 29.700MHz to 5.300MHz) continuously | £489.95 |
| CHA F-LOOP PLUS as above but with heavy duty aluminium loop                                                                                                                                                                  | £649.95 |

### Base Antenna

|                                                                                                                                                                                                                  |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| <b>CHA ECOMM II</b> This antenna has been specially designed for backup emergency HF system or permanent installation 6-160M 500W SS8 60lt                                                                       | £139.95 |
| <b>CHA SKYLOOP</b> This antenna is a 250' (14 gauge) full wave loop antenna cut for 80M. With the help of an antenna tuner the antenna will cover all the bands between 80M and 6M included and capable of 1000W | £149.95 |

### Portable Antenna

|                                                                                                                                                                                                                      |         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| <b>CHA TD</b> The CHA TD (Tactical Dipole) is a HF broadband antenna specially designed for portable HF communication where rapid deployment and simplicity of operation is essential. 10-80M 300W                   | £399.95 |
| <b>CHA HYBRID MICRO</b> This antenna is a lightweight highly portable broadband antenna system designed to offer maximum portability and performance. The antenna weights approx. 1lb. 6-160M 100W                   | £229.99 |
| <b>CHA HYBRID</b> The CHA HYBRID Base is designed to enhance the capabilities of the common HF radio application by allowing faster tuning operation across the HF bands including MARS/CAP frequencies. 6-160M 800W | £199.95 |

**CHA TD LITE** This antenna is a HF broadband antenna specially designed for portable HF communication where rapid deployment and simplicity of operation is essential but compactness is primordial. 6-160M 500W

### Mobile Antenna

|                                                                                                                                                                                                                                                               |         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| <b>CHA V2L</b> The CHA V2L is a rugged multiband HF antenna designed for smaller vehicle. The antenna must be used in conjunction with either the CHA HYBRID or the CHA CAUM to perform adequately. 10-80M with CHA HYBRID or CHA CAUM (6/2/70cm stand alone) | £169.95 |
| <b>CHA MIL</b> This whip is a broadband monopole antenna designed for portable or manpack radios requiring compact but rugged antenna systems. 6M-160M with CHA HYBRID, 6M-10M stand alone 1500W                                                              | £129.85 |

### Accessories

|                                                                                                   |        |
|---------------------------------------------------------------------------------------------------|--------|
| <b>CAP-HAT</b> This capacity hats increase the bandwidth of your antenna making it more efficient | £89.95 |
| <b>RFI Choke 1-300MHz</b>                                                                         | £34.95 |
| <b>JAW</b> mount great versatile mount to make dipole out of two mobiles                          | £44.95 |
| <b>SPRING</b> Heavy duty stainless steel 3/8th spring                                             | £29.95 |

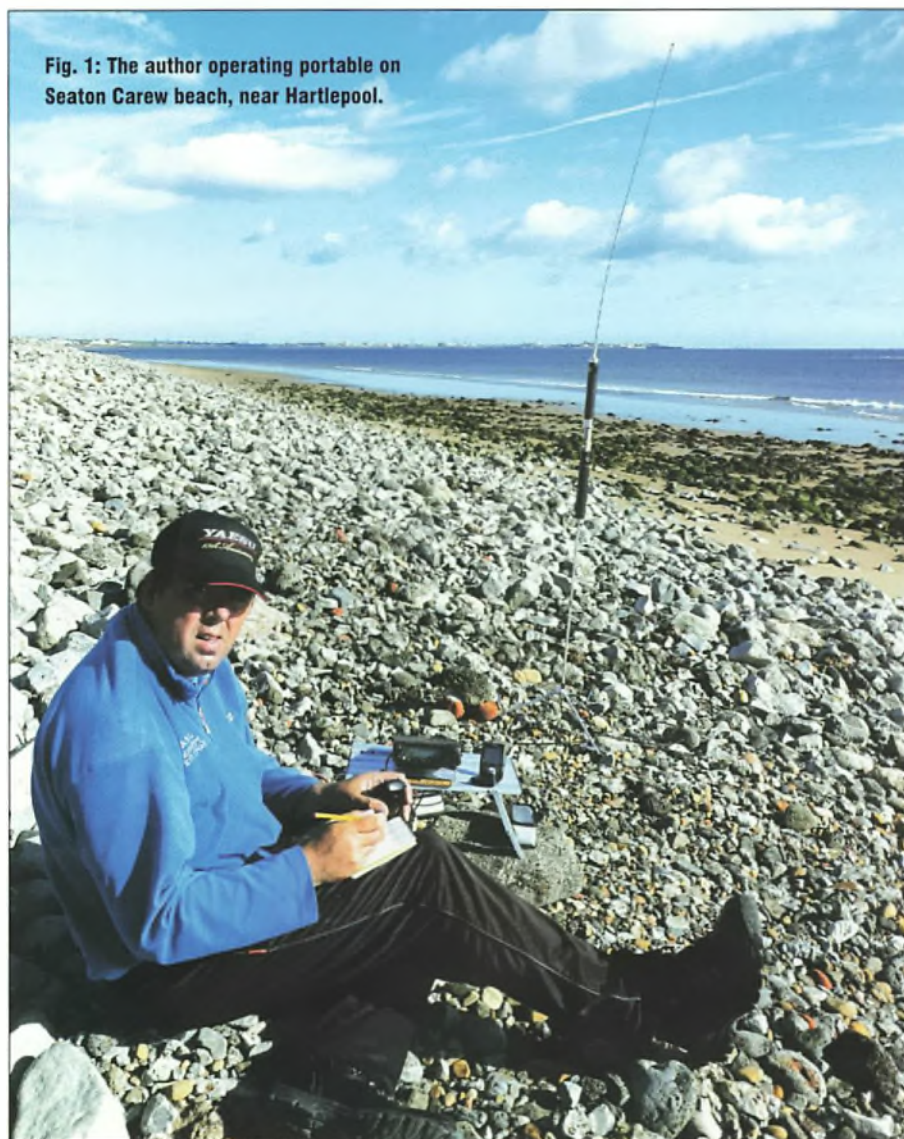




# The Super Antenna MP1DXMAX

**PW reader and indefatigable portable operator Carl Gorse 2E0HPI shares his hands-on experience of using the Super Antenna MP1DXMAX.**

**Fig. 1: The author operating portable on Seaton Carew beach, near Hartlepool.**



I've been using one of the Super Antenna products for quite some time for my various portable activities – the original MP1. During a recent exchange of e-mails with the manufacturers (in the US), they told me that a new version was now available and would shortly be coming to the UK (to be stocked by Martin Lynch & Sons). Would I like the opportunity to be the first to use one and to review it? The answer, of course, was “yes”.

My portable operating is largely on the HF bands for World Wide Flora and Fauna (WWFF), Summits on the Air (SOTA) and similar activities, mainly using the 40m band for working around the UK and the higher bands for making contacts around Europe. I've tried various antennas and there's no single solution. Sometimes I use a resonant dipole, suspended from a fibreglass mast, but I then need several dipoles to cover the various bands. Also, it's not always possible to string out a dipole, depending on the operating location.

My answer to setting up quickly for portable operations, with the ability to change bands easily, was that original MP1 antenna, which I bought in 2013. It suited my operating pattern and despite its compact size, it gave me plenty of contacts around Europe and farther afield, especially when I was operating from a location close to the sea (as I often do because I am fortunate enough to live in a coastal town in the north-east, Fig. 1).

## The MP1DXMAX

The sidebar details the specification of the antenna and what the MP1DXMAX package contains. There are several changes from the earlier Chapstick package, making the antenna more robust and easier to install. More robust in that there is now a titanium whip, which is more flexible than the earlier telescopic whip (I managed to break mine on more than one occasion while struggling to get the antenna up in awkward locations!). Easier to install in that the package now includes a handy tripod and a ruler for setting the antenna to the correct band rather than having to laboriously count turns. There are also





**Fig. 2: The 60m and 80m coils.**



**Fig. 3: The full set of MP1DXMAX goodies with Go Bag.**

several sets of radials, hopefully improving performance in that you can choose the radial set(s) for whichever band(s) you are about to operate on. The MC60 coil, **Fig. 2**, gives you access to the 60m band while the MC2 coil adds capability for the 2m (144MHz) band. You can buy the basic antenna and add to it later but the MP1DXMAX, reviewed here, contains everything you need to operate 80 through 2m, **Fig. 3**.

The quality of the materials is high, as you would hope for portable operation, the radials, for example, being constructed from Teflon coated wire. The coil now has a new shield too, to improve its weather protection.

## In Use

Setting up the antenna in the field is straightforward and takes around 10 to 15 minutes maximum. There is a video on the Martin Lynch website showing how it's done. Set up the tripod, **Fig. 4**, and mount (or there are clamps for attaching the antenna mount to an alternative surface such as tabletop) and connect the two extension rods and coupling nut. The main part of the antenna is the MP1C sliding coil with either the telescopic whip or the new titanium Super Whip. The FG1 SWR Ruler, **Fig. 5**, is used to adjust the coil for the band you plan to operate on.

In terms of performance, as I said earlier, I have used many portable antennas in the past and the Super Antenna has always been my number one choice for operating WWFF or SOTA or on the local beaches, where fishing poles or larger antennas cannot be erected. In general, it won't beat a resonant dipole but it's not far behind and has the advantage of easy portability and can be set up within minutes to get you on the air.

While I realise that a list of contacts can be fairly meaningless, I have been pleased when running QRP with the Elecraft KX2 or, more recently, the Yaesu FT-891, to work Australia (VK4 and VK6) as well as into the USA and all around Europe, mostly on SSB although I occasionally use the data modes. As an example, just this

morning (as I write this), I managed some 39 contacts around Europe in just under two hours while operating on the 17, 20 and 40m bands.

6m operation is achieved by removing the telescopic or Super Whip and adjusting the coil tap. I have yet to try this out but plan to do so later in the year.

On 2m FM, I have worked over a distance of 120 miles from The Cheviot (highest point in the Cheviot Hills). I sense that the new arrangement with the MC2 coil works significantly better on 2m than previously.

In practice, I have double-laminated the 'SWR Ruler' to give it additional weather protection. It can be a bit fiddly to find the best match on 80m (being such a wide band) but there is really no need to carry an analyser or SWR meter with you when out portable and most rigs will, in any case, tune out any residual VSWR provided it is 3:1 or less. I would also advise always winding the radials back on to a wire winder (I use the excellent ones from SOTAbeams) when you close down, or they can easily become tangled.

## Conclusions

While the Super Antenna MP1DXMAX may not suit all portable operators, it certainly ticks the boxes for me. It is well made with high quality materials and offers quick setup with access to all HF bands as well as 2m, with ready-tuned radials, **Fig. 6**.

I have been running a Super Antenna User Group on Facebook for a while now and welcome *PW* readers who want to join and enjoy the mutual support of other users.

Finally, my thanks to **Bonnie KQ6XA**, Chief Technical Officer at Super Antenna, for answering my questions and providing excellent support over the years. The MP1DXMAX is available from Martin Lynch and Sons for £399.95 or £499.95 with the TM4 tripod. There is an 'entry level' package, the SuperWHIP MP1DXTR2, at £229.95 but without, for example, the 60m coil and some of the other accessories.

## Specification

The Ultra compact Antenna Go Bag setup with all bands from 80m to 6m plus VHF (2m) with the MC2 Coil

Size total antenna extended length 7ft (2.13m)

Antenna Collapsed 12in (0.3m)

Power Rating 500W SSB & 300W CW/ Data

Connector SO259 (PL259 Compatible 50Ω)

Go Bag Size 13x9x3.5in (330x230x90mm)

Frequency Bands 80-60-40-30-20-17-

15-12-10-6m (80 & 60 with optional coils MC80 MC60 and 2m with MC2 adaptor)

No antenna tuner needed or analyser or external power (works straight out of the bag)

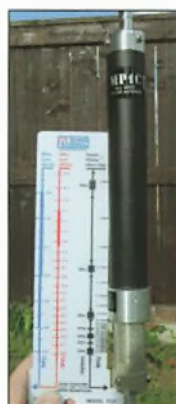
The TM1 Low Profile Tripod sets up on any flat surface. The UM2 SuperMount clamps to most surfaces, fences, ladders, tables, benches, railings, or attaches with included U-bolt to any 1.25in pipe, post or balcony railing.

## MP1DXMAX Package Contents

- MP1C Super Antenna
- MP2 SuperPlexer (VHF Adapter)
- SW1 Titanium Super Whip
- TM1 Low Profile Tripod
- UM2 Super Mount
- MC80 Coil
- MC60 Coil
- FG1 SWR Ruler
- GB1 Go Bag
- Radial Sets MR4010 MR8075 MR6060 MR642 MR2R MR2Y MR2B



**Fig. 4: The TM1 low profile tripod.**



**Fig. 5: Using the FG1 SWR Ruler to adjust the antenna resonance.**



**Fig. 6: Five sets of radial wire, to be used according to band.**



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2 metres

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with no tuner needed

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outside field use

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male thread

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two minutes by  
one person  
no tools needed

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Extends up to  
7ft (2.1m) for operation



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**SuperWhip HF-VHF**

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Antenna Go Bag Package**

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

# The HF Challenge

With the onset of autumn, HF conditions should start to pick up and Steve Telenius-Lowe PJ4DX is recommending that readers take up the challenge of seeing what they can work during September.

**W**elcome to the September HF Highlights. This is the month of the annual HF Challenge organised by CDXC (Chiltern DX Club, the UK DX Foundation). The purpose is simply to work as many DXCC entities as possible on the 15, 12, 10 and 6m bands during September. Each entity is only counted once, regardless of how many bands or modes that entity is worked on. The Challenge is open to all licensed amateurs and everyone is encouraged to submit their log, although only members of CDXC are eligible to receive the awards (trophies, silver salvers and certificates). To take part, you need to upload your log to Club Log and elect to enter the HF Challenge on the Club Log website.

[www.clublog.org](http://www.clublog.org)

I participated in the Challenge last year, ending up in fifth place after working 83 DXCC entities, and received a certificate, Fig. 1, for my efforts. The winner was Martin M0BCT, who worked an amazing 174 entities, followed by Lionel G5LP and Roger G3LDI with 151 and 146 entities respectively. Congratulations to all of them.

More than 50 amateurs from 26 countries on six continents posted their scores on the Club Log HF Challenge page in 2016. People often assume the higher HF bands are dead at this stage

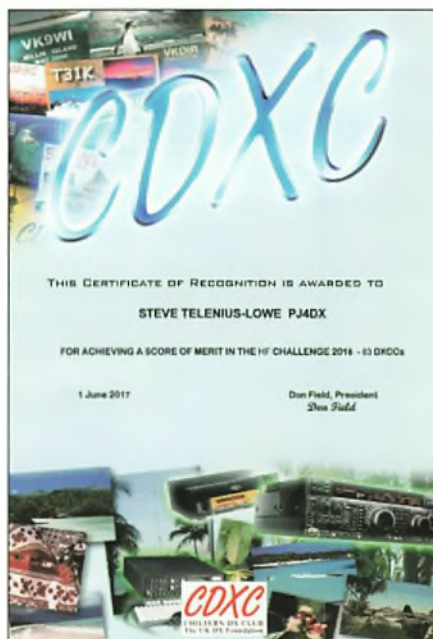


Fig. 1: Certificate awarded to your columnist for his activity in last year's CDXC HF Challenge.

of the solar cycle yet openings do still occur, as this challenge proves. It will be interesting to see how many countries can be worked on these bands in 2017 as HF conditions continue to deteriorate. Such challenges – as well as contests – are a great way to increase activity on bands that tend to be ignored when the solar cycle declines. The full rules of the CDXC HF Challenge can be found at: [www.cdxc.org.uk/HF-Challenge-Rules](http://www.cdxc.org.uk/HF-Challenge-Rules)

## Readers' News

First this month is Martin Jühe M0XJP from Knebworth, but who wrote from "100ft up the cliff in a cedarwood cabin at

Branscombe, Devon. So far for four days we have had gales and torrential rain so I haven't even been able to put my two 10m poles and SOTA dipole up and use my KX3 – just my luck after three weeks of superb weather at home! Anyway, I can tell you about my trip in May, when I operated again as EA5/M0XJP from La Romana, near Aspe, Spain. I was last here in November 2016 and although conditions were much better than at home in Knebworth, I noticed a big difference in just six months. With my small station of an Alinco DX-70TH running about 70W, MFJ ATU and G5RV at about 25ft (8m) things were not good on the bands... I did manage to have a morning contact on 20m each day with members of Stevenage & DARS and Brickfields ARS on the Isle of Wight... No Australian contacts, no 80m contacts, very little on 10, 12 and

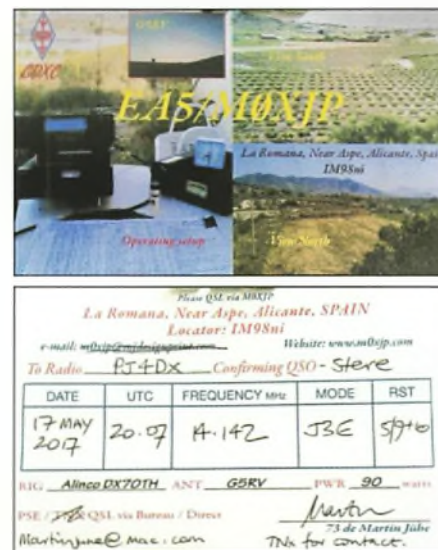


Fig. 2: Thanks to Martin Jühe for sending this QSL from his activity as EA5/M0XJP in May.

15m and not many from North and South America – but thanks for your contact, much appreciated, QSL attached", Fig. 2.

Steph Foster G4XKH, secretary of the Riviera ARC (Torquay), wrote to say that the club will be running two special events in September. GB1BOB will be active on September 15th and 16th "celebrating the hard work and sacrifices of all those who fought in or served during the Battle of Britain". The other event is GB4BCR for the Railways on the Air event on September 23rd. It publicises the Babbacombe Cliff Railway, a funicular that takes people up and down the cliffs between Oddicombe Beach and Babbacombe Downs. Steph says, "This will be running a Kenwood TS-590S and an inverted-V at approximately 15m. We aim to be working 40/20m and



other bands, dependent on conditions."

Although his e-mail was received before the August PW had been published, it was as if **Dick Allisette GU4CHY** (Guernsey) had already read the contribution from **Martin Kay G1EOJ**, who was using a Miracle Whip antenna hanging out of a bedroom window. Dick wrote, "If anyone was wondering if stealth antennas are worth bothering with, today I received a direct QSL from JA1OYD for a 17m CW QSO. He was using 50W to a 4m fishing pole with loading coil stuck out of his balcony window! I gave him 559: I try to give genuine reports outside of contests/pile-ups. I was pleased to be his first GU."

**Etienne Vrebos OS8D** (Brussels) says he is, "no more in any struggle with myself regarding the next antenna: I bought a Hexbeam in Germany and I should get it

anyone has the chance. I also operated from GFF-0333 Durham, **Fig. 3**, on the coast starting very early for three hours and worked 134 contacts with the Yaesu FT-891 and home-made dipole with only 5W." Carl has recently received the latest antenna from Super Antenna, the MP1DXMAX, reviewed elsewhere in this issue.

**Tom Morgan ZS1AFS** (Robertson, South Africa) has been operating again using his special event call sign, ZT1T. "Yesterday was a fun day at ZT1T", reports Tom. "I met up with **Stan KE5EE** about 1200UTC on 20m long path. He was 58 to 9 for almost an hour. He was talking to **David ZS8Z** [on Marion Island – Ed] and arranged to come up on 17m at 1500UTC short path. Sure enough, Stan was a good 58 on 18130kHz for some time but David was poor copy: probably darkness and

**Geoff Powell M1EDF** (Tamworth) reported, "I followed the **James Clark Ross** [GMØHCQ/MM – Ed] on numerous nights and have several eQSLs, **Fig. 4**, covering the journey from where I picked him up at Montevideo, calling at Rio, and then abeam Ascension Island for several days, then making his way to Southampton. He was re-stocking for a trip soon to northern waters, the North Pole, on research work. All CW."

**Terry Martin M0CLH** says, "Not such a large log as usual as I have been reorganising the shack to make more room for construction (latest project is an Arduino-based CW keyer) and, of course, gardening! Again, some useful Sporadic E to get HV0A on 12m. 17m seemed to be the place for plenty of JA activity" (see band reports).

**Owen Williams G0PHY** (Biggleswade) wrote: "After the excitement of E31A, S01WS and E44WE in May, it was back to rather more humdrum activity in June. There was the usual run of special event stations, including Russian stations on for the Confederation Cup football tournament, TM24H for the 24-hour Le Mans, some IOTA operations and a nice opening to Europe on 10m. The month started with a 17m contact in the late evening with HB0/SP9FIH. I subsequently had contacts with **Janusz** on 10, 12 and 20m. The IOTA contacts were both with Norwegian stations: LA1EOA/P on EU-036 and LA9RY on EU-055. The 10m opening occurred over the weekend of June 17/18th: the band was full of contesting Italians on the Saturday but on the Sunday signals from Scandinavia, Eastern Europe, Italy and Spain were audible at good strength. I had contacts with SB7S, ES1BA and S57DX... There was some intercontinental DX during the month," Owen reported. He worked LU8HH on 17m, CO8LL on 20m and 8P2K, also on 20m during the King of Spain contest. "On June 9th I was listening on 20m and heard ZL4AS on the South Island working a European station. He was 57 with me and said he was beaming long path, so there's still life in the bands", Owen concluded.

**Kevin Hewitt ZB2GI** says his June highlights were, "Operating portable with a low-power 10m radio and operating JT65 on 40m and 30m." He also worked a new country, Lebanon (OD5YA). His portable operation included activity from the top of the Rock, 412m ASL, on 10m SSB using 10W to a two-element monoband Yagi, **Fig. 5**.



**Fig. 3:** Carl 2E0HPI/P operating from WFF location GFF-0333 in Durham.

this week and install it ASAP. I'm not sure to keep the CobWebb; the Hexbeam is only 3.25m wide (CobWebb 2.70m). I'll keep you informed about the installation and results." The Hexbeam is a two-element beam on each band, whereas the CobWebb has single element dipoles bent into a square shape, so Etienne should definitely notice an improvement in signals even though the Hexbeam is not so very much larger. We will be interested to hear how you get on, Etienne.

**Carl Gorse 2E0HPI** (Hartlepool) "went to the local radio rally and purchased a Clansman RT-320 HF military radio. I have been out a few times with this purchase for £150 with headset and 2.4m whip. The Clansman is an excellent radio, a little heavy to carry but well worth getting if



**Fig. 4:** Geoff M1EDF followed GMØHCQ/MM on board the **James Clark Ross** from South America to Southampton.

latitude at that frequency? I worked the guys on the West Coast long path on 40m about 1415UTC... then I got an e-mail from **Gordon MM0AWA** who heard me in Scotland at 57... I'm only using a rotary dipole on 40m, it's the driven element of the Mosley TA-34XL at 15m. But I do have a terrific take-off on the long path to the US – and Scotland apparently!"

**Tony Usher G4HZW** (Mobberley) commented, "June was another good month for Sporadic E contacts on 10m, with many EU stations worked. Best of these was OY1OF who was on most evenings putting a big signal into Cheshire. Two hop, perhaps, to 4X6TT and also KP2XX and FG4NN on June 5th. On WSPR, VY0ERC at Eureka was being heard all over Europe using 10W and on June 4th they copied my 2W of WSPR. On the 16th and 20th the VE8AT beacon on 28200kHz was RST539 on 100W and Q5 at the 10W level. I believe it's also located at Eureka. It was encouraging to hear so many Foundation licensees enjoying these good conditions during the month."





Fig. 5: The 10m 2-element Yagi used by Kevin ZB2GI/P from the top of the Rock of Gibraltar, 412m ASL.

**Victor Brand G3JNB** (Sheffield) reports that his June DX log opened with a surprising QSO with **Henk VK2GWK**. "On 20m, a strong European was CQing without success but I just felt that there was also someone else there. Under the 'megawatts' I detected another CQ, just a smidgen LF, which turned out to be Henk. Oblivious, the European went QRT and so my 50W to the doublet produced an excellent DX QSO. Also on 20m, PY4HO plus the ever-reliable ZP6CW and 4U1ITU were worked and 30m yielded TF3JB and FY5FY in French Guiana without fuss." Victor says that conditions then changed and DX seemed to disappear. When this happens he switches to QRP and just works around Europe: a reasonable 1500-mile CW contact with UA1ORK on 30m was made using his MFJ Cub running 1.5W to a helical vertical. "It took ages to get through because **Sergey** was running a large pile-up of QRO stations but he eventually copied me at 449". However, while struggling to work special event RW8OSP in Ekaterinburg on 17m, Victor heard a strong signal using his G3JNB callsign to make the contact on his behalf. Victor commented, "I do think it was kindly meant but it was so strange to sit there and hear it go through!"

Not until the 17th did Victor find longer paths reopening. On 17m he worked XQ8CTX in Chile, YU2AX/MM sailing off St Peter and St Paul Rocks and then, on 30m, VK3CWB. "Unbelievable: Moz was belting in on my small vertical and came back first call! For me, with modest power, this is what DXing is all about." Victor

added, "And so it continued with late night QSOs on 17 and 30m with LU1YT, CU2/DL9MWG, PP5BI, TF3JB, HK1MW and J68GD. A 20m contact with YV5LAY was tricky because Francis was running his pile-up simplex but, eventually, he heard me transmitting up 0.05kHz."

Finally, some sad news. We are grateful to **Bill Mahoney G3T2M** for writing about **Brian 'Joe' Poole 7Q7BP** (also **G3MRC**, Fig. 6), who died in May at the age of 78. Trained as a Royal Navy telegraphist, Joe later worked in communications and IT for Oxfam, the World Food Programme and UNICEF. His work took him to places such as Congo, Rwanda, Burundi, Mozambique, Kosovo and East Timor, from where he operated with a series of exotic callsigns. Joe's final posting was to Malawi, a country which he and his wife liked so much they decided to retire there, building a lakeside home in 2005. Joe's CW operating skills were widely admired and he was a well-known member of FOC, the First Class CW Operators' Club.

### Band Reports

Carl 2E0HPI/P used a Clansman military radio and a Yaesu FT-891 to work the following. 40m SSB: IZ5JNO, PD0EBS, SP2WW. 20m SSB: 9A1AA, 9H1GP, LB1RH/P (SOTA LA/BU-078), MU0CHN/P, OF6FTR, OZ8CTH, RW3XZ, SA2CLU, SP1MVG, SV2HSV/P (SVFF-0066), UA6FZ, UR7ET, VE3EXY, W1OW, YO6PIB. Carl also caught some 10m summer Sporadic E openings: 9A5O, DM60BER, F4FPG, IW2MXY, R112MS, RN2F, UR5BFG.

Etienne OS8D reports, on 40m SSB:

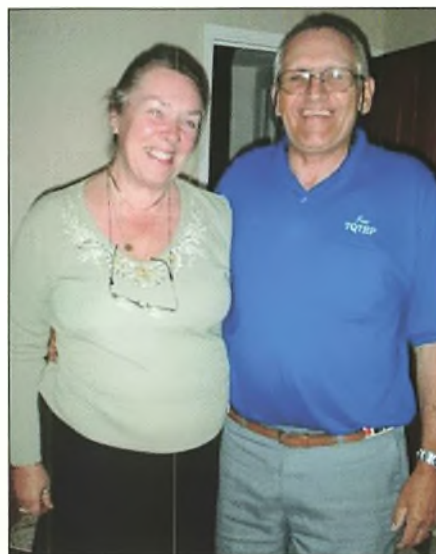


Fig. 6: Joe 7Q7BP (SK) with his wife Janet. (Photo: Bill Mahoney G3T2M).

4U1ITU, HB0/ON5UR. 20m SSB: TZ4PR. 17m SSB: E44WE. 15m SSB: TN5E. 10m SSB: 4X6TT, 7Y0A and "lots of good contacts with all Europe (even UK!)".

The log from Terry M0CLH showed a lot of activity on various data modes. 30m JT65: IK2ZEC. 20m SSB: EE5T. 20m CW: LZ121SBS. 20m JT65: K3DEJ, VE2AHS. 20m JT9: 5Q6OM, CT8/DH2IW, JR3IIR. 20m PSK63: 3Z1BLH. 17m SSB: IU4FIT. 17m RTTY: HF90GOT. 17m JT65: HS0ZIV, IS0EQP, JA1CPU, JA2JBT, JA4FDR, JH3CUL, K3XR, K4GHS, SV8NAJ, TF2MSN, W1ARY, ZS6UB. 17m JT9: JO3TAP. 15m SSB: EF0F, EF5Y. 15m JT65: TF2MSN. 12m CW: HV0A. 12m JT65: UA9CNX, YL2IV. 10m SSB: DJ9HX, EF1W, EF5T, IS0DCR. 10m JT65: 4X1QQ, 5P1KZX, EW6DM, LX1DA, SV5KKU. 10m JT9: RW9SQ.

Once again Kevin ZB2GI operated portable from the Rock of Gibraltar as well as from home. These are the best of his loggings: 40m JT65: 9H1AE, LU8EKC, PY2FUL, TA1L, ZS1BHJ. 30m JT65: SM5FQQ, VP9GE. 20m SSB: AD5ZZ, EI11WAW. 20m JT65: R2AAR. 20m JT9: JR3OEH, LA5SJA, UA3DJY, WJ2D. 17m SSB: IZ6HYR. 17m JT65: 5P1KZX, 5Q1K, JJ2LPV, K2TQC, K4DET, KF7PG, VE2ZT, WD4R, WJ0T. 12m JT65: RN3QN. 10m SSB: 5B4AJC, 9H5BZ, 9Z4BM, EI99WAW, HB0CC, OD5YA, OG5N, WP2R, YV7MAY, YY7RCV. 10m JT65: EU7FBB, LX1DA.

### Signing Off

Thank you to all the contributors. Please send any input for the column to [teliniuslowe@gmail.com](mailto:teliniuslowe@gmail.com) by the first of the month (September 1st for the November magazine, October 1st for the December issue). 73, Steve PJ4DX.





# More on Spy Server

Mike Richards G4WNC has more encouraging news on Spy Server for the Raspberry Pi.

**O**ne of the great things about working with the Raspberry Pi is the rapid pace of development.

While last month I said the Pi wasn't powerful enough to run Spy Server in reduced bandwidth mode, this month it is! The progress is the result of some updates from the AirSpy development team.

## Spy Server

For those that missed last month's *Data Modes*, Spy Server is a very neat software server that lets you share your AirSpy receiver or a DVB-T dongle over your local network or the wider internet. The server has versions for Windows, Linux (32- and 64-bit) plus 32-bit ARM, as in the Raspberry Pi, Odroid and Orange Pi systems. In addition, Spy Server can handle multiple connections. I may be wrong but I've not seen this in any other Pi SDR server. When

attempting to share SDR receivers over a network, the main problem is one of data bandwidth. If we take the humble DVB-T dongle as an example, this device has a sweet spot for performance when using a sample rate of 2.048MSPS (Mega Samples per Second). Because we must send both I and Q values, the data rate is actually

double the sample rate. However, each IQ sample comprises eight bits of data, so the data rate in Megabits per second (Mbps) is  $(2.048 \text{ sample rate} \times 2 \text{ I\&Q signals}) \times 8\text{-bits} = 32.768\text{Mbps}$  or approx. 5MB/s, Fig. 1.

1. This is well within the capabilities of a standard 100Mbps Ethernet link. However, if you want to use a Wi-Fi link on your local network or even the wider internet, you will very quickly run out of bandwidth. That's without taking into account the receiver control signals.

The AirSpy team's response to this problem was to take a fresh look at the requirements. In most cases, the only reason for starting with a high IQ bandwidth is to provide a graphical view of a wide band of signals, to aid activity monitoring. When it comes to processing and demodulating, we only need a small fraction of the available IQ bandwidth and, typically, just a few tens of kSPS (kilo Samples Per Second) is often enough. The solution selected by the AirSpy team was to take some of the processing work normally carried out by the SDR software and move it to the Spy Server. To help visualise this, you can imagine that there are now three data streams. The first is the reduced bandwidth IQ stream, second is the control data for the receiver and finally the FFT display, Fig. 2. The two new elements are the reduced bandwidth IQ stream and the FFT display so let's have a look at those in a bit more detail.

## Spy Server Decimation

Decimation is used in all SDR receivers and can be likened to the mixer used in analogue receivers. The main purpose of decimation is to reduce the sample rate and therefore the available bandwidth of a high sample rate signal. In a simple SDR system, such as a DVB-T dongle, Fig. 3, the receiver starts with an analogue tuner (Rafael R820T) that is configured for a wideband IF centred on 4.57MHz. This produces an analogue IQ output bandwidth of up to around 8MHz. That analogue signal is then digitised by the RTL-2832 chip to produce the eight-bit digital I and Q data streams, the most common sample rate being 2.048MSPS. Now, at this point you may be thinking that Nyquist says the sample rate needs to be double the highest frequency we want to digitise, so how can 2MSPS give a bandwidth close to 2MHz? That's true but because we have both I and Q signals, we can combine these digitally. With 2.048MSPS sampling, we then see 1MHz

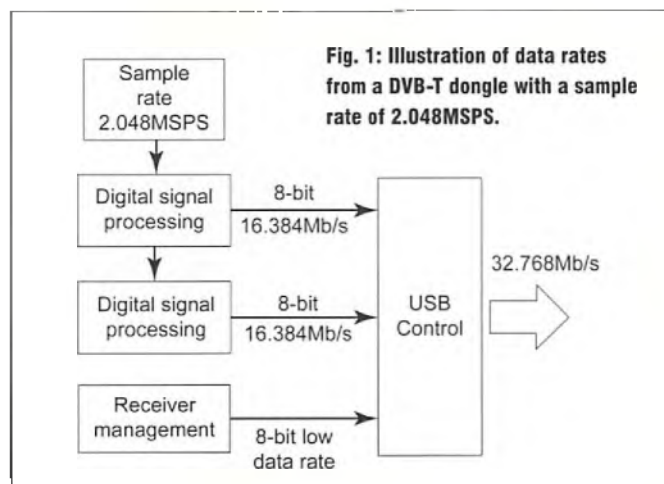


Fig. 1: Illustration of data rates from a DVB-T dongle with a sample rate of 2.048MSPS.

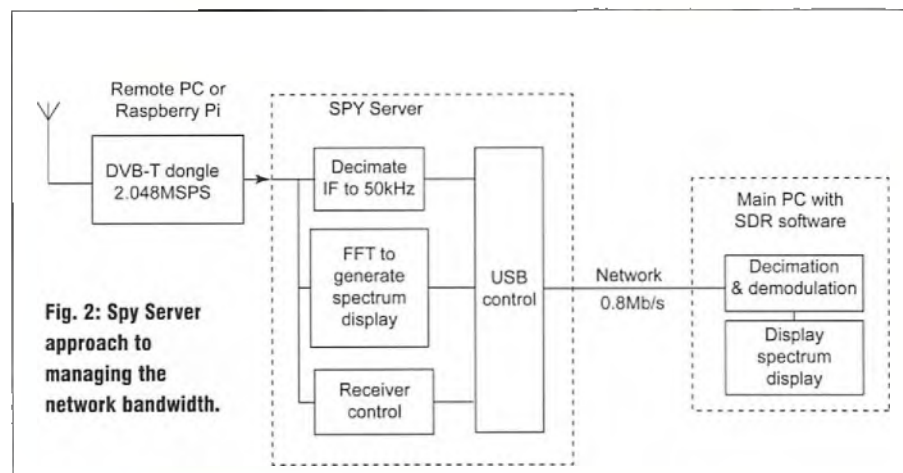


Fig. 2: Spy Server approach to managing the network bandwidth.



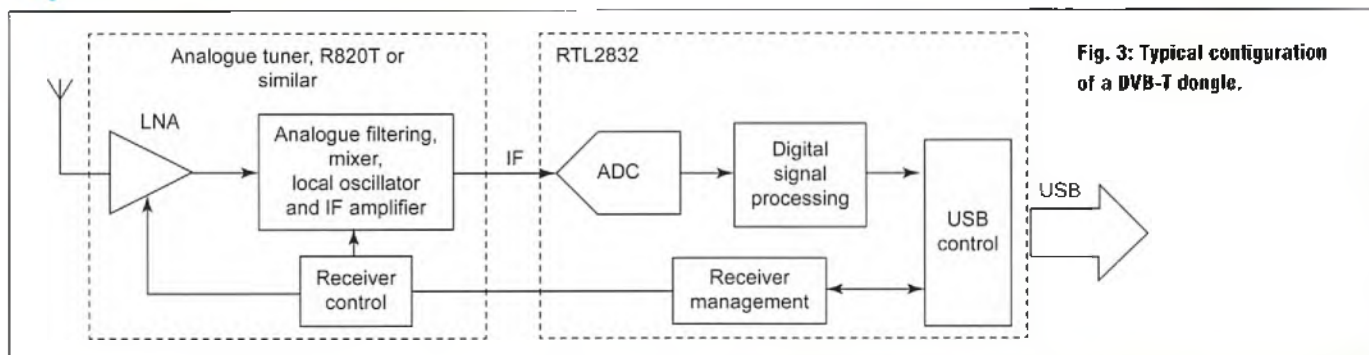


Fig. 3: Typical configuration of a DVB-T dongle.

above the IF centre frequency and 1MHz below that frequency, thus giving close to 2MHz of bandwidth with a 2.048MSPS sample rate.

Due to the requirements to filter the signal to avoid unwanted responses, the practical bandwidth available from a 2.048MSPS rate is around 1.7MHz. In the SDR receiver, that signal is processed using FFT (Fast Fourier Transforms) to produce a spectrum display of the 1.7MHz bandwidth. While we could demodulate directly from the raw digital IQ stream, that would put a high demand on the computer's processor and make multiple receivers and any other DSP (Digital Signal Processing) work difficult to achieve. The simple solution is to use decimation. To understand decimation, we need to revisit the Nyquist theorem. Don't worry, there's no maths because I'm going to keep this very simple. While the Nyquist theorem is usually quoted as the requirement to sample at twice the highest frequency of the wanted signal, the theorem also applies to sampling a specific bandwidth of a signal.

If, therefore, we wanted to sample a 50kHz bandwidth of a 100MHz signal, we would have to sample at 100kSPS or higher. The process is called down sampling and there's a snag. First, the device doing the down sampling needs to be able to deal with a 100MHz input signal but we also need to filter the signal so that only the 50kHz slot we want to digitise is presented to the sampler. If we don't do this, you would receive every 50kHz slot at the same time! This process of filtering and down sampling is known in the SDR world as decimation. If we want to demodulate a speech-band signal, we don't need to deal with the full 1.7MHz of bandwidth – a few tens of kilohertz is enough. In a practical example, we would probably want around 50kHz bandwidth to supply a selection of speech-band demodulators (AM, SSB, etc.). We could achieve that with an IQ stream running at around 50kSPS. That would equate to a data rate of (50kSPS x 2 IQ signals x 8-bits) = 0.8Mbps or 100kbps. Now

that's so much more manageable than the 32.7Mbps required for the full 1.7MHz bandwidth! This is how Spy Server runs its reduced bandwidth mode but the downside is a bit more work for the server processor.

### FFT Spectrum Display

In normal mode, the spectrum scope we all associate with SDR receivers is created by FFT routines operating on the full IQ bandwidth within your SDR receiver software. As a result, the spectrum can only be created if the full bandwidth IQ signal is available. However, in the Spy Server's reduced bandwidth mode, the FFT spectrum is created in the remote server and the result is sent as ready processed video frames back to the SDR software, see Fig. 2 again. While this is more work for the remote server, it significantly reduces the bandwidth requirements of the link between the server and the host computer.

### Putting it Together

The combination of sending the spectrum display as a series of video frames with the use of a bandwidth-restricted IQ stream, reduces the data bandwidth requirement to around 800kbps for a typical speech-band signal and just over 5Mbps for a VHF/FM broadcast signal. That's a huge gain and makes the server usable over Wi-Fi and the wider internet, at least for speech-band signals.

### Raspberry Pi Capable

These Spy Server improvements mean that the server demands are now within the capabilities of the Raspberry Pi. There are just a couple of caveats. The first is a requirement to keep the SDR receiver

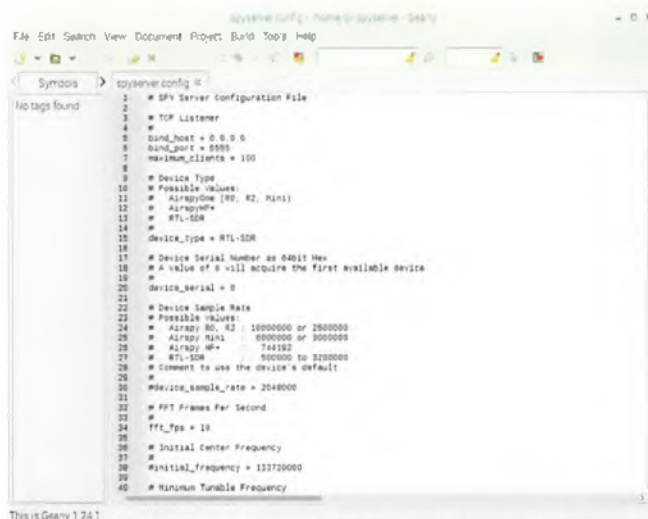


Fig. 4: spyserver.config file opened in the excellent Geany programmer's editor.

sampling rate around the 2MSPS mark. That means using 2.5MSPS for the AirSpy and 2.048MSPS with DVB-T dongles. Performance is also improved if the spectrum display frame rate is dropped below the 20FPS default setting. 15FPS usually works well enough but I have found that 10FPS is fine and leaves a bit more headroom for handling multiple connections.

### Raspberry Pi Installation

Let's just run through the process of setting the Pi up as a Spy Server. To save space in this column, most of the instructions are now available from my website here:

<http://photobyte.org/running-spyserver-raspberry-pi-3>

These instructions are regularly updated as new versions come available. If you want to use Spy Server with a DVB-T dongle on a Pi, you'll also need to install the OSMOCOM driver on the Pi and blacklist the TV and digital audio drivers. Step-by-step instruction for this can be found here:

<http://photobyte.org/using-the-raspberry-pi-as-an-rtl-sdr-dongle-server>

Those wanting to use a DVB-T dongle with Spy Server will also need to make some changes to the spyserver.config file.



If you prefer to use a GUI (Graphic User Interface) editor, open the `spyserver.config` file in the Geany programmer's editor, Fig. 4. If you're happy with the command line, then nano is probably the best option.

Here's a list of the lines that need to be changed. Do note that each of these entries starts with a lowercase letter and you need to delete # at the start of the line, if present.

First set the receiver type:

**device\_type = RTL-SDR**

Now set the sample rate to 2.048MSPS using this line:

**device\_sample\_rate = 2048000**

Next, we slow down the spectrum display frame rate. The default setting of 20FPS is too much for the Pi processor so I recommend using 10FPS or 15FPS with the latter being fine if you don't expect to handle multiple connections. Here's the line to change:

**fft\_fps = 10**

If you're planning to use your DVB-T dongle with an HF converter, you also need to subtract the up-converter's IF frequency. For the AirSpy, that would be  $-120000000$  but for a popular DVB-T converter such as the Ham-It-Up unit, you would enter

$-125000000$  as per the following line:

**converter\_offset = -125000000**

While updating `spyserver.config`, it's worth making a few additional changes.

The first is to set the initial frequency.

This is the frequency that the server will automatically tune to when it boots. This frequency is entered in Hertz and could be your local repeater or maybe a favourite calling channel. To start on the 2m mobile calling channel of 145.5MHz, enter:

**Initial\_frequency = 145500000**

You may also want to increase the gain above the default value 5. Here's how:

**Initial\_gain = 15**

For frequency correction, to compensate for local oscillator errors in the DVB-T dongle, a compensation figure can be entered. Note that this compensation is in parts per billion, not the parts per million used in SDRsharp. Here's the line to change:

**frequency\_correction\_ppb = 0**

That completes the changes so you can save the `.config` file and restart the server or re-boot the Pi to use the new settings.

I've found Spy Server to be perfectly usable for speech-band signals over the

wider internet both with an AirSpy and a DVB-T dongle. The point to bear in mind is that you need a minimum of 0.8Mbps of data bandwidth available. Any less and the demodulated audio will stutter. To make your Spy Server accessible via the internet, you will need to use port forwarding on your broadband router. This extends port 5555 on the Pi server to your public IP address. Because all routers are different, you will need to check the manual or search the internet for the precise settings. One important security consideration is to change the default username and password on your Pi. If you don't do that, there's a risk that the Pi could become a gateway for a hacker to get on to your network. Details of how to make the change can be found on the Raspberry Pi's website at:

[www.raspberrypi.org/documentation/linux/usage/users.md](http://www.raspberrypi.org/documentation/linux/usage/users.md)

Those that would prefer to avoid the Linux setup can use one of my pre-installed SD cards that come with printed instructions and a new username/password. More details here: [g4wnc.com/shop](http://g4wnc.com/shop)



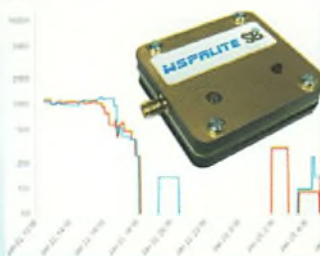
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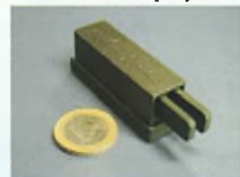
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# Temporary VHF Antenna Installations

**Wally Sawyer G7FHN offers advice on how to set up simple omnidirectional antennas for temporary use, such as when providing communications for a community event.**

**M**y son Jonathan MOJSX and I are heavily involved in providing radio support for community events. One of the challenges is to erect effective antenna systems in non-optimum locations. Event organisers don't always, for example, choose the location of checkpoints on the basis of good radio paths! As a result, a handheld transceiver with rubber-duck antenna or even a full-size whip antenna on a car roof are often insufficient to maintain a reliable link.

Over the years we have developed a number of solutions, largely based on putting our antennas on top of an 8m or 10m mast. This article looks at some of those solutions, not as a prescription for a particular way of doing things but to throw out some ideas. These are solutions that have worked for us in a temporary location but you may, for example, want to adapt them for more permanent use. Do make sure that you seal the lid and holes of the box, particularly if the antenna will be a permanent or semi-permanent fixture.

The bands we use most for the sort of communications I have described are 4m, 2m and 70cm and sometimes a combination of two or three bands, for example by using one band for local communication with on-site volunteers and another for the link to the next



**Fig. 1: The assembled 'ground plane' arrangement.**

checkpoint. Often this involves linking the two bands with a multiband transceiver or a pair of single-band transceivers set up in rebroadcast mode.

## Ground Plane

The typical antenna will be a single- or multiband mobile whip, designed to work against a car roof as a ground plane. The challenge then, if this whip is to be mounted on top of a mast, is to create a suitable alternative ground plane. One way I have solved this, **Fig. 1**, is to use cheap rubber duck antennas as radials. I say cheap – this would be an expensive solution if you bought four such antennas new but I find that I can often pick them up at rallies for next to nothing. What's more, if you use dual-band antennas for this purpose, you can then use them with a single-band whip for either band or with a dual-band whip antenna.

As can be seen from the photograph, I mount everything on a small diecast box. In this instance the radials are ex-PMR

and I had to solder nuts to the diecast box and tap them for the appropriate thread size. You'll see that the antenna itself uses a PL259 plug. However, it all depends on what you can lay your hands on – most whips come with a BNC or SMA connector and suitable sockets are readily available.

For the feeder, I have tended to standardise on N connectors at the top of the mast because the pressure-sealed plugs are as near watertight as you can get (and it invariably pours with rain at the crucial moment during your event!).

## Vertical Dipole

The other configuration that works well is the vertical dipole as illustrated in the drawing, **Fig. 2**, and the photograph, **Fig. 3**. Again, choose connectors, antenna types and so on to suit, depending on what you can lay your hands on – there's no reason to spend a lot of money on gear that will be used (and abused) out and about in the field. The other photos show, **Fig. 4**, the internals of one of my early feedpoint boxes and, **Fig. 5**, a vertical dipole in situ in my garden.

The choice of ground plane or dipole will depend on your mounting arrangement. The former will sit handily right on top of a mast while the latter lends itself to being at one end of a cross-arm. I mentioned earlier, for example, that we often need to run two bands at a checkpoint and a cross-arm can support vertical dipoles for, say, 2m at one end and 70cm at the other. Suitable brackets for mounting to masts are readily available from any number of suppliers or, again, at rallies.

## Sourcing Parts

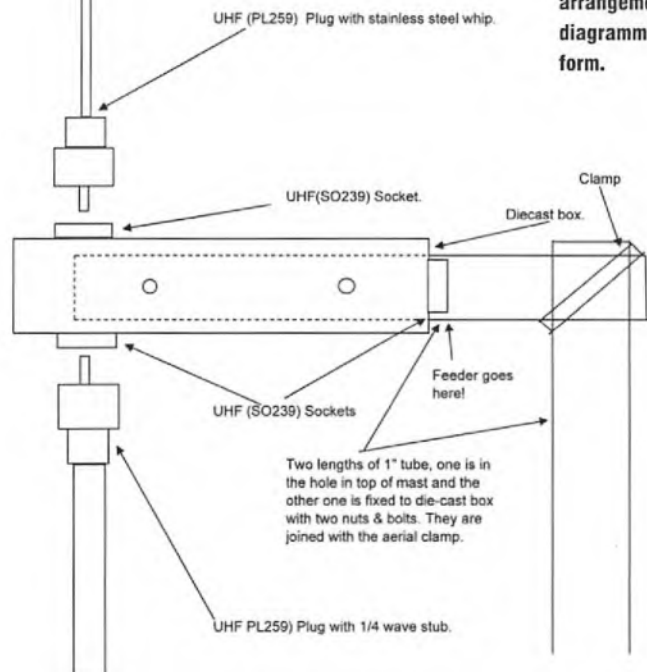
I have suggested sources for some of the parts in the list (see sidebar). However, none of this is sacrosanct. *PW* advertiser Moonraker carry a wide selection of whips and rubber duck antennas at sensible prices. Several of my own antennas use Garex products bought many years ago but the good news is that another *PW* advertiser, Spectrum Communications, acquired the Garex range and can supply antennas for pretty much any combination of frequency and connector type (see their website).

## Handhelds

All the foregoing applies equally to handhelds. Most, at least of the more expensive ones, have a removable antenna, so you can happily relocate it on



Simple Di-Pole Aerial for use with 8 mtr aluminium mast.



**Fig. 2: The vertical dipole arrangement, in diagrammatic form.**

#### Parts List

UHF Sockets, square chassis, Maplin BW85G  
Die-cast Box, Maplin N88BQ  
Lengths of 1" all tube and aerial clamp, B&Q?  
Whip antenna, Garex Part Number 554, state 73 Mhz and Straight PL259 Plug.  
Stub antenna, Garex Type CL 45 CM and state 73 Mhz and PL259 straight plug.  
Short length of RG58 50Ohm coax, to connect feeder socket to whip socket in box.  
Nuts/Bolts as required to secure sockets to box.  
Solder tags, same size as bolts.

#### Notes

1. The input centre is wired via coax inner to inner of upper whip socket.
2. The coax braid should be wired to solder tags fitted to fixing bolts of input & whip sockets.
3. The inner of the bottom socket is connected to the box by a short wire link.
4. Once assembled, the VSWR should be checked. The reading should be less than 2:1.

#### Parts List

UHF sockets, square chassis, Maplin BW85G or other types to suit.  
Diecast box, Maplin N88BQ.  
Lengths of 1in aluminium tube and antenna clamp (B&Q or similar).  
Whip antenna, as required.  
Stub antenna, as required.  
Short length of RG58 50Ω coaxial cable to connect feeder socket to whip socket in box.  
Nuts/bolts as required to secure sockets to box.  
Solder tags, same size as bolts.

#### Notes

1. The input centre is wired via coax inner to inner of upper whip socket.
2. The coax braid should be wired to solder tags fitted to fixing bolts of input and whip sockets.
3. The inner of the bottom socket is connected to the box by a short wire link.
4. Once assembled, the VSWR should be checked and should be below 2:1.

at 400MHz while a similar length of RG-8X has a loss of 7.9dB and RG-213 comes in at just 4.8dB. These are significant differences and worth thinking about when you are doing the radio planning (terrain, distances to cover, path losses and so on) for an event.

[www.w4rp.com/ref/coax.html](http://www.w4rp.com/ref/coax.html)

#### Conclusions

None of what I have suggested is especially novel and you may feel that you can homebrew something suitable even more cheaply using, for example, offcuts from metal coathangers as antennas or radials. The benefit of my approach, I would suggest, is that it is easy to reconfigure for different bands (or combinations of bands) using some basic components. What's more, if you can standardise the various parts and connectors within your club, RAYNET group or whatever, it makes life so much simpler when something needs replacing in the heat of the moment out in a muddy field with impatient users wanting you to pass their traffic.

top of the mast while you operate the radio from the comfort of a car or tent.

#### Coaxial Cable

Finally, a word about coaxial cable. You'll have standardised the connector type at the antenna end. At the radio end you may be faced with various types of connector and may have to resort to the use of adaptors. Better, though, to terminate at the output of your VSWR meter and use a short length of cable between the radio and the input to the VSWR meter. You could have several such short lengths made up ready,

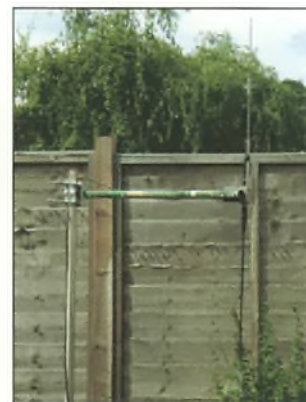
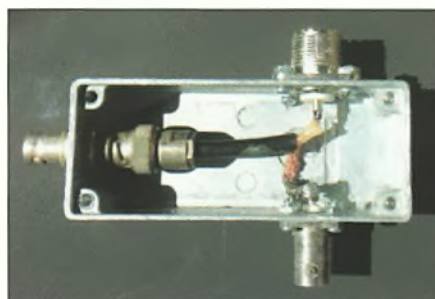
with alternate connectors for the radio end.

Having a VSWR meter permanently in circuit is a good idea in any case – it's reassuring to know that the antenna is working correctly and you'll see immediately if something goes awry. Beware, though, that a long length of lossy cable can give a rosy picture of a poor antenna. While you may get away with, say, a 10m length of RG-58 on 4m or 2m, better to use a lower loss alternative for the higher frequencies. Just to give one example, according to the W4RP website (below) 31m (100ft) of RG-58 has a loss of 11.2dB



**Fig. 3: The vertical dipole arrangement as finished.**

**Fig. 4: Internal view of connector box.**



**Fig. 5: Vertical dipole set up in the author's garden.**





# A New Weak Signal Mode in WSJT-X

**Tim Kirby G4VXE has news of a new weak signal data mode, more on MD-380 firmware and lots of news on VHF activity, especially via seasonal sporadic E.**

**K**een users of weak signal digital modes on the VHF (and HF) bands may be interested to learn that the latest version of WSJT-X 1.8 (currently in beta release) features a new mode, FT8, that is attracting a lot of interest. It's intended for 'reasonably' strong signals, such as on HF or VHF sporadic E (Es), but the real benefit is that QSOs can be completed four times quicker than the other JT modes because it uses 15 second transmit and receive periods. For very weak signals, JT65A will still be superior but it's easy to see that FT8 should work very well in Es openings.

You can set the software so that it will send the appropriate messages based on what you've received, which with a rapid turnaround of overs can be quite useful. You have to be quite quick when you reply to a CQ because with a 15 second over, there's not so much time to spare. So far, I've made just a handful of QSOs but it seems to work well and I'm looking forward to trying it more. I note that, like JT65A, it's reasonably susceptible to aircraft reflection but at least a corrupted over is only 15 seconds, rather than a full minute. You can find the download at: <https://physics.princeton.edu/pulsar/k1jt/wsjsx.html>

## More on MD-380 Firmware

If, like me, you've been following the development of the 'hacked' MD-380 DMR rig firmware, you might be interested to know that there is another version. The interesting thing about this one is that the update tool will run natively on Windows so there's no need for a virtual machine running Linux. This version is very slightly different but has all the main useful features of the 'hacked firmware', as well as some new features. This fork of the MD380 firmware is called MD380Toolz (yes, with a 'z') and has been developed by Ty Weaver KG5RKL. You can find out more and download the upgrade utility on the Facebook group 'DMRTrack'. I have found no problem in installing it and then going back to the version of the firmware installed using the KD4Z toolkit that I have mentioned previously, so you're safe to experiment.

## The 6m Band

Tony Collett G4NBS (Cambridge) has been back on the 6m (50MHz) band after many years. Although he finds his QTH very noisy on the lower VHF bands up to 2m, he has been able to work around it better on 6m. Tony set himself a target to see how quickly he could work 100 locator squares and nearly got there in a week, before the 50MHz Trophy contest weekend, so he then went on to see if he could break 200 and get 100 confirmed using Logbook of the World (LoTW) by

the end of the second week. Tony says it took 30 years to do that on 2m! He almost made it, reaching 195 worked and is hoping that LoTW will turn up a final confirmation, being at 99 at the time of writing.

Tony continues, "I've seen several stateside signals on JT65 but don't have enough ERP (effective radiated power) to break through the pile-ups. I was heard by K1TOL on the 15th but he faded out, unfortunately. TY2AC was a strange one on the 22nd. I first saw him at 1135UTC and continued to hear him off and on throughout the day before working him at 1619. Never stronger than -12 and in/out as he worked stateside. It seems a very long period for multi-hop Es but I don't know what else it could have been. I've even had to try CW for a couple of contacts but way too fast for my brain to cope with these days".

## Josef VanRaepenbusch ON8NT

(Aalter) sends his always interesting log. He generally uses no more than 5W of JT65 with a V2000 vertical. The highlights of his log are as follows: June 1st IS0BSR/P (JM49), E77AW (JN83), SV2JAO (KN10); June 2nd Z31NA (KN01), 4X4SIX (heard); June 4th OH0/DL1FDH (JP90), US8UA (KN59), UT3UA (KO50), YO4FZX (KN45), SV2/RW3AL (KN10); June 5th OH5LK (KP30), OH4SS (KP20), SM2EKM (KP05), GM0EWX (IO67); June 6th UY1HY (KO60), OF0RJ (KP00); June 9th 5B4ALX (KM64), E73R (JN94); June 18th LA8HGA (JO58).

Phil Oakley G0BVD (Great Torrington, Devon) has made plenty of contacts too, with the highlights being UW2M (KN99) on June 17th and GJ8P (IN89) on June 18th.

David Smith MOOSA operated mobile and caught a number of Es openings, working nine squares and Z3A (KN11) for a new DXCC during the 50MHz Trophy Contest. During another operating session, David worked LA3LJ (JP32) for a new country on the band as well as stations in JN00 and KP30. David runs 50W to an Outback 2000 antenna.

I received an e-mail from Keith Ballinger G0ROQ (Lincoln) entitled, "Want to try 6m but no suitable antenna? Don't give up!" Keith continues, "During the recent Es openings, I managed to work 17 non-UK countries. Nothing too remarkable about that, you may say, except that my antenna is an end-fed half-wave for the 40m band, in a horizontal-vee shape, and is only about 6ft above ground in an urban city location. This is necessitated



by being in a ground floor flat with a common garden area for all residents, so one leg of the antenna is supported by the clothes line and the other is nailed to the garden fence". Keith's best DX was UW3E at around 1800km, so thoroughly respectable results. I love getting e-mails like this and hope that it might encourage others to give the band a go, even if they don't have a suitable antenna. Remember, the only antenna that doesn't work at all, is the one you don't have up!

**Kevin Hewitt ZB2GI** is running 10W into a wire dipole using JT65 and sends a list of stations worked, the highlight being AB1NJ (FN34) as well as a nice number of Europeans. Kevin has also operated portable from the top of the Rock, using his FT-817 (5W) into a magmount whip cut for the band. He worked PA2M (JO21), S56Y (JN65) and IK0FPH (JN61), all on SSB.

**Mark Marmont CT1FJC** (Algarve) has had an interesting mix of openings but has worked OX3LX, C6ATA, ZF1EJ, 9Y4D, J69DS and FG1JS as well as some very nice North American openings. Mark has also noted openings into Japan, day after day, but hasn't managed to make any QSOs, perhaps being at the wrong end of the continent for that path. *(An interesting observation, this. When my son and I visited SV9CVY in Crete in late June, Mike had already worked more than 300 JA stations this season on 6m JT65, using a 9-element Yagi – Ed.)* Mark lists 9K2NO and UN7TW as worked, so the shorter paths into Asia are working well. Mark has also been active on FT8 and finds it interesting and promising, getting over the issue of the DX station fading out before a four minute JT65A contact can be completed.

**Paul Bowen M0PNN** (Newport, Shropshire) says the month has been a little quieter but still with some interesting DX about. Highlights from Paul's log are WP2B and KP4EIT on June 11th, OY1CT on June 15th, TF2MSN (HP84) on June 22nd and CU1EZ (HM76) on June 24th.

### The 4m Band

**Simon Evans G6AHX** (Twynning, Gloucestershire) just missed the last deadline, owing to holidays, but caught some nice Es on the 4m (70MHz) band, particularly EA5/G0KSC (**Justin Johnson** of InnovAntennas fame) on June 3rd. Simon is using a 5-element OWL antenna from the very same G0KSC. During the VHF NFD weekend, Simon



The Telford and District Amateur Radio club station at VHF Field Day 2017.

had 21 contacts, with his best DX being GM3HAM/P (IO74), also working EI9E/P.

**Roger Daniel G4RUW** (Newbury) says it's been his first season on the band using his IC-7300. He says that the season started well up to the middle or end of June but since then, it's been quiet. Some of the more interesting contacts have included EA6, an OH station in KP31 and an LA in JO59.

Here at G4VXE, I've not been on the band much but was pleased to work EA6SA on SSB on June 14th.

### The 2m Band

**Ron Pincho ZB2B** caught an interesting 2m opening on June 14th, when he heard I3MEK (JN55), initially weakly. Ron called him and signals came up to S5 as Mario turned his beam. Ron was delighted, having thought it would be impossible to work Italy on 2m from his QTH. Ron is on the western side of the Rock, so can only effectively beam from 180°, through 270°, to North. Just to make things even better, Ron moved down to 144.300MHz and heard IV3GBO (JN66) and was able to make a QSO.

David M0OSA spent a couple of hours on the band during the VHF NFD weekend and the highlight was working EI9E/P running 50W into the Diamond SG7200 vertical on his car. EI was David's seventh country on the band.

**David Butler G4ASR** (Herefordshire) found the band open to Africa on July 14th. At 2000 he worked EA8BPX (IL18) at 2847km and an hour later, EA8TX (IL18) at 2861km. The opening seemed to be

mostly confined to the west coast of the UK with the EA8s working IN79, IO70, IO80, IO81 and IO82.

Roger G4RUW says that the Es seems to have been everywhere but his QTH! However, he did work IK7UXU (JN81) on June 14th, although he missed an EW station, which would have been a new country.

**Lyn Leach GW8JLY** (Cardiff) sends a very interesting report about the Es propagation so far this summer. He writes, "2m Es continued throughout June with very nice openings here on June 14th, 16th and 18th. In the June 14th opening, between 1810 and 1903UTC, I worked IK7UXU (JN81) and IS0AWZ (JM49).

On June 16th, there were two separate openings in Cardiff, in the afternoon and evening. Between 1214 and 1401 I made QSOs with YO2YA (KN05), LZ2FO (KN13), UW6SM (KN28), 9A9R (JN85), 9A2SB (JN95), 9A5M (JN95), YU1ES (KN04) and YU1EV (KN04). I also heard but didn't complete with HA0HO and YO4GJT. During the evening event, between 1920 and 1928, I worked RX1AS (KO59) at 2364km and OH2LIY (KP20).

"On June 18th between 1754 and 1814, I made QSOs with UA3WM (KO72) at 2624km and EW8W (KO42) at 2230km. UA3WM was exceptionally strong at many decibels over S9 and could be copied continuously for around 15 to 20 minutes. For a while he was calling CQ with no other replies and I couldn't resist the urge to call him twice more to have a short chat.

"Since June 18th, the intense Es openings came to a sudden end, at least



at this QTH and not only on 2m but on 6m too. There were, of course, a few weak openings on 6m after the 18th but these were not as good as those before this date.

"I can remember **Ken G4IGO** saying many years ago that you only see a certain amount of Es (as measured in total hours) each season and looking at this year, it appears that we may have reached that point already. 2m was open for Es events somewhere in Europe every day from before May 30th up until June 21st. As far as I am concerned this is quite exceptional. Ken spent many years analysing Es events on all bands from 6m up and became an expert in this type of propagation".

Ken and Lyn's point about only having a certain amount of Es propagation in any one year is interesting. Certainly, up until this year when it seemed full on for days on end, you seemed to have a couple of good days and then it seemed to need a day to 'recharge' before propagation returned. Since June 18th, there has certainly been Es but it has been noticeably more patchy. What changed, then?

Lyn was also delighted to work **EA8TX** (IL18) on July 14th at a distance of 2808km. It's a difficult path to the south-west from Lyn's house so this was an unusual contact.

During the Aegean VHF contest on July 2nd, **Panos Dadis SV1GRN** (Athens) intended to operate from the summit of Mt Hymettus but because the temperature was too high and because of the risk of fire, access to the summit was not allowed. Panos and **Thanasis SV1IVK** decided to go to an alternative location. They made 15 contacts. The longest distances were **SV8CS** (KM07) and **SV9CVY** (KM25) running 5W to a 7-element DK7ZB Yagi.

It's nice to hear from **Barry Horning GM4TOE** (Banff) who was surprised to see his callsign in the August *PW*. Barry was interested to read that **Jeremy M0XVF** that thought it was an auroral contact when he and Barry worked on May 21st. Barry's thoughts were that it was more likely aircraft scatter based on the fast fading and flutter. Barry says it's heartening to find more people beaming north during the UK Activity Contests and welcomes contacts – anything south of IO94 is DX for Barry! He finds it is possible to work stations with quite modest setups, so he is always keen to try and says that a 'meep' on the ON4KST website will usually grab his attention. Please keep in touch,



**Thanasis SV1IVK operates during the Aegean VHF Contest, July 2017.**

Barry – you are certainly DX for those of us in the south.

### Satellites

Jef ON8NT heard the ARISS contacts from the International Space Station (ISS) on June 10th around 1620 and June 13th around 1520. Jef also followed the ARISS HamVideo transmissions via Live DATV at: <https://hamtv.batc.tv/dashboard>

It's great to hear from **Brian Bosson M0SWL** (Marlborough) for the first time. I met him at a talk I gave on Simple Satellite Operating at the Swindon and District Amateur Radio Club. Brian decided to invest in an Arrow antenna and a Kenwood TH-D72E, has already made a contact via AO-85 and is starting to look at SO-50 and APRS via the ISS. Keep us posted, Brian and I hope to speak to you soon via the satellites.

**Graham Jones G3VKV** (Cheltenham) has had a couple of good passes on FO-29. On July 9th, Graham worked **K8YSE**, **CG2FU**, **W3KXR**, **WB8RJY**, **KC9ELU** and then right at the end of the pass, **WC7V** at 7203km. The maximum elevation of the satellite was 5° with a pass time of ten minutes. On July 11th, Graham heard **H18KW** and **FG8OJ** in the first couple of minutes of a south to north pass – both stations were good signals.

During my recent holiday to Pembrokeshire, operating as **GW4VXE** from near Pembroke Dock, I made an APRS exchange through the ISS digipeater with **Richard Brooks GW1JFV** (Haverfordwest) over a distance of 13.2km and I remarked on Twitter that it was my shortest distance contact through the ISS. It was particularly nice to work Richard because we speak often on Twitter and it was his first live exchange on ISS. **Patrick Stoddard WD9EWK** mentioned that his shortest distance contact through the ISS was around 20 yards! Patrick had been operating at the Scottsdale Hamfest in March this year doing a demonstration at the AMSAT booth and made a QSO with **Chris K7TAB** who was standing just a few

yards away. The tricky thing about short contacts like that is to make sure that you are hearing the digipeated signal from the ISS, rather than the direct one. In the case of mine and Richard's contact, this was made easier owing to the coastline between us.

Mark CT1FJC's best contacts through FO-29 were **H18KW** on July 11th and **R3THA** on July 12th.

Patrick WD9EWK was active during the ARRL Field Day, where satellite contacts are permitted and indeed, there is a bonus for satellite activity. He also writes, "Besides Field Day, many satellite operators were anticipating another trip by **Gabe NJ7H/VE6NJH** to operate from different countries and grids via satellite. This time, a trip to Iceland (TF/NJ7H), the Faeroe Islands (OY/NJ7H) and, finally, Greenland (OX/NJ7H). Once again, Gabe did a great job activating several Icelandic grids, as well as one grid in the Faeroes. Many operators across Europe and North America picked up new grids and DXCC countries from TF/NJ7H and OY/NJ7H and Gabe is now operating as OX/NJ7H from grid GP49 – a new grid for almost all satellite operators.

"From my home in central Arizona, I'm not able to work continental Europe or the UK via satellite but I have footprints via AO-7 and FO-29 with Iceland and the Faeroes. Starting on July 4th, I tried working TF/NJ7H from my back yard. Two nights on FO-29; two unsuccessful tries. Between the RF noise from my neighbor(hood) and obstructions that prevent me from working the lowest passes, I tried something different. As I did last summer to work **PJ6Y** in Saba via SO-50, I drove to a highway rest area 50 miles north of Phoenix. From there, I could work a late evening FO-29 pass on July 7th down to the horizon. With a three-minute window between my location in grid DM34we and Gabe's location in HP94ad, this was going to be my best – and possibly final – chance to work him in Iceland. About two minutes into the window, I heard Gabe answer my call. After almost 12 years of working satellites, I finally had a QSO with 'Europe' in my satellite log. When I woke the next morning, LoTW had my confirmation from TF/NJ7H, since Gabe works fast to confirm his QSOs from wherever he happens to be. Last night (July 14th), I was able to work Gabe as OX/NJ7H from my back yard".

Thank you for all the news – please keep it coming and see you next month.



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# Making Waves

## Critical Frequency and NVIS

Steve White G3ZVW explains Critical Frequency and Near Vertical Incidence Skywave.

**T**here are lots of facts and figures related to HF radio propagation. For a beginner – and even for some who have been in the hobby for a very long time – they can be truly daunting. The good thing is that with just a basic understanding of these things, you can know in advance whether you are wasting your time looking for contacts on a particular frequency at a particular time.

In this instalment I will be looking at some online sources of live propagation data, examining the numbers and helping you understand what they mean.

### Revision

In the very first *Making Waves* (March 2016) I introduced the concept of the Diurnal Cycle, the cycle that HF propagation goes through every 24 hours.

I presented a figure, Fig. 1, in which I showed how the level of illumination from the Sun is the driving force behind a lot of HF propagation. Very simply, the higher the Sun is in the sky the higher in frequency you can expect HF signals to be refracted back to Earth. Needless to say the picture is more complex in the real world.

### Critical Frequency

Critical Frequency is something that

constantly changes. It is usually abbreviated to  $f_oF_2$ , so that's what I'm going to call it from now in. It's determined by the use of an ionosonde. This is a special scientific transmitter that beams a radio signal upwards and listens for a return from the ionosphere, if indeed there is any. The frequency of an ionosonde's transmitter is constantly changing, which leads to it being known as a chirp transmitter. This term is used because that's the sound you hear on an SSB or CW receiver if you're listening to it move quickly past the frequency you are monitoring. This constantly changing frequency gives an ionosonde the ability to determine at which frequency no signal from straight above it is returned by the F2 Layer of the ionosphere. Above the  $f_oF_2$  all the signal transmitted upwards goes straight out to space. Below the  $f_oF_2$  at least some of it will be returned.

There is a worldwide network of ionosondes and a really useful page on the internet that gives you access to the frequency plots produced by them: [www.ngdc.noaa.gov/stp/IONO/rt-iono/realtime/RealTime\\_foF2.html](http://www.ngdc.noaa.gov/stp/IONO/rt-iono/realtime/RealTime_foF2.html)

Once you go to that page you can click on a link to an individual ionosonde, to see how the  $f_oF_2$  has been behaving at a specific location over the past five days. I'm going to use Chilton in Oxfordshire as the example. What Figs. 2, 3 and 4 show are 'pictures' from the Chilton ionosonde captured in January, April and July 2017. I have chosen these months because the first was in the winter, the second in the spring and the third in summer.

Taken together these images help to explain how the varying amount of daylight hours affects HF propagation. I have added dawn, sunrise, sunset and dusk markers to them and yellow lines to show the average  $f_oF_2$  across the five days that each image covers. What you see in all the figures is that at dawn (before sunrise) the  $f_oF_2$  starts to rise. Equally, at dusk (after sunset) the  $f_oF_2$  drops.



Fig. 1: How the height of the Sun in the sky affects HF propagation.

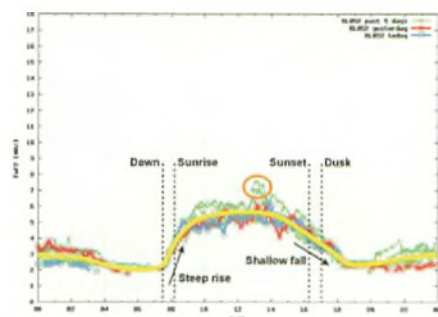


Fig. 2: 5-day Critical Frequency image from January 11th 2017.

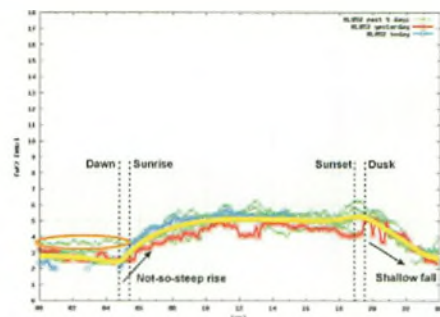


Fig. 3: 5-day Critical Frequency image from April 11th 2017.

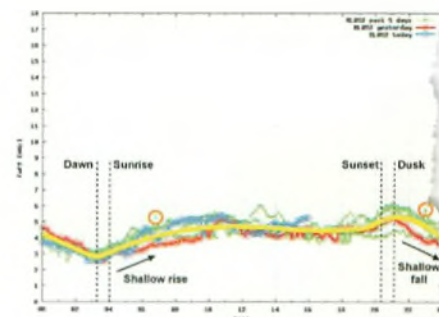


Fig. 4: 5-day Critical Frequency image from July 11th 2017.



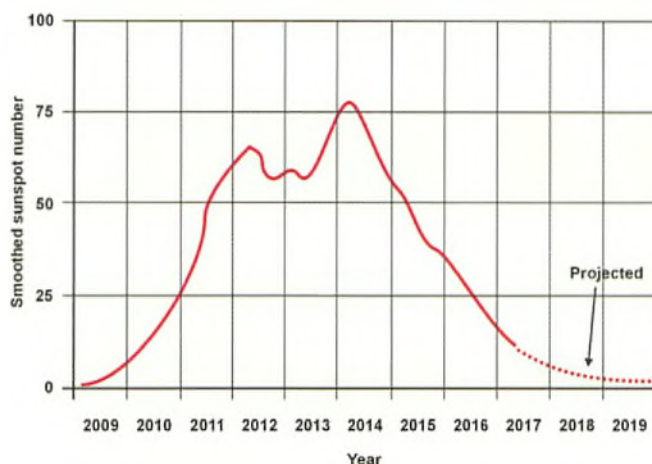


Fig. 5: The historical and projected state of Solar Cycle 24.

### Seasonal Changes

In winter the nights are long, so foF2 has a long time to settle to a low frequency. That's why in Fig. 2 there's a steep rise at dawn. During the morning it climbs and for about four hours in the middle of the day the yellow line is fairly flat. This is when the Sun is highest in the sky so the ionosphere is receiving the greatest amount of radiation. Winter days are short so as the day progresses, the foF2 starts to gradually fall and after dusk it falls faster but not steeply because it takes time for ionisation levels to drop. Overnight the yellow curve bulges upwards a little, then drops back until dawn the next day. In winter the difference between the lowest and highest foF2 is the greatest of any season – about 3.5MHz in this illustration.

In spring the nights are shorter so there is less time for the ionisation to drop. At dawn the foF2 is typically a little higher than it was in the winter. In Fig. 3 you see that the rate of rise at dawn is not as dramatic as it was in winter. In spring there is a broadly flat period of about eight hours in the middle of the day and a little peak around dusk, before foF2 drops away overnight. The picture in autumn should be similar.

Summer nights are short, so ionisation – and foF2 – never has time to fully drop. Consequently, it doesn't reach a stable level before the next dawn. Note in Fig. 4 that the foF2 at dawn is higher than it was in the spring. Also, because it is starting from a higher base, the rise is less dramatic. There's a broad peak of about 12 hours in the day before a small peak around dusk. As in Fig. 2 and Fig. 3, foF2 drops away overnight. In summer the difference between the lowest and highest foF2 is the smallest of any season – about 2.5MHz in this illustration.

The differences between the seasons are easy enough to see but there are also some things the figures have in common. First, the rate at which foF2 drops after

dusk is always about the same. Second, there are always plenty of day-to-day differences caused by variations in the energy being received from the Sun. Third, the highest daily values of foF2 remain broadly the same across the seasons.

### Another Year

Something to consider is how Figs. 2, 3 and 4 might look at a different part of the 11-year Solar Cycle, Fig. 5. The last Solar Maximum was in 2013 so we are now on the downward part of the slope and approaching a Solar Minimum. Nobody will be able to tell you exactly when the next Solar Minimum will occur but if I was to say the year 2020, I don't think I would be far out. Solar activity is quite low even now so in 2020 the Figures should look similar to how they are this year, although the lines might be a little lower. However, when the next Solar Maximum takes place (in about 2024) they should look quite different. The Diurnal (24-hour) Cycle will still mean that the lines are higher during the day than at night and there will still be day-to-day variations but the overall numbers should be higher. An example of this is that at the moment foF2 doesn't reach 7MHz at any time of day. This means that 7MHz is never any good for working people close to you, except by Ground Wave (up to a few tens of miles). At Solar Maximum the foF2 should exceed 7MHz during the daytime.

### Gaps and Blips

If you examine Figs. 2, 3 and 4 carefully, you might see some gaps in the data. The same is likely to be the case if you look online at the near-live images. One of the reasons for this is that ionosondes don't generally work below 2MHz so in the winter, Fig. 2, there are plenty of gaps when the foF2 was very low.

You might also see jumps in the graphs and odd instances when the foF2 suddenly appears to be 1 or 2MHz

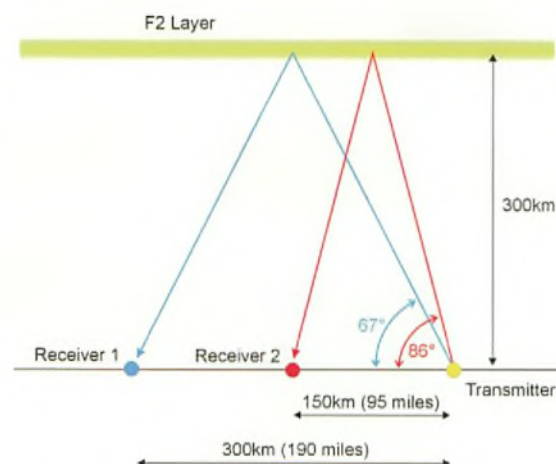


Fig. 6: Near vertical signals being returned from the F Layer.

higher than it actually is. I've circled some instances of this in orange, to highlight them. These instances of apparently higher foF2 are caused by refractions from the E Layer of the ionosphere, which confuse the ionosonde.

Radio amateurs generally only take an interest in the E Layer at upper HF frequencies and VHF frequencies. When the E Layer is strongly ionised – which it tends to be more in summer than at other times of the year – we can enjoy making contacts up to about 2000km via low angle refractions from it but we don't generally regard it as being of much use at low frequencies and/or at high angles. Clearly, though, it can sometimes refract signals at lower frequencies and high angles.

### Near Vertical Incidence Skywave

The Critical Frequency (foF2) is important for those wishing to make contacts or listen to stations via Near Vertical Incidence Skywave (NVIS). Basically, if you know what the foF2 is, you will have a pretty good idea whether you're wasting your time or not.

If you want to make HF contacts around Britain, meaning distances in the order of hundreds of miles, NVIS propagation comes into play when Ground Wave propagation runs out (typically after tens of miles). Say you want to make contacts 300km (approx. 190 miles) and 150km (approx. 95 miles) away. Assuming the middle of the F Layer is at a height of 300km, Fig. 6 shows that the approximate angle at which your signal would need to strike it is 67° for it to be returned 300km away and 86° for it to be returned 150km away. For the purposes of propagation, both these angles would be considered to be 'near vertical'.

The important thing to remember for NVIS is that you will only be able to hear people or make contacts on frequencies below the foF2.





# The Ninth Practical Wireless 70MHz Contest

**Colin Redwood G6MXL invites readers to participate in the Practical Wireless 70MHz Contest.**

**T**he 9th Annual *Practical Wireless* 70MHz Contest takes place on Sunday September 24th 2017 from 1300 to 1600UTC. Please note the later start this year.

The contest is split into two sections. The low power section with a power output limit of 10W enables Foundation Licence holders to compete on an equal basis with other low power stations. The high power section allows stations to run up to the full power permitted by their licence conditions.

The rules are very much in line with those used last year and are based on the popular *PW* 144MHz QRP Contest. You may operate from a fixed location or portable – a good hilltop location can make a huge difference to your score.

For those new to the 4m band, the *PW* 70MHz contest is a great introduction to the friendly nature of contesting found on the band.

## Equipment

The choice of equipment at 70MHz (4m) is somewhat limited in comparison with 144MHz. However, a number of FM transceivers for 4m have come onto the market in the last few years. These include the Wouxun KG-UDV1P/L 4m and 2m dual-band handheld, the Wouxun KG-

699E 4m handheld and the MyDEL ML-5189 mobile.

The Icom-7100 transceiver, introduced in 2013, is a fully-fledged multimode transceiver covering 4m in addition to other HF and VHF bands. It has been used by several stations in contests since its launch.

2014 saw the launch of the Noble NR-4SC, a dedicated 4m SSB/CW (but not FM) transceiver, which was reviewed in the March 2015 issue of *PW* and used by at least one station every year since.

2016 saw a couple of stations using the newly introduced Icom IC-7300 transceiver, which includes 4m. It was reviewed in *PW* in August 2016.

The UK version of the older Yaesu FT-847 also covers 4m. These are often available second-hand.

Transverters are also popular with 4m operators. Most use an intermediate frequency (IF) of either 28MHz or 144MHz, taking the 28MHz output from an HF or 144MHz transceiver and mixing with a local oscillator to give 70MHz for transmit and vice versa on receive. Transverters usually require drive levels much lower than the full output power of most HF and VHF transceivers, sometimes as little as a few milliwatts. You may need to build or buy a suitable attenuator unless your main transceiver has a low-power transverter

output. Spectrum Communications in Dorchester have a good range of transverters available as kits or ready to use.

## Antennas

Many stations will perhaps be using nothing more than a simple dipole or quarter-wave vertical. Stations with Yagi antennas are likely to have fewer than six elements.

Vertically polarised antennas are generally used for FM and AM operation. For SSB and CW, most stations use horizontally polarised antennas. For those who like building antennas, there are a number of designs for the 4m band on the *PW Antenna Collection Archive Disc*.

## Operating

I would suggest spending some time on FM and AM in addition to SSB and CW. If you are unfamiliar with the 4m band, you could be in for quite a surprise at just how many stations are using these modes.

In previous years there has been activity from almost all parts of the British Isles, including a number of EI stations. There has also been increasing activity from the continent. It is easy to miss out on contacts simply by not looking in all directions or by trying to work stations off the back of the beams. Don't forget that slow QSB (fading) is a common occurrence on the 4m band, so you may miss a station altogether if you don't rotate a directional antenna a number of times during the contest. The QSB can cause stations to disappear for a minute or two and then reappear.

## Entries

After the contest, please submit an entry. Although electronic entries via e-mail are preferred, those of you who don't use computers will no doubt be pleased to know that you can easily submit an entry without going anywhere near a computer.

## Do make a note in your diary now

The 9th *Practical Wireless* 70MHz Contest takes place on **Sunday September 24th 2017**. If you plan to use batteries, don't forget to charge them a day or two before and do put a reminder in your diary to submit your entry to be received by **Tuesday October 17th**. Let's hope for some good weather and propagation on the day so that we can all have a really enjoyable time.



## The 2017 Rules

**1. General:** The contest is open to all licensed radio amateurs, fixed stations or portable, using SSB, CW, AM or FM in the 4m (70MHz) band. Entries may be from individuals or from groups, clubs and similar organisations. The duration will be from 1300 to 1600UTC on Sunday September 24th 2017.

All stations must operate within the terms of their licence and only transmit within the 4m allocation allowed within their licence. Stations using transverters are reminded to be particularly careful to ensure that they don't transmit out of band.

Subject to licence conditions, split frequency operation is permitted for the purpose of working stations in countries with different 4m allocations. Cross-band contacts where either station is not operating between 69.0 and 71.0MHz will not count for points.

Entrants must observe the bandplan for their country and keep clear of normal calling frequencies such as 70.200MHz. Entrants must avoid using any frequency that is obviously in use for non-contest purposes. **The 4m band is not an exclusive amateur band in many countries. Contest stations must allow all other users (including non-amateur users) of the band to carry out their activities without hindrance.**

The station must use the same callsign throughout the contest and may not change its location. Entrants not operating as a fixed station must use the /P suffix.

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

- (i) callsigns of both stations (including any /P suffix)
- (ii) signal report, standard RS(T) system
- (iii) serial number: a 3-digit number incremented by one for each contact and starting at 001 for the first contact
- (iv) locator (the full 6-character IARU Universal Location for the location of the station)

Information must be sent to and received from each station individually and contacts may not be established with more than one station at a time. Simultaneous transmission on more than one frequency is not permitted.

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

Contacts via repeaters or satellites or using any digital modes (including D-STAR, Fusion and DMIR) are not permitted.

**3. Power:** In the low power section, the output power of the transmitter

or transverter final stage must not exceed 10W PEP. If the equipment in use is capable of a higher power, the power shall be reduced and measured by satisfactory means. Stations cannot rely on feeder loss to meet the 10W power limit. In the open section, stations may use whatever power they are permitted to use by their licence conditions.

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

Example: 52 stations worked in IO81, IO90, IO91, IO92 and JO01 squares; final score =  $52 \times 5 = 260$ .

Only one contact with a given station will count as a scoring contact, even if it has changed its location, e.g. gone /M or /P. If a duplicate contact is inadvertently made, it must still be recorded in the log and clearly marked as a duplicate (not necessary in computer logs submitted by e-mail).

**5. The Log:** Logs may be submitted by e-mail or by post. In either case the log must contain the following information for each contact:

- (i) time (UTC – NOT BST)
- (ii) callsign of the station worked (including any /P suffix)
- (iii) report sent
- (iv) serial number sent
- (v) report received
- (vi) serial number received
- (vii) locator received (or location)

The preferred form of a log is a computer file sent by e-mail. This may be generated by contest logging software such as EISDI's SDV or the RSGB's MINOS, or a file in any other suitable format (plain text is fine) provided each of the items above is separated by a separating character such as a comma or tab (please don't mix separators). Give the file a name including the station callsign (e.g. g6mxi-p.log), and send as a standard e-mail attachment to [contest@pwpublishing.ltd.uk](mailto:contest@pwpublishing.ltd.uk)

The REGTEST, .log, .edi and .adi formats or the spreadsheet available on the contest website are preferred. If there is any problem with your entry, you will be contacted by e-mail.

Log sheets and covering information sheets for paper-based entries are available for downloading from the contest Website [www.pwcontest.org.uk](http://www.pwcontest.org.uk)

**6. Entries:** The covering information listed below must be provided with each entry. The preferred method of submitting this is by the use of the online facility on the website. Alternatively, the information may be written in the e-mail message to which

the log file is attached. For entries sent by post, it should be written on a separate sheet of A4-sized paper.

The information required for every entry is:

- (i) name of the entrant (or of a club etc. in a group entry as it is to appear in the results table and on the certificate)
- (ii) callsign used during the contest including any /P suffix (e.g. G6MXL/P)
- (iii) name and address for correspondence
- (iv) location of the station during the contest
- (v) full 6-character locator as sent during the contest
- (vi) whether single or multi-operator (a single-operator is an individual who received no assistance from any person in operating the station, which is either his/her permanent home station or a portable station established solely by him/her); if multi-operator, include a list of operators' names and callsigns
- (vii) a full description of the equipment used including transmitted PEP output power
- (viii) if you are entering the low power section and the transmitting equipment (including any transverter employed) is capable of more than 10W PEP output, a description of the methods used (a) to reduce and (b) measure the output power
- (ix) antenna used and the approximate station height in metres above sea level (ASL)
- (x) if you receive or send a report of poor quality signals (e.g. wide/splattering), full details of the complaint, including time, callsign, nature of complaint and actions taken during the contest to investigate and resolve
- (xi) the following declaration must be included in the e-mail text or written and signed by the entrant: "I confirm that the station was operated within the rules and spirit of the event and that the information provided is correct".

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

## Entries & Other Information

Entries by e-mail must be sent to [contest@pwpublishing.ltd.uk](mailto:contest@pwpublishing.ltd.uk)

Paper entries should be sent to: Practical Wireless Contest, c/o Colin Redwood G6MXL, 53 Woodpecker Drive, Poole BH17 7SB.

**Entries must be received not later than Tuesday October 17th 2017. Late entries will be disallowed.**

Any other general comments about the station, the contest and conditions during it are welcome (written on a separate sheet of paper in the case of entries sent by post).

Photographs relating to the operation are also invited. Please note that photographs cannot be returned and may be used for publication in PW or on the contest website. If these are not available by the time the entry is submitted, they may be sent later by e-mail or post, to arrive by October 24th 2017.

The results will be published in PW.

**7. Miscellaneous:** When operating portable, obtain permission from the owner of the land before using the site. In particular observe any restrictions on access. Always leave the site clean and tidy, removing all litter. Observe the Country Code.

Take reasonable precautions to avoid choosing a site that another group is also planning to use. It is wise to have an alternative site available in case this problem does arise.

**8. Poor Signals:** Make sure that your transmitting equipment is properly adjusted and is not radiating a broad or poor quality signal, e.g. by over-driving, excessive speech compression or low voltage supply. On the other hand, be aware that your receiver may experience problems due to the numerous strong signals it will have to handle and that this may lead you to believe that another station is radiating a poor signal. Before reaching this conclusion, try heavy attenuation at the received input. The use of a high-gain RF preamplifier is likely to worsen strong-signal problems so if you do use one, it is best to be able to switch it off when necessary.

If after making the checks above, you are certain that another station participating in the PW 70MHz contest is radiating poor quality signals, please call the station, giving your callsign, and tell them about the problem. You cannot expect a station with a poor signal to do something about it if they are unaware!

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

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





# Heathkit Receivers

**Ben Nock G4BXD is back, taking a look this month at receivers from kit manufacturer Heathkit, receivers that were classics of their day.**

**H**eathkit is probably unknown to most amateurs who started in the hobby after the 1980s or so. To us children of the 1960s, Heathkit was a magical name, a company that produced receivers, transmitters, test equipment, audio and hi-fi equipment as ready-built sets or, more interesting in my belief, as kits. Indeed, such a company would be ideal today to give those starting in the hobby excellent kits to learn on.

In 1935 Howard Anthony purchased a bankrupt company, the International Aircraft Corporation, which itself had started as Heath Airplane Company, founded by Edward Bayard Heath during WW1. Howard changed the name back to Heath Aircraft Company and moved to Benton Harbor, Michigan. He kept the company in the aircraft parts business until the end of WW2 but during that time had also started to produce radios for aircraft. After Howard bought a large stock of surplus WW2 electronics parts, in particular quantities of 5BP1 cathode ray tubes, he had an oscilloscope designed, to sell in kit form for half the price that a comparable factory built oscilloscope was retailing for at the time.

The O-1 oscilloscope kit, launched in 1947, was an instant success and the Heath Company changed from the aircraft business to the era of electronics. Several more test instrument kits were produced and gradually kits for amateur radio, hi-fi and other consumer electronics were added to their catalogue. Right from the start Howard realised that a detailed instruction manual was important and this was one of the keys to the company's success. The Heath instruction manuals were easy to follow, step-by-step, for both non-technical beginners and for more experienced engineers.

## The Daystrom Era

In 1954 Howard Anthony was killed in an aircraft accident and in 1955 Daystrom Inc bought out the Heath company. Daystrom added more new kits and the company grew but they kept the belief in a well-presented constructional manual. A new modern plant was needed and in 1958 it was built at Hilltop Road in St. Joseph, the twin city of Benton Harbor.

Daystrom established distribution centres in other countries. A factory in Gloucester made kits for the British market but also for other European countries. Some, but not all, of the British made kits had a different style to their American

counterparts. They also had a U (for United Kingdom) in the designations. The American made kits that were meant for export (intended for 115V/230V supply voltage) had an E (for Export) in the designations.

## Schlumberger

In 1962 Schlumberger Ltd bought Daystrom Inc. The 1960s and the 1970s were golden years for the famous green-cased Heathkits. Millions of kits were produced, gradually becoming more complex, using integrated circuits and digital techniques and evolving into the computer business.

One line of the Heathkit range that proved exceedingly popular with many were the various receivers they produced. They made both general coverage and amateur bands only sets catering for all aspects of shortwave listening. I offer up just a flavour of the company's wide selection.

## The RG-1

The super little RG-1 receiver, an eight valve, including rectifier and regulator, superhet design, had a frequency coverage of 600kHz to 32MHz in six bands with both shortwave broadcast and amateur bands marked on the tuning scale. The IF is a high 1691kHz (compared with the more typical 455kHz) and there is an accessory socket that can be used for the optional crystal calibrator.

The set, Fig. 1, was produced in a very striking and distinctive green case with a front mounted S-meter and dial lights. It was listed in the Heathkit 1966 catalogue at £39 and 16 shillings (20 shillings to the Pound in those days) as a kit or £53 assembled (*almost £950 in 2017 money – a lot of money for a basic receiver!* – Ed.)

## The RA-1

The RA-1 was the amateur bands only version of the RG-1 covering the 160, 80, 40, 20, 15 and 10m bands across the full tuning dial of the set. It used eight valves:



Fig. 1: The RG-1.



Fig. 2: The RA-1.



Fig. 3: The HR-10.





Fig. 4: The SB-301.

EF183, ECH81, EF183, ECF82, EB91, ECL86, EZ80 and OA2. Many older readers will recognise these as a very typical valve line up of receivers of the time.

The set, Fig. 2, had a 1621kHz IF with a half-lattice crystal filter to sharpen up the selectivity. The receiver is listed in the 1966 catalogue at £39/6/6 (39 pounds, six shillings and six old pence), £52 and 10 shillings assembled.

### The HR-10 Receiver

The HR-10, 1967 to 1975, was similar to the RA-1 but with amateur band coverage only on 80 through 10m. Each band is separately calibrated on a large, easy-to-read slide-rule dial. The tuning dial, Fig. 3, is illuminated and provides over 6in of bandspread for precise frequency settings. A carefully-designed diode detector, plus BFO, tunes AM, CW or SSB signals. The seven valve, no regulator fitted, superheterodyne circuit featured an RF stage for added sensitivity and again employed a half-lattice crystal filter for excellent selectivity. The line up is 6BZ6, 6EA8, 6BA6, 6EA8, 6BJ7, 6EB5 and a 6X4 rectifier.

Two IF amplifiers operating at 1680kHz provided good image rejection. Other features included: S-meter to aid in tuning, a three-gang tuning capacitor to assure proper tracking of all circuits, a front panel dial calibration control and provision for a plug-in 100kHz crystal calibrator to provide accurate dial calibration at any 100kHz point across the band.

An accessory socket was provided on the rear chassis apron for receiver muting when used with a transmitter and a speaker jack is provided for use with any 8Ω loudspeaker. The receiver weighed 9.5kg (21lbs).

### The SB-301 Receiver

The Heathkit SB-301 amateur bands only receiver kit replaced the SB-300 in 1966 and included a few refinements over the 300. The SB range of sets included matching transmitters, transceivers and linear amplifiers, all housed in a very distinctive rounded-edge cabinet.



Fig. 5: The Mohican.

The SB-301, Fig. 4, is a 10-valve dual-conversion superheterodyne receiver. All oscillators employ crystal control for excellent stability except for the local oscillator, which came preassembled and linearly tunes from 5.5MHz to 5.0MHz in five full turns of the shaft. The SB-301 receives the original five non-WARC amateur bands 80 through to 10m in eight switched ranges.

Each band is 500kHz wide so the 10m band is divided into four separate 500kHz segments on the bandswitch. The SB-301 also has an additional position on the bandswitch that covers 15.0 to 15.5MHz, allowing reception of the WWV standard frequency transmission at 15.0MHz. This band was not available on the SB-300 model. An additional feature of both the SB-300 and SB-301 is the ability to mount two VHF converters on the back of the main cabinet.

Heathkit made the SBA-300-3 for the 6m band although at the time the band was not available in the UK. There was also the SBA-300-4 for the 2m band. These converters cover the first two megahertz of the band and used the 10m range as the tuneable IF.

### The Mohican

The Mohican was Heath's first all transistor, nine of them, general coverage shortwave and broadcast receiver. Intended primarily for the shortwave listener and for portability, it includes a calibrated bandspread for the amateur bands and a beat frequency oscillator (BFO) for copying CW and SSB. 1960 was the year of introduction for the earlier GC-1 version of the receiver with a GC-1A being available from early 1962 until 1968. Apparently Heath made a kit of parts available to upgrade the performance of the early GC-1 "for Mohican owners who have experienced excessive distortion in the audio system or difficulty in obtaining stable operation in the higher frequencies".

The Mohican, Fig. 5, GC-1U for the British version, requires 12V DC and draws a maximum of 35mA. Power is provided by either eight D batteries or the optional XP-2



Fig. 6: The QPM-16 Q Multiplier.

AC Power Supply. Due to the extensive use of PNP transistors in the Mohican, Heathkit designers chose to make the chassis positive ground. This means that if you choose to power the unit with an external power supply, the metal chassis should be at 12V DC positive potential.

The coverage is 550kHz to 32MHz in five ranges, with bandspread scales for the 80 to 10m amateur bands and 11m CB. Modes are AM/CW/SSB. There is a built in 50in telescopic whip antenna. The GC-1U is in the Heathkit 1966 catalogue at £37/17/6 as a kit or £45/17/6 assembled.

### The Q Multiplier

If you had a receiver and wanted to improve its selectivity, then Heathkit even helped there. The QPM-16 Q Multiplier worked on sets with a 1.6MHz IF while the QPM-1 was for sets with a 470kHz IF. The unit, Fig. 6, is connected to the IF circuit of a receiver and can be used, very basically, to increase the selectivity, or sharpness of the IF response, making it easier to pick out wanted signals on a crowded band.

In a 1968 edition of *Wireless World* it was advertised at £8/10/0 as a kit or £12/14/0 assembled.

### Hours of Fun

I think it's sad that today's amateurs do not have the opportunities to construct such sets. The building of the set taught the would-be amateur more than any book could. You had to learn to read circuit diagrams, master good soldering technique, how to follow a set course of actions as laid down in the comprehensive manuals and a tried and tested method of aligning and fault-finding any problems. It gave you confidence and the joy in finally completing your transceiver, built by your own hand, was something to cherish.

Of course, in today's mad world of safety first, the idea of letting anyone build a mains-powered set with possibly several hundred volts on the transmitter anodes, on their own, unregulated and without safety goggles is ludicrous but we all did back in the day and most of us are still around.





# An RF Field Strength Indicator

**Rob Dancy G3JRD describes a simple-to-build field strength indicator than can be the basis of some handy antenna measurements.**

**T**his is a description of a simple RF electric field strength indicator for checking the effectiveness of different antennas and their radiation patterns. It is capable of detecting signals from 1.8MHz up to microwave frequencies and is sensitive to the direction of polarisation. It is not capable of an actual measurement of the field strength but provides very useful comparisons.

## Details of the Unit

A 150mm length of copper wire acts as the pick-up antenna and a germanium diode detector is used to charge a capacitor, the resultant small voltage being fed to the input of an LM741 Op Amp. The gain with a 1.5M $\Omega$  negative feedback resistor between pins 6 and 2 is sufficient for most purposes but can be changed by using lower or higher value resistors. Increasing

resistor value gives more gain. The LM741 has a frequency limit of less than 1MHz so RF pickup at its input is not a problem at any frequency above 1.8MHz. The circuit diagram is shown at Fig. 1.

## Construction

I used Veroboard for construction as in Fig. 2, which shows the component layout. Fig. 3 is an underside view of the board, indicating where to cut the strips. A parts list appears in the sidebar. The total cost was about £25 – less if you have the typical amateur's junkbox. I opted for 8-pin and 18-pin IC sockets rather than soldering the ICs directly to the board because it is easier to fault-find in the unlikely event that the unit does not work. Make sure that no tracks are shorted out, that all necessary breaks in the tracks are cut and that all the links are in place.

I could have used a moving-coil meter for the display but the LM3914 bargraph IC is readily available and inexpensive. If high brilliance LEDs are used, spaced at least

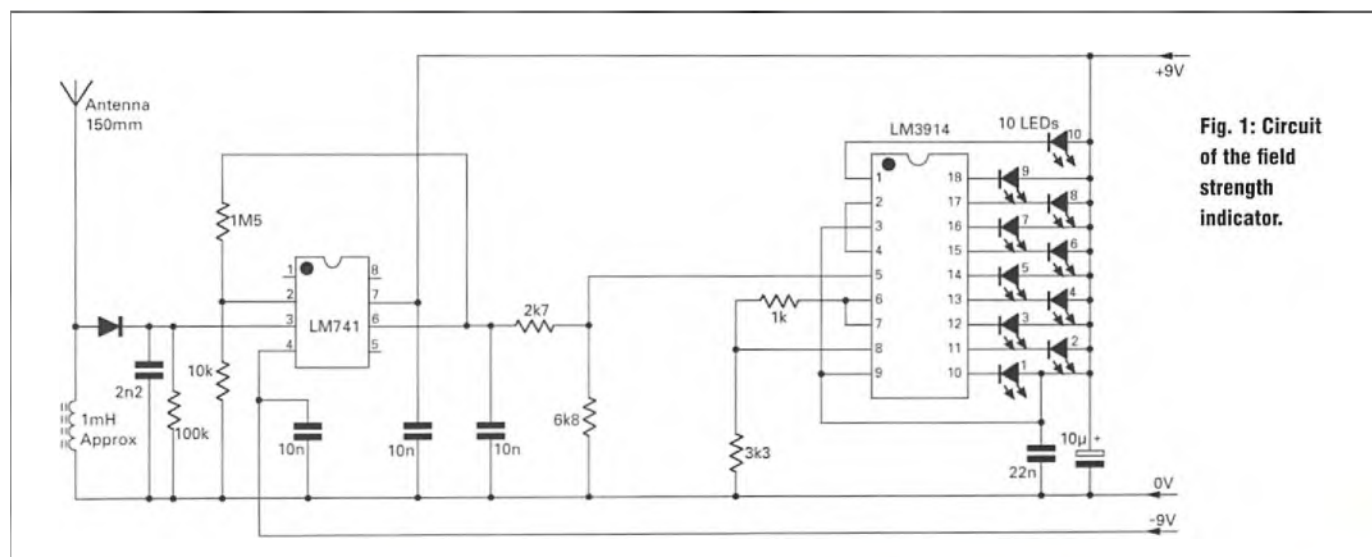
10mm apart, it's easier to see the 'reading' at a distance. Using 8mm diameter LEDs gives good visibility.

Component values are not critical. The 0.01 $\mu$ F capacitors are preferably ceramic decoupling types if you have them. If not, use any ceramic ones that are near that value.

I found the LEDs are best wired independently using light gauge wire. Make sure that the orientation of all the LEDs is correct (the longer lead is the positive and the one by the little flat on the plastic base is the negative).

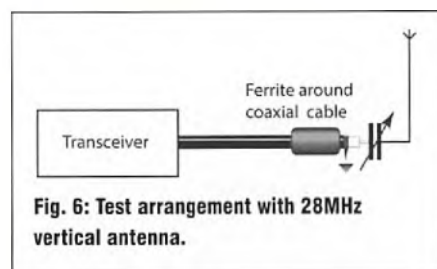
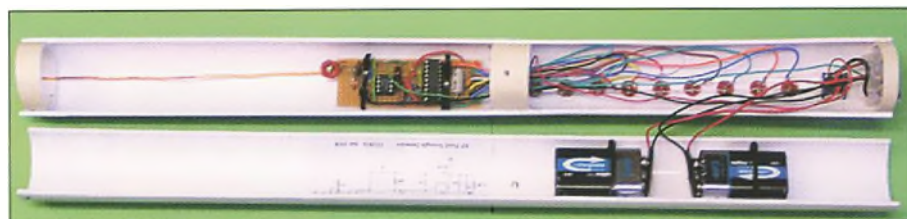
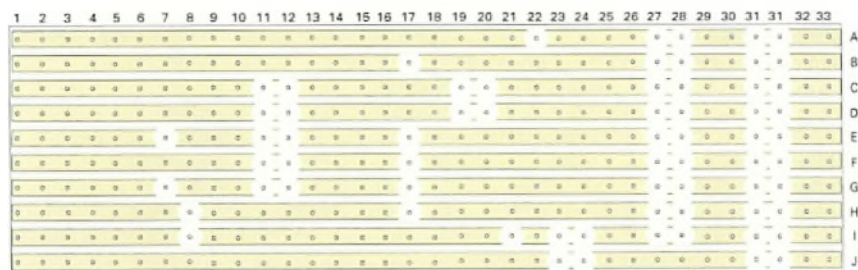
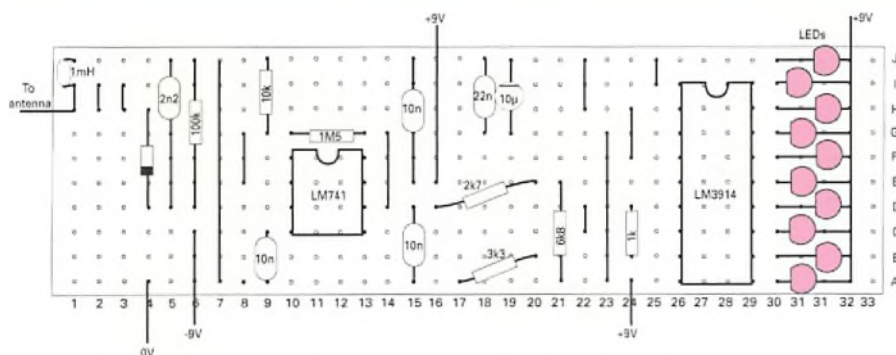
I used two rechargeable PP3 9V batteries and extended the three terminals to the positive, common and negative with short wires to a connector so that the batteries could be easily recharged. Alternatively, you could use a non-rechargeable PP3 for the negative supply given that the drain is very low, or one of those ICs that convert a positive voltage to a negative one (the ICL7660 for example) to give -9V.

A 450mm section of easily obtained white plastic drainpipe 2in (5cm) in diameter was very satisfactory for mounting the unit in, Fig. 4. The tube was split lengthways down the middle and the LEDs mounted along one end. By heating the tube, the LEDs can be pressed into slightly undersize holes, which will hold them firmly when the plastic cools. Boiling water is not hot enough to soften the tubing but using a fan heater within



**Fig. 1: Circuit of the field strength indicator.**





about 150mm will soon soften the plastic sufficiently. But be careful!

One way to combine the two halves of pipe is to cut three 20mm lengths of the plastic pipe and then take a small section out of each lengthwise to reduce their diameter. They can then be glued inside one of the half-sections as seen in the inside view, **Fig. 5**. Place the two halves together and drill a small hole through both the outer pipe section and the small piece near the centre, and a single self-

tapping screw can hold the unit together. No doubt there are other equally good ways to hold them together and/or to mount the unit.

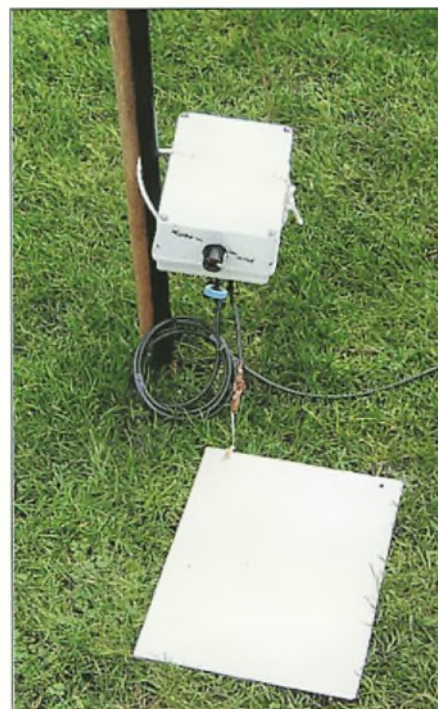
### Characteristics of Unit

The unit was found to have enough sensitivity for testing at low levels of transmitted power of around 5W. Surprisingly, it also responded when held next to a microwave oven, indicating the usual very slight leakage near to the door seals. Given that it was a new oven I tested it on, it was presumably a safe level and we have had no problems. If the leakage radiation is too high, your eyes can be severely damaged. Worth checking!

The unit is sensitive to polarisation as you would expect. When using a quarter-wave vertical antenna on 28.5MHz, a full reading (with all LEDs glowing) was obtained when the tester was held

### Components Required:

1mH inductor  
Germanium diode, e.g. OA81  
LM741 op-amp  
LM3914  
IC bases  
Resistors 1k $\Omega$ , 2.7k $\Omega$ , 3.3k $\Omega$ , 6.8k $\Omega$ ,  
10k $\Omega$ , 100k $\Omega$ , 1.5M $\Omega$   
Switch DPDT  
Capacitors 3 x 0.01 $\mu$ F, one each 0.02,  
0.002, 10 $\mu$ F  
Veroboard  
Two PP3 rechargeable batteries  
Battery clips  
Ten LEDs



**Fig. 7: The 28MHz vertical with a stainless steel plate as 'earth'.**

vertically and it progressively went down to zero as it was rotated 90°, to bring it horizontal.

### Tests with a 28MHz Quarter-Wave Vertical Antenna

I carried out tests on the 28MHz band using a vertical Extended Marconi antenna, with a length slightly over 2.1m (9ft), held on a glass-fibre rod and fed with 50Ω coax, **Fig. 6**. The feeder had a turn through a ferrite ring close to the base of the vertical and a small coil of the coax, as seen in the photograph, **Fig. 7**. Only a few watts were used for the tests. Such low-level signals would not be likely to cause any serious QRM to other band users. The RF field strength indicator was placed on a pole 2.5m above ground about 9m



away from the transmitting antenna and I transmitted a 4W signal on 28.5MHz.

The results of various earth connections were interesting. The first surprise was the 0.2 x 0.3m sheet of stainless steel, seen in Fig. 7, lying on the ground and connected to the coax outer. This gave a high indicated radiated field strength. Raising the plate 10mm had no effect and even 15mm up from the ground, the apparent reduction in radiation was only about 25%. I tried a cross formed from two 10mm copper tubes, 0.6m long, with equally good results. Those funny little stubs at the bottom of commercial antennae probably do something useful, after all.

I then made some tests using various earth connections, **Table 1**. The results suggest that RF currents are only on the surface, as the books say.

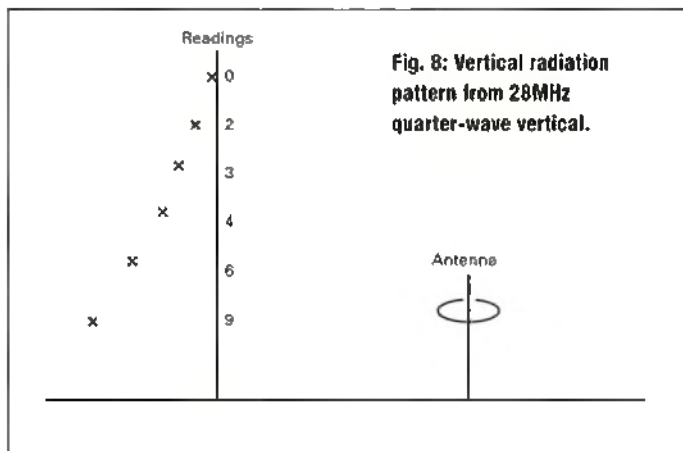
Next, I carried out some testing of the vertical radiation pattern by progressively lifting the detector up on a light line, about ten metres away from the transmitting antenna. The results, **Fig. 8**, showed a good low-angle reading, with very little disappearing upwards. The textbooks were right again but it is nice to have some real, physical proof and boosts your

**Table 1:**

| Type of earth                                             | Indicated level                  |
|-----------------------------------------------------------|----------------------------------|
| 300mm of 15mm copper horizontally just below ground level | 4                                |
| 50mm of 15mm copper just below ground                     | 4                                |
| 1.2m earth rod driven into the ground vertically          | 3 (surprise, approx. 25% lower!) |

confidence that DX can be worked.

The horizontal pattern was less easily determined because of various obstructions but gave a good insight into how local topography affects radiated signals. Google Earth was whipped into action to get a good close-up antenna view of the 'estate' and the field strength noted at various positions. The results showed that the radiation pattern was highest towards an open field on one side but was considerably reduced behind a telephone pole and a small tree, even in dry weather and with no leaves on the tree. This was also the case behind the steel-framed



garage until several feet above its roof.

Build a unit for yourself and have fun with your own experiments. You might be surprised and it could lead to you improving your antenna efficiency. It might also be useful as a small building project when teaching budding radio amateurs.

## J. BIRKETT.

### ELECTRONIC COMPONENT SUPPLIERS

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GLASS REED SWITCHES 6 FOR £1.00  
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[www.zyra.org.uk/birkett.htm](http://www.zyra.org.uk/birkett.htm)

TOGGLE SWITCHES DPDT 3 AMP @ £1.50 EACH  
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SMALL BLACK KNOBS SCREW THREAD 6mm HOLE @ 50p EACH OR 5 FOR £2.00  
MES LAMPS 8 VOLT, 12 VOLT, 50 VOLT ALL @ 10 FOR £1.00  
TOKO CERAMIC FILTERS 10.7MHz @ 3 FOR £1.00  
5UB-MINIATURE ELECTROLYTICS 470F 16VW @ 8 FOR £1.00, 470F 25VW @ 8 FOR £1.00  
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# Noise Tuning Bridge

**Tony Nailer G4CFY develops a noise tuning bridge, taking his usual approach of describing the trials and tribulations he encounters along the way.**

In *Doing it by Design* in *PW* July & September 2012 I developed the classic single-ended noise bridge into a version with push-pull drive. This moved the technology of noise bridges forward significantly by creating a near perfect balance across the bridge transformer.

Prior to this the single-ended drive versions had all sorts of gimmicks applied to create a reasonable balance at 30MHz, although none of them did it really well without leading to calibration problems across the range.

The push-pull drive version resulted in excellent balance up to and beyond 50MHz. The design, though, was initially for a piece of test equipment to be used in setting up an antenna. It included a switch to put it into circuit and after obtaining a match using an antenna tuning unit (ATU), to manually switch it to bypass. The circuit of the original version is shown in Fig. 1.

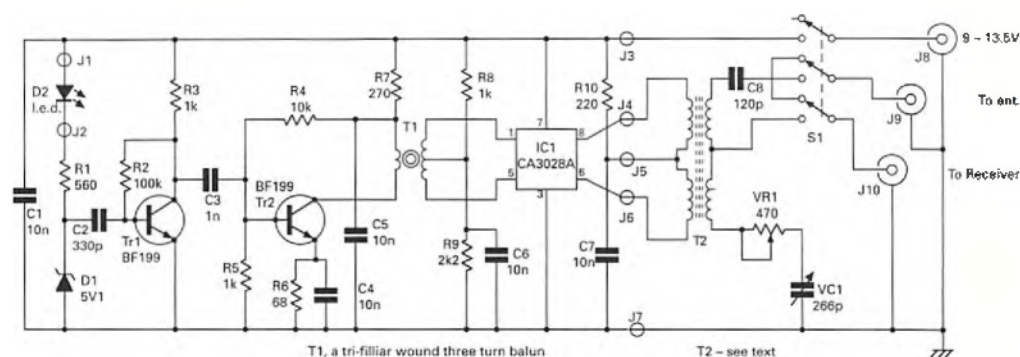


Fig. 1: The original noise bridge circuit from July and September 2012 *PW*.

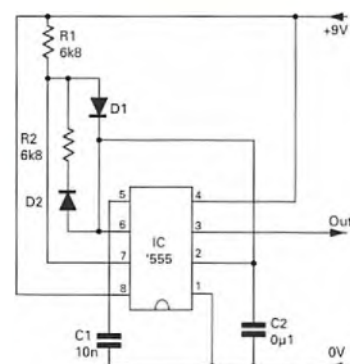
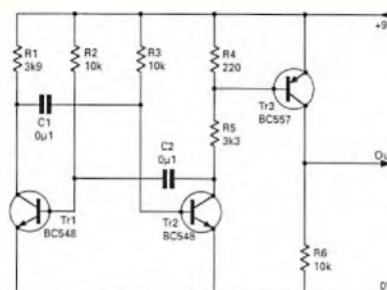


Fig. 2: The 555-based noise bridge circuit, redrawn from 1985 ARRL Handbook.

Fig. 3: A basic astable multivibrator circuit using discrete components.



## New Bridge Circuit

For a long while I have been intending to make a version with RF sensing and switching that can be used in conjunction with a transceiver and left in circuit to look after itself.

The original push-pull version had gain provided by the two transistor amplifiers followed by the CA3028A and produced an output in excess of 5mV when unbalanced. Considering the notch created by matching the antenna would likely be no more than 30dB and the background noise floor in most locations is less than S6, say 6μV, the bridge output is excessive. It only really needs to be quite a lot less, say 300μV.

I built a noise bridge using an original board and created a new small bridge transformer using seven turns quadrifilar wound on an FT37-61 core. Testing with the aid of a spectrum analyser showed that it worked just as well as the original version, which used an air-wound bridge transformer.

One side of the bridge transformer was terminated with a 56Ω resistor and the other side was taken to a 220Ω trimpot. When the trimpot was adjusted for balance, the noise dropped to the background noise floor of the analyser. When the trimpot was removed and the circuit was radically unbalanced, the spectrum of noise was in excess of 5mV at 5MHz but fell off by about 20dB to 100MHz.

I removed the first transistor stage and fed the diode noise directly into the second transistor. This produced an excellent result when unbalanced, with noise now about 300μV and only falling to 100μV at 80MHz. With a much lower noise floor in the low VHF spectrum, this unit can then be used on all the HF bands plus 6m and 4m.

## 555 Timer Modulator

In the 1985 edition of the *ARRL Handbook* there appeared a noise bridge with a 555 timer to provide modulation. The circuit is redrawn here as Fig. 2. I built it using an experimenter panel, comprising rows of vertical sockets linked together and with a horizontal row above and below for supply rails. It didn't work!

I thought the problem was that I had used a 7555 timer so I changed it for a basic 555 but it just sat there with the output not producing a square-wave. Checking with the *555 Timer* booklet by Signetics, the circuit for a near 1:1 mark-space ratio square-wave is very similar to that of the ARRL. I changed the circuit to that of the Signetics book but it still didn't work.



## Discrete Astable Modulator

Not to be beaten so easily, I fabricated a two-transistor astable multivibrator with an additional switching transistor at its output, as shown in Fig. 3. It did do something – at least the multivibrator bit worked – but the output stage was barely switching. The frequency was only around 400Hz because I had used 22kΩ resistors from the transistor bases to the supply rail. Changing these to 10kΩ gave a frequency of about 750Hz.

The output stage was not switching because the resistor R4 was initially 1.2kΩ and clearly not low enough to ensure that the transistor turned off properly. As the value was reduced, so the wave increased in amplitude, although it was a sawtooth shape. With a value of 220Ω the output was a rail-to-rail square-wave with a 4:6 mark-to-space ratio.

When connected to the LED feeding the noise diode, the wave was back to a sawtooth again. Also, the circuit used 11 parts so was not an ideal solution.

## Logic Astable Modulator

An alternative could be an astable multivibrator using a 4011 logic integrated circuit, such as I use in a 1750Hz repeater toneburst unit.

I copied this and adjusted the component values to give around 700Hz. Again it was fabricated on experimenter board and worked first time. The frequency was actually 880Hz because I was using a 22kΩ resistor in conjunction with a 22nF capacitor for timing. Changing the resistor to 27kΩ brought the frequency to just where I wanted it.

I connected this modulator to the noise bridge board and the square-wave held up nicely. Modulated output was clearly discernible to beyond 100MHz. I adopted this as the best solution and it is shown at the top left of Fig. 4: IC1:B, IC1:A and IC1:C.

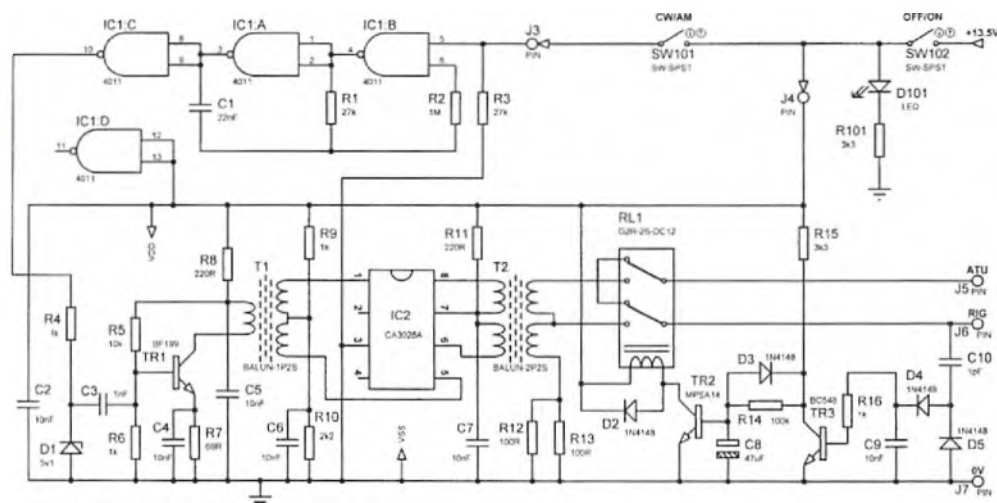


Fig. 4: The complete noise tuning bridge, RF switched and with modulation option.

The gate IC1:D is not used but must have its inputs tied either to supply or to ground and must not be left floating. With pin 14 being the supply input  $V_{DD}$  it made sense to link pins 12 and 13 to pin 14.

I added a CW/AM facility by means of switch SW101 and a pull-down resistor R3. When SW101 is open, the input pin 5 of IC1:B will be low and its output pin 4 will sit constantly high. With the inputs of IC1:A high, its output will be low. With the input of IC1:C low, its output will be constantly high. The astable multivibrator won't run and the noise will be unmodulated.

When the input pin 5 is pulled up by closing the switch, IC1:B and IC1:A oscillate and IC1:C buffers this from the loading effect of the series resistor and noise diode. The noise will be modulated at about 700Hz by a square-wave.

## Testing the Basic Circuit

I decided to do a real world experiment using a throw-out antenna some 5m long run along the product shelf and round the corner to the store rack. This was plugged into my receive series-parallel capacitor (SPC) ATU and the output of that connected in place of the trimpot.

A front view of the setup is shown in the photo, Fig. 5. There is also a view from above of the same setup in Fig. 6. The output was again monitored on the HP spectrum analyser and Fig. 7 shows the noise response across a range from DC to 40MHz in 5MHz steps. The vertical scale is 10dB per division and is about 1mV at the centre line. You should easily discern a notch at about 21MHz going down to about three divisions (30dB). This is where the ATU has tuned the 5m wire to balance with the 56Ω resistor on the opposite arm of the bridge transformer.

The effect of the SPC arrangement of ATU is that it always gives a lowpass response. This results in the noise spectrum being reduced towards the top of the frequency range as against what occurs when the ATU is not in circuit. Even so, the right-hand side of the screen is 40MHz and the noise is two divisions (20dB) down from the centre line, making it around 100μV, equivalent to 6dB over S9.

## RF Sensing & Switching

For RF sensing and switching I again used a



Fig. 5: A front view of Tony's test setup.



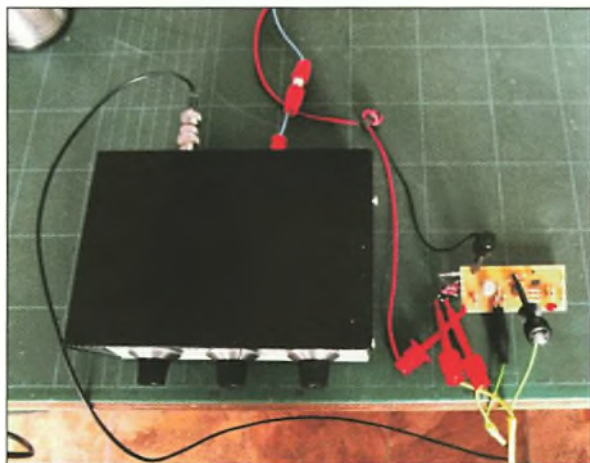


Fig. 6: A top view of the test setup.



Fig. 7: A display of the noise tuning bridge output as seen on an HP spectrum analyser.

circuit block that has served me well for decades and is used in my receive preamplifiers and in the QRP Transmitter Attenuator. It has a relay normally energised during receive by TR2; actually a Darlington transistor that has the base pulled up by R14 100kΩ and R15 3.3kΩ.

It takes about half a second (500ms) to initially switch to receive mode and means the unit will be drawing the relay current of  $13.5/280 = 0.048\text{A}$  or 48mA plus that required by the other active devices. The circuit shows the relay in transmit mode or when the unit is switched OFF.

When RF power in excess of 500mW is applied to the RIG terminal pin J6, a proportion sampled through C10 1pF rapidly switches on TR3, which in turn rapidly discharges C8 via diode D3 and allows the relay to deactivate in less than 40ms.

When the RF is removed, it again takes about 500ms for the relay to reactivate. This monostable operation ensures that the relay operates quickly enough when going into transmit but doesn't drop out during speech syllables when operating on single-sideband (SSB).

### Concluding Remarks

The modulator and modified bridge section have been proved during this development and the RF switching circuit is well proven. Time being at a bigger premium during the summer months with the requirements of hedges, grass, and garden weeding, I didn't have time to lay out a printed circuit board (PCB) or work out the details of a boxed unit. The PCB, box and hardware, assembly and wiring will be concluded in the next issue of *DiD*.

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# What You Can Do with a VHF/UHF FM Handheld

**Colin Redwood G6MXL continues to look at VHF/UHF analogue handhelds and considers some of the aspects of the hobby that can be explored with one.**

**L**ast month I looked at programming repeater parameters using the CHIRP software. The next step is to listen for activity on a local repeater. If you haven't heard anything, you may be out of range of the repeater so I suggest trying a better location. If you have been indoors, try moving out of doors, to a location with a relatively clear take-off in the direction of the repeater. If this doesn't work, then try a different repeater and/or an external antenna mounted above the ground. Sometimes repeaters are taken off the air for a variety of reasons so I'd suggest checking with another local amateur to eliminate this as a possible cause.

## First Repeater QSO

Firstly listen to make sure that there isn't a QSO already taking place on the repeater. Then put out a call. I suggest something like "This is G6MXL, Golf Six Mike X-Ray Lima, checking access to GB3SD". Obviously you will need to replace G6MXL with your own callsign and replace GB3SD with your local repeater's callsign. Don't talk too fast, and don't whisper, because some repeaters require a few seconds of well-modulated audio to latch-up.

While transmitting, check that the display frequency on the transceiver has changed to the repeater's input frequency. If not, then you'll need to re-check that you have correctly entered the repeater's input frequency into CHIRP.

Assuming that the repeater is receiving your signals, you can expect to hear it respond with some Morse code. If you are lucky, another station will respond. Once you have finished, the repeater will send some more Morse before closing down. Either way, you can be pretty certain that your transceiver is working.

If you weren't successful, it's worth checking that you are not using a low power setting on your transceiver and that you are using the correct CTCSS tones for the repeater.

## Simplex

Having checked out the transceiver through the local repeater, why not try a simplex contact? Tune to either 145.500MHz or 433.500MHz and try calling CQ. If you get a reply, then agree on a frequency to move to (perhaps 145.450 or 433.450MHz) and after checking that it's free, you could have a QSO without tying up the local repeater. I'd suggest referring to the relevant band plan to help choose a suitable frequency.

## External Antenna

Almost without exception, handheld transceivers are supplied with a small flexible whip antenna. In most cases the antenna is attached using an SMA connector. Knowing that my location is not a particularly good VHF site, I used my dual-band 2m/70cm vertically polarised 'white stick' antenna, Fig. 1, mounted on a pole at about 6m above the ground and fed with UR67 coaxial cable. Inside the shack I made up a short patch lead in RG58 cable with appropriate connectors and an adapter to the SMA connector used on my handheld.



**Fig. 1:** An external vertically polarised antenna mounted high up and fed with low-loss feeder will certainly increase the range over which you can hear and be heard.





Fig. 2: A slow-scan TV picture received from the ISS.

## Satellites

There are a number of amateur satellites that use 2m/70cm FM. It is surprisingly easy to make contacts through them and a handheld can be an ideal transceiver to use. I looked at satellites in the February and March 2016 *What Next* columns and there are frequent reports of satellite QSOs with simple equipment in Tim Kirby G4VXE's *World of VHF* column.

## Data Modes

A handheld transceiver can also be used for a number of data modes. Sending and receiving slow scan television (SSTV) and RTTY signals on VHF/UHF FM is absolutely possible. Over the years, there have been a couple of SSTV nets on 2m FM in my area, although these seem to have died out recently.

There are opportunities from time to time to receive SSTV pictures from the International Space Station, Fig. 2. The signal strength from these pictures is such that I would certainly recommend opening the squelch fully. You'll need to know the time of the pass, the frequency on which to listen (and be prepared to adjust this slightly due to Doppler shift) and the SSTV mode being used for the transmission.

In order to use data modes with a handheld, you'll need to find out which sockets are used for an external microphone and headset. Many handhelds use the standard shown in Fig. 3. Some manufacturers will provide details in the instructions that come with their transceivers. For others, such as the Baofeng UV-5R, I found the necessary information on the internet.

## Mobile

While a handheld transceiver can be used by a passenger in a moving vehicle, I would strongly advise against using one as a driver. Regardless of the law, there is no doubt in my mind that holding a

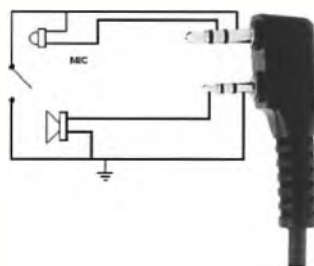


Fig. 3: Connections for using the Baofeng UV-5R with data modes. The spare pins are used for loading data into the transceiver's memories.

transceiver or just a microphone while driving is a dangerous distraction. If you really insist on operating while driving, then you should certainly use a suitable hands-free microphone/PTT. I'd suggest doing some tests to make sure that the transmitted signals don't interfere with the vehicle's electronics, particularly if using the set-top antenna rather than an external antenna.

## WAB, SOTA and Similar

Small portable transceivers are ideal for making contacts towards various award schemes such as Summits on the Air (SOTA), World Wide Flora and Fauna (WWFF) and Worked All Britain (WAB) because they are easily transported to remote places. I took the Baofeng UV-5R I mentioned last month on a recent holiday to North Wales. I caught the mountain railway up to the summit of Mt Snowdon. I called CQ for about 15 minutes on 145.500MHz (the 2m FM calling frequency) without any replies, Fig. 4. I also tried a few calls on 433.500MHz (the 70cm FM calling frequency), without success.

Fortunately, I had previously researched the local repeaters and programmed them using CHIRP into the memories of the Baofeng UV-5R, as I described last month. I called through the new Harlech 2m repeater GB3DW and was pleased to get a reply from Bob MWORHD. We then switched to a simplex frequency and exchanged good reports to complete a SOTA, WWFF and WAB contact. I wish I could have stayed longer and made a few more contacts to meet the requirements of at least four contacts for a full SOTA activation but I really didn't want to miss the train back down the mountain to Llanberis! Active SOTA enthusiasts tend to advertise their forthcoming activations on the SOTA internet reflector so that SOTA chasers know when and where to look for them.



Fig. 4: Operating from the summit of Snowdon in North Wales.

## Repeaters

My experience on the top of Snowdon shows the importance of making use of local repeaters. Many radio amateurs listen to their local repeater while in the shack. Listening on the 2m and 70cm calling frequencies is certainly less common than it once was. I would refer readers to last month's *What Next* column where I described how to program the necessary repeater parameters into an analogue handheld using the CHIRP program.

## RAYNET

There are numerous RAYNET groups around the country that provide communications in times of emergency, when normal communications via landline and mobile phone are out of order. In addition, RAYNET groups provide communications to various events such as charitable walks to ensure their preparedness for disasters. A key aspect of RAYNET operations is the assumption that mains power is not available, so battery powered equipment such as



handheld transceivers really come into their own. If you are interested in getting involved with RAYNET, I'd suggest getting in contact with your local group. The RSGB website has plenty of useful information on RAYNET and there is more on RAYNET's own website:

<http://rsgb.org/main/operating/emergency-communications>  
[www.raynet-uk.net](http://www.raynet-uk.net)

## Community Support

While emergencies are few and far between (although RAYNET members train regularly), radio amateurs are frequently involved in supporting community events such as rallies, sponsored walks and the like. This may be under the auspices of RAYNET, as I mentioned above, but is equally likely to be done through a local radio club. Handheld transceivers are perfect for working across a limited area, for example when directing car parking at such an event. For greater distances, the club may set up a temporary repeater (rebroadcast unit) so that, again, handhelds can be used but can work across a wider area.

## Club Nets

Many local clubs run nets on 2m or 70cm. A handheld transceiver can be used for these. Unless you are located on an elevated site, I would suggest using an external antenna to improve your chances of working more distant members, particularly if they are not line-of-sight. Using an external antenna, I can participate in my club's 2m net on a Wednesday evening. Running 5W, I get good reports from stations several miles away.

If you've not participated in a net before, the main things to remember are to keep your overs short (up to around a couple of minutes) and to pass the transmission to the correct station at the end of your over. Usually the correct station is the net controller but sometimes it may simply be the next station in sequence. I'll look at nets in a bit more detail on another occasion.

Club nets are an excellent way of getting critical audio reports. In my case, it turned out that the initial reports from those participating in the net were not particularly good. At this stage I was using the built-in microphone on my transceiver. Plugging in the optional external speaker microphone made a huge difference, with much better reports.

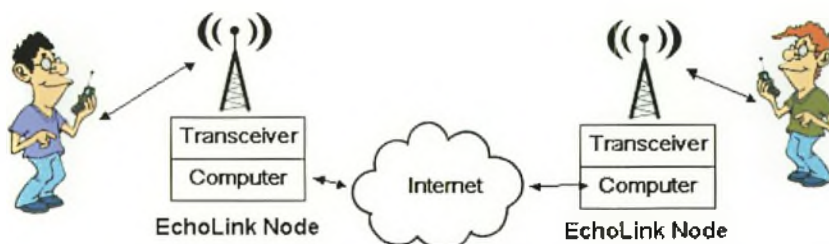


Fig. 5: A simple 'internet assisted' radio-to-radio contact with local nodes connected by Echolink across the internet.

I have used this for all subsequent contacts.

## RSGB FM Contests

Since the beginning of this year, the RSGB have been running a series of FM-only contests on Tuesday evenings. The 2m FM contests take place between 7pm and 8pm local UK time on the first Tuesday of each month. The 70cm FM contest take place on the second Tuesday of each month, also between 7pm and 8pm local UK time.

These are excellent ways to use a handheld transceiver to see just how far you can make contacts. You can help improve your score by operating from a hilltop or by using a well-located external antenna. You don't have to be a member of the RSGB to enter these contests. The low power section is limited to 10W, making it an excellent choice for those with Foundation Licences or operating handheld equipment.

I tried the 70cm contest on Tuesday June 13th using an external 2m/70cm dual-band collinear antenna. Despite calling CQ Contest for almost all of the hour, I didn't get any takers in my area although I have heard activity in previous months. If you intend to take part, I'd certainly suggest trying to get to a hilltop unless you know that there is plenty of activity in your area. I'd also suggest actively calling CQ rather than relying on hearing other stations calling CQ. Details of the contests can be found on the RSGB Contest Committee website:

[www.rsgbcc.org](http://www.rsgbcc.org)

## Special Events and Similar

Handheld VHF/UHF FM transceivers can be useful at a special event station or other similar activity. While many would probably consider the LF/HF bands as the prime ones to focus on, during times of poor propagation the VHF/UHF bands can supplement the activity and provide a source of prearranged skeds to help keep the show on the road for visitors. If

you are well sited, then distances may be greater than expected. I recently helped my club operate a Museums on the Air station from Poole Museum and worked a station on the Isle of Wight some 30km away.

## JOTA

With Jamboree on the Air (JOTA), it is a good idea to get the Cubs and Scouts on the air. If LF/HF propagation is poor on the day, or there are too many contest stations operating, it is useful to be able to fall back on the VHF/UHF bands for some prearranged contacts with a few local amateurs. The station being worked can even be operated by another member of the team outside using an FM handheld transceiver.

## Echolink

FM handheld transceivers can also be used for Echolink. With Echolink it is possible to have worldwide contacts supported by internet links, Fig. 5. Some analogue repeaters also have Echolink facilities.

To use Echolink, you'll need to be able to generate Dual-Tone Multi-Frequency (DTMF) command tones. In the case of the Baofeng UV-5R, this is done by using the relevant keys on the keypad while transmitting. Other transceivers may need a DTMF signalling microphone designed to work with the set. These microphones have a numeric keypad that looks like the numeric keypad on a telephone.

## Conclusions

I hope I have shown that there is much more that can be done with 2m/70cm analogue FM handheld transceivers than just a matter through the local repeater. Nevertheless, I would encourage newcomers to amateur radio to explore the HF bands in addition to the VHF/UHF bands. If you confine your experience of amateur radio to 2m/70cm FM, you'll be missing out on so many aspects of the hobby.



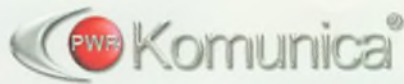


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# Emerging Technology

## Battery-Free Wireless Devices

Regular readers will have read my comments in earlier columns about low power wireless devices harnessing power from other electromagnetic fields around them as well as from solar energy. Well, there's now a new invention of a mobile phone that needs no charger. The phone uses a small amount of energy that it takes from Wi-Fi signals as well as solar energy and has been described by its inventors as the first to use 'almost zero power'. They say that the device uses radio signals both to pick up vibrations from the phone's microphone and to generate sound in its speakers. This technique was mastered during the Cold War when spies used a technique called backscatter, which makes calls by reflecting radio waves, a process that requires considerably less power than modern phones. This is from a team at the University of Washington in Seattle, who created a prototype model that used Skype to send and receive calls and data, with users pressing a PTT (push-to-talk) button to switch between receive and transmit. **Professor Joshua Smith** of the university said, *"The proof of concept is exciting and could impact everyday devices in the future"*. This could mean that our amateur dual-band handhelds in the future may no longer need batteries!

## New Emergency Amateur Modes at Friedrichshafen

I've visited the HAM RADIO exhibition and conference in Friedrichshafen, Germany, a few times in the past and it's currently Europe's largest gathering of radio amateurs, this year with 198 exhibitors. The 2017 event, which will be taking place shortly after I write this, will also host the largest gathering of Emergency Communicators. IARU Region 1 will be hosting a meeting for radio amateurs interested in emergency communications. As well as an open forum for national co-ordinators to report on activities in their countries, RAYNET-UK will give



a presentation on what technology we should be using for emergency communication, with a discussion later that day on how we can have an international network. With an increasing variety of amateur radio emerging technology modes, the results of this should be interesting! I hope to report on this in my next *Emerging Technology* column.

## Electromagnetic Waves Deter Shark Attacks

As a scuba diver myself, I'm well aware of the potential threat from shark attacks in some areas. Although there are relatively very few of these attacks each year, compared to other diving hazards, they do exist and the presence of a shark right next to you underwater, even if there's little or no danger of an attack, is, to put it mildly, rather disconcerting! However recent research into electromagnetic waves when used underwater has shown that these can minimise the risk of a shark coming towards you.

Taking Australia as an example where records of shark attacks are regularly kept, a significant rise in shark attacks from an average of 6.5 incidents per year in 1990 to 2000, to 15 incidents per year over the following decade, rising to 23 in 2014, and 26 in 2016, coincides with an increasing human population, more people visiting beaches, a rising popularity of the coastal lifestyle and the marine activities that come with it, and the increased accessibility of previously isolated coastal areas. A spate

of fatal shark attacks in Western Australia has seen seven deaths over the last three years, with the most recent occurring this April. When a great white shark attacked a teenage surfer, it became the third deadly attack in the state over a twelve-month period.

## Electromagnetic Wave 'Shark Shields'

Shark Shields, a device that emits an electrical field to repel sharks and is attached to a person's ankle or surfboard, falls within a raft of new shark attack prevention methods, or shark mitigation strategies (to use the correct term), that employ the findings of scientific research into shark behaviour, combined with the innovative use of technology, to achieve a more effective, preventative approach, as opposed to the random killing that culling, baiting and nets entail. The ability to sense electrical stimuli is an ancient sensory capability present in all Elasmobranchs, the subclass to which all sharks, skates and rays belong. Sharks detect electromagnetic fields in the Ampullae of Lorenzini, clusters of multiple nerve fibres in gel-filled canals in the head, opening to the surface via pores and functioning as independent receptors. Besides the detection of prey, predators and mates, the system is also believed to help sharks navigate using the Earth's electromagnetic fields.

These highly sensitive receptors can detect electromagnetic fields at levels as low as 5nV/cm (five one-billionths of a volt per centimetre), making the shark an impressive stalker. This is far more sensitive than any of our amateur radio receivers! But if you make that electrical pulse sufficiently powerful, the well known radio 'capture' effect to us, that same sensitivity becomes disorientating and even physically painful, causing muscular spasms that are enough to deter the big fish.

This is the basis behind the 'Shark Shield', which is a device with an electronic control unit typically attached to the ankle of the user, with a 2.2m long flexible mesh trailing antenna. The antenna contains two elongated electrode plates separated at its ends approximately two metres apart. When the device is turned on, seawater surrounding the electrodes acts as a conductor and an electric circuit is completed, forming an electric field that surrounds the user and is repellent to sharks. I think I need to use one for my next diving trip!



### Wireless Shark Detection Buoy

On a related subject, Shark Mitigation Systems Ltd (SMS) is an Australian company based in Perth, focused on developing scientific, non-invasive solutions to mitigate shark attacks. Its 'Clever Buoy' is a near-shore wireless-communicating shark detection system using sonar and identification software to detect sharks and relay accurate, real-time data over radio to the authorities responsible for beach safety. It uses multi-beam imaging sonars that provide a real-time, high-frequency imaging solution. This high-tech sonar is combined with shark-detection software and processing electronics. If a shark is detected, the message is then instantly relayed over radio to lifeguards on the beach with information about both the target and location, so that the alarm can be raised. The company says, "The system needs the object within range for about four seconds for it to be able to interrogate its swim pattern – it's basically instantaneous. From there it's down to the time it takes to get the messaging out, around 10-15 seconds." Another example of wireless emerging technology.



### High Speed Data Over Radio

Many of us use a cellphone for communication, both for voice and data, the current fastest system being 4G (4th Generation). The next system is, unsurprisingly, entitled 5G (5th Generation) but is unlikely to come into use until 2020 at the earliest, a long time off. However, EE, Qualcomm and Sony have recently teamed up to bring super high-speed mobile access to 4G devices. In a recent demonstration event held at Wembley Stadium in London, a gigabit LTE mast was in operation providing real-world internet speeds that fluctuated between 10 and 20 times faster than a typical 4G connection in London. In order for handsets to take full advantage of

these speeds, they will use a four-antenna setup, known as 4x4 MIMO (Multiple Input and Multiple Output), which is, of course, emerging technology at its best. Amateurs, including myself, have used multiple antennas (typically two antennas for diversity reception), especially in a mobile fading environment, and there's even an amateur scanner receiver that uses this technique.



### Millimetre Wave Radio Communication

Radio spectrum is a limited resource but technology companies are building new radio chips that can use extremely high frequencies that have been largely off limits to all but the military until now, apart, of course, from radio amateurs who have been pioneering advances in communication at these microwave frequencies, indeed right up to laser frequencies. These frequencies can carry enormous amounts of data over short distances and they're commercially hardly used today. Millimetre waves occupy the frequency spectrum from 30 to 300GHz. They're found in the spectrum between microwaves (1 to 30GHz) and infrared (IR) waves, spectrum that is sometimes known as extremely high frequency (EHF). At one time this part of the spectrum was essentially unused simply because few if any electronic components could generate or receive millimetre waves. New chips from Qualcomm and Silicon Valley are unlocking this spectrum, which will alleviate spectrum scarcity in densely populated areas once it's enabled by small cells. That means higher data rates and more generous data limits for radio devices and for fixed-location services aimed at rural homes and farms. Good news for rural inhabitants, perhaps.

### Terabit Satellite

While radio communication satellites, which have been pioneered and significantly advanced by radio amateurs,

can reach remote and hilly areas where it's uneconomical to install landlines or to build wireless base stations, their traditional performance limitations have made them a last resort for fixed broadband communication applications. The world is currently encircled by 400 or so commercial satellites with an aggregate capacity of about 2.5 Terabits (2,500 gigabits) per second. But what happens if one company launches three satellites with a Terabit each?

Homes, businesses, aircraft, ships and oil-drilling platforms that currently stumble along will get an upgrade in the form of service plans that go from 100Mbps to 1Gbps in these satellites' service areas. Satellite will still be challenging for highly interactive applications such as voice and video conferencing but for all other applications, such satellites will be invaluable. The first group of Viasat-3 satellites is set to launch by late 2019 and subsequent launches will be cheaper thanks to reusable rockets being developed by Space-X. Voilà, a world in which every place will be connected. This will deliver 100Mbps service to remote residential properties in Europe, the Americas, the Middle East, Africa and Asia. The company claims that work is already underway on the first two satellites and that Boeing is already preparing them for launches by the end of 2019. This is yet another case of radio amateur-inspired emerging technology helping the world to communicate.



See you soon as I explore the future on behalf of PW readers. Chris G4HCL.





# ICQ Amateur Radio Podcast

Many readers will have come across the ICQ Podcast and PW's editor was interviewed for ICQ at last year's Newark Hamfest. Here's a look behind the scenes.



"I had just made the decision to stop watching Formula One Motor Racing to regain 54 hours per year back in my life", remembers **Martin Butler M1MRB/W9ICQ**, looking back on the conversation that started the ICQ Amateur/Ham Radio Podcast nearly nine years ago.

"I received a call from my eldest son, who asked if I had heard of podcasting", says the father of three from Carshalton in South London. "I knew roughly what a podcast was but had no desire to create one."

A podcast is either a video or audio broadcast file made available on the internet for listeners to download and playback through any PC/Mac or mp3 player (such as an iPod). Some podcasts are chargeable but the majority, like the ICQ Amateur/Ham Radio Podcast, are made available free of charge by their creators.

Martin's eldest Son **Colin** had seen podcasting as the newest wave of internet broadcasting. After working as a website designer during the second phase of internet publishing, podcasting

appeared to offer a publishing platform from a smaller footprint. Colin had seen an explosion in growth of shows covering his two main interest areas, technology and football.

"I wanted to create a show and was looking for a topic area that was not already saturated with content. I knew my father was a keen amateur radio operator and trainer and the hobby seemed under-populated compared to other interests".

Martin, of course, supported his son, lending his time and expertise, losing many more than the intended 54 hours gained by not watching Formula One.

Targets were set for the opening months, included an exit plan if no-one listened to the show after ten episodes and a promise by Colin to become a licensed radio amateur (Colin currently holds the callsign **M6BOY**).

Both being very green and having no idea what they were letting themselves in for, the first show was recorded one Saturday afternoon for release the following day. It quickly became evident that the timescale of recording the day

before release was too tight. The show is now recorded on the Wednesday before the weekend release.

It took four shows to prove that the concept worked but many more to refine the audio quality. However, with the support and assistance of the growing community, both content and quality increased.

"Looking back over the early shows, they were a disaster. However, the early shows are an important part of our evolution so we have made the early shows available for new listeners to download and to our grateful surprise, they are downloaded by new listeners every day", remarks Martin.

## Developing an Ethos

From the first show, Martin and Colin wanted to be a podcast "For radio amateurs by radio amateurs" and this still holds true today. Every listener and contributor has the right to a point of view and a platform to express their opinion. The show has provided the opportunity for many contributors to talk about their passions in the hobby, from technical expertise to training and general operation.

## Can Anyone Get Involved?

Because the show is "For amateurs by amateurs", all input is welcome. The best way to become involved is to contact the team via the website with your idea. They can help you with technical assistance and get your passion to the community.

## Expanding the Team

Over the first 170 episodes, many contributors joined Martin and Colin, providing technical content features, using the growing platform to promote projects and activities passionately to the amateur radio community.

Production problems were becoming apparent due to rural broadband issues in Ireland where Colin is located. Father and son took the opportunity to restructure the show, bring more opinions to the News section by introducing a more vocal roundtable discussion, with Colin taking over a newly created News in Brief section and working on the various communication channels that needed creating and maintaining.

Long-term contributor **Ed Durrant DD5LP**, recently relocated to Germany from Australia, provided a European view, along with UK amateurs **Chris Howard**



**M0TCH/N4TCH** and **Martin Rothwell M0SGL**. **Dan Romanchik KB6NU** providing a North American view gave a greater worldwide appeal to the News section. New contributors joined, including **Leslie Butterfields G0CIB**, **Edmund Spicer M0MNG** and **Matt Nassau M0NJX**.

### Servicing the Amateur Radio Community

While the central effort is the fortnightly podcast show available free from many sources, there are lots of other ways the team produce content for the ICQ Amateur/Ham Radio community.

There is a website (below), a twice weekly e-newsletter detailing new information available on the website and, of course, social media is covered with Twitter updates and a Facebook group. [www.icqpodcast.com](http://www.icqpodcast.com)

The biggest challenge the team have worked to solve is, to the extent possible, to automate as much of the publishing procedure as they can in order to allow a concentration on the show content and audio quality.

### Stepping Away From The Microphone

It's not just about being behind a microphone. Members of the team try to get to as many amateur radio events as possible. ICQ Amateur/Ham Radio Podcast presenters have recently attended HamRadio in Friedrichshafen, National Hamfest in Newark, UK, the RSGB HF Convention, Hamvention in Dayton and many smaller rallies.

Team members are distinctive in bright orange T-shirts and happy to talk about the hobby, or the show or just to share a coffee.

### Funding

Making a commercial profit was never the aim of creating the ICQ Podcast and while this gives freedom in terms of the show's direction, it does limit the amount of financial investment in the production.

The team are therefore very grateful for the financial support they receive from the listeners.

"Our website hosting and podcast publishing costs are partially paid for by the listener donations", comments Colin. "Listeners have also generously donated when we have needed new equipment and upgrades to services. I'm a firm believer that if everyone donates a few pennies if they find value in what we produce, we



Martin M1MRB interviews PW editor Don G3XTT at the 2016 Newark Hamfest.

can improve and continue to do the work, enhancing listeners' enjoyment".

It's not only financial support the team receives. Donations of time, technical features, audio clips, graphics and even coffee have been gratefully received.

For all the members of the team, being part of the show is as much a part of the hobby as operating, contesting or teaching.

### The Future

In the past, the ICQ team have experimented with video content but have no desire to evolve from an audio show to a visual production. Previously the team have recorded video of the 2015 Friedrichshafen HamRadio show and made it available via YouTube. And while there is always the potential to create more video, primarily ICQ will remain an audio show.

With the expansion of the team and faster and more streamlined production techniques, more regular shows are topic for discussion.

"End of the day", explains Martin, "As long as people enjoy what we produce, we will keep on doing what we do".



The ICQ Podcast on location at HamRadio, Friedrichshafen in June 2015.

### How to Get the Show/Take Part

Each episode of the ICQ Amateur/Ham Radio Podcast is free to download. Shows are available either from the website or many podcast directories, including iTunes, gPodder, PodcastAddict, Sticher, Podkicker or Amazon Echo to name a few, and can be downloaded to either a computer, tablet or smartphone for listening.

If you wish to be part of a future episode, contact the ICQ Amateur/Ham Radio Podcast – [info@icqpodcast.com](mailto:info@icqpodcast.com)



The ICQ Podcast team in their bright orange regalia!





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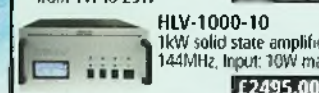
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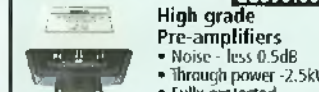
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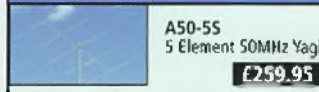
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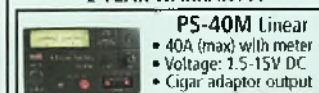
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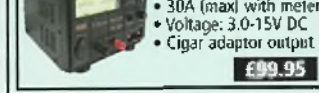
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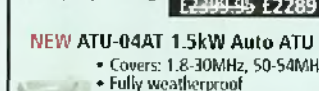
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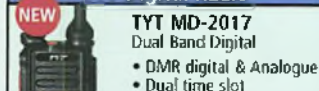
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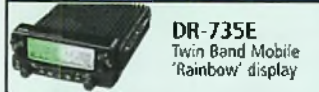


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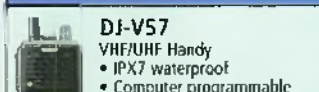
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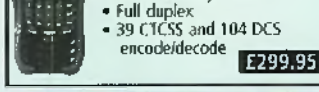
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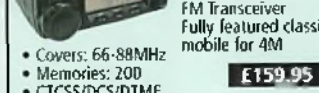
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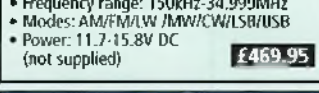
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## My Hobby and Other Matters

Dear Don,  
What's my hobby? Well, obviously, amateur radio. Something I've never been able to escape. Each and every time I try to run from its embrace, it drags me back. And when it does, I'm happy all over again. And wonder just why I ever contemplated such a thing.

But, of course, I do have other hobbies. After all, too much of the same thing can wear extremely thin. So, as you've also noticed because it is 'popular among radio amateurs', photography runs a close third. And in that regard, before the advent of digital photography, I would print all my snaps in my lashed together darkroom while, at the same time, listening to all the thrilling HF happenings on my AR88D. And no, I don't think I'm a 'visual' person either. Well, I can't be, because according to my XYL, I never notice that the washing machine has finished or that it's pouring with rain and the washing is still out on the line getting soaking wet!

My other two hobbies – putting to one side collecting cash – are collecting contemporary art and watercolours along with philately.

Amateur radio has something for everyone as you rightly pointed out. Like me, you can leave it and come back to it. Nobody, whatever their interest, needs to feel excluded. There is something for everyone.

Lastly, if I may, nostalgia is a wonderful thing. However, we cannot spend all our lives there but it is nice to go on a day trip now and again. And on that note, I read somewhere that any sufficiently advanced technology is indistinguishable from magic. Amateur radio fits this description very well. I always remember this when

someone is moaning about the state of modern day amateur radio and why it seems necessary to embrace change, even when it first appears that such change is not apparently needed.

On another topic entirely, my day has been totally ruined! Why? Well, there I was enjoying the current (August) issue of *PW* when I came to the *Letters* section.

Before I get to my main point, Dave Allsebrook G1VAC mentions in his communication that he "would have simply ignored it" – the callsign M3D, that is. I am strangely puzzled by that comment because it is/was perfectly kosher. So why he thought otherwise is still more puzzling. After all, if he'd heard this callsign being used (as a friend of mine did) on the amateur bands and being answered by other operators, it would be reasonable to assume that it was indeed legitimate, wouldn't it?

Then, right at the end of Dave's letter came his bitter bombshell. He is "currently not a member of the RSGB". What? No, that cannot be possible, can it? A UK licensed amateur enjoying the pleasures and camaraderie of our beloved hobby and not a member of the RSGB. And there I was thinking that every right-minded licensed British amateur is a member. How wrong I am. So with that amazing revelation still ringing loudly in both my ears, how many other British amateurs dare to not be members of the RSGB? Dare to daily flaunt their callsigns on any amateur radio allocation knowing they are not fully paid up members of you-know-who?

I can only hope that, in the foreseeable future, Dave mends the errors of his ways and sends the RSGB a cheque. He might like to know that I occasionally travel through the fair city of Derby and I'll keep an ear wide

open for his callsign. Just by way of a pleasant QSO, of course!

**Ray Howes G4OWY/G6AUW**  
Weymouth

*Editor's comment: It's always good to hear from you Ray and I realise the latter part of your letter was written with tongue firmly in cheek. The numbers are difficult to pin down nowadays because the number of licences/licensees on record at Ofcom may not reflect the number still active in the hobby (and some amateurs have multiple callsigns, as indeed you do). But I would guess that about a third of UK amateurs are RSGB members. It's a shame that the proportion isn't significantly higher because, whatever its occasional faults, the RSGB is our principal representative in international licensing matters and, here in the UK, our bulwark against some of the crazy notions that occur to the powers-that-be from time to time.*

## Insurance & Liability

Dear Don,  
I was just looking at your piece about insurance and liability in the July *Keylines* and agree with all you say. I understand the importance of insurance and being in a public place so last year I obtained a quote for cover when my kit is in transit in my car and liability cover while operating portable in public parks and the like. My quote was for £215. I only carry around £600 worth of kit at most and usually only an FT-817 and a wire. I have insurance and liability cover for model aircraft and steam engines worth a lot more for a fraction of that price. Also my son has a package to cover £6000 worth of music equipment and £5 million liability cover while performing

for just £60. These policies are provided as 'special interest' type policies so why is amateur radio cover so expensive? Are our activities so dangerous? Could the RSGB not negotiate individual cover for its members and not just clubs?

**John Harrison G0UBE**  
Kingstanding, Birmingham

*Editor's comment: Thanks John. The RSGB had a recommended insurance agent ARIS (Amateur Radio Insurance Services) for many years but I'm not clear on the current position. A search of their website brings up advice for clubs and for RAYNET activities but not for individuals, unless I'm missing something. Perhaps one or more of our readers can advise on the best way for obtaining individual cover? I recall a story from years ago, perhaps anecdotal, where a radio amateur used the additional cover available on his household insurance to list his radio gear. When his microwave bands gear was stolen, the insurance company replaced it with, you guessed, a microwave (oven)!*

## The Cost of Hearing Aids

Dear Don,  
"I don't know why hearing aids are so expensive" (John Adams G3ZSE, *Letters*, July).

Well, it's one of the many commercial rip-offs. Modern transceivers such as the Kenwood TS-590 or the Icom IC-7300 cost less than a pair of modern digital hearing aids. The transceivers have similar software and hardware incorporated in their much more complex packages. Prices of transceivers are keen and have barely increased in real terms since the 1970s or 80s, due to competition. In contrast, hearing aids probably are sold at keen prices to the



## My Hobby is ...

Dear Don,

I was interested in the section headed *What's your Hobby* in your July *Keylines*. It seems as though my own hobbies are pretty much in line with what you wrote.

I have been interested in electronics since I was about 11, having started with a Philips electronics construction kit before progressing to build projects from *PW*, *Practical Electronics*, *Everyday Electronics* and the like. I still construct the odd project today and also do a lot of repair and restoration work on valve and transistor radios.

The interest in radio came a bit later – in my late teens – and today as well as amateur radio, I do a lot of shortwave listening on my trusty Yaesu FRG-7.

As far as other hobbies go, I am as you say many other radio people are, very interested in photography and also other technical hobbies such as model engineering, woodworking and wood-turning. All of these come in useful for electronics when the need to construct cases and enclosures arises.

I am probably fortunate that I followed a career in electronics that gave me the opportunity not only to increase my practical skills but also to gain technical qualifications (HNC, MSC) that

enable me to design my own projects. The first year of my apprenticeship was spent learning general engineering skills and that sparked the interest in model engineering. Although I didn't realise it at the time, I suppose that I was also encouraged by my dad and granddad, who always allowed me the free use of their tools as a youngster.

I think it's a shame that more young people today don't take an interest in hobbies such as electronics and model engineering. As well as being hobbies, they are useful life skills and enable you to repair something that has broken or gone faulty rather than throwing things away and buying new ones. I wonder how many of the electrical items that get dumped have very simple faults such as a faulty switch or blown fuse that, with a bit of knowledge, could easily be repaired and have their life extended.

Keep up the good work with *PW*.

**Chris Murphy MOHLS**  
Derby

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

NHS but are, I am sure, heavily overpriced to the general public, even bearing in mind the distribution and service network.

It's possible to purchase extremely effective and good quality hearing aids online at around half the typical retail price.

In other words, it's highway robbery and probably amateur transceiver suppliers are not robbing us!

**Bill Abrahams ON9CGB**  
G0MEU  
West Flanders, Belgium

## Help Needed

Dear Don,

I am a visually impaired amateur who is looking for a volunteer to buy and construct the frequency counter featured in the July 2017 issue of *PW*. I will meet all costs plus any reasonable fee. Please phone on 01909 722133.

**Eric Ford G3VRU**  
Workshop

## Items at Hamfests

Dear Don,

I have been to South Normanton Hamfest for the last five years. However, recently I've noticed on certain tables at the Hamfests are people selling articles that have been rejected at car boot sales and charity shops! This I feel should stop because there is no comeback with these people, unlike

charity shops where you will be reimbursed if the goods are faulty.

**Michael Blagg 2E0BSM**  
Mansfield, Notts.

**Editor's comment:** *Thanks Michael. I'm not clear what evidence you have that the articles you mention have been rejected elsewhere or exactly what you are expecting to happen. Frankly, there is no comeback with any sales from individuals at rallies, only with sales from established dealers. Indeed, I've noticed that some items seem to do the rounds from rally to rally! But you do prompt me to observe that there really is a lot of junk at some radio rallies, stuff that I would have consigned to the recycling centre (or worse). Who, nowadays, wants an old VCR player or, indeed, an old TNC, when technology has moved on since they were leading edge products. Having said that, though, maybe they will become the collectables of the future!*

## Revalidation (again)

Dear Don,

Talking to an RSGB officer at a rally in July, I had occasion to check the *RSGB Yearbook 2017* to confirm I was in.

To my surprise, I'm not, not even as 'details withheld'. Yet I knew I'd revalidated online about three years ago. The RSGB representative advised me that logging onto Ofcom and confirming my details was

not sufficient to revalidate my licence – additionally I would need to print off a new copy. This was news to me and since I have not done the licence printing for many years, the possibility arose that I was not licensed.

First thing on the Monday, I went to the Ofcom website and tried – unsuccessfully – to log on. Now quite concerned – was I a pirate? – I rang Ofcom to check my status. The revalidation procedure, I was told, was unchanged; confirmation of details is sufficient. My licence was definitely active (Phew, as they say!). By my contacting Ofcom by telephone like this, I was revalidating again.

The problem I'd had logging on was an IT issue. The software has been changed in the last two years and old passwords, even when entered correctly, are not being recognised. The chap from Ofcom sent me a link to change my password so I did that, then logged on

and updated my mobile phone number just to see for myself that things were fine, which they were.

I write this to remove any confusion readers may have concerning revalidation of their licences and to thank **Mark** from Ofcom, who reassured a very worried G7ETW!

**Tony Jones G7ETW**  
Ruislip, Middlesex

**Editor's comment:** *I wasn't planning to revisit this topic Tony but it's worrying that your details didn't carry over into the RSGB Yearbook. You don't appear on the [qrz.com](http://qrz.com) site, either. So maybe you don't exist (other than that I saw you recently and we have been running your articles here in *PW*!) I wonder if others have had the same experience of disappearing off the radar, even when their licence remains valid.*

44th Welsh Amateur Radio Rally by:

**Blackwood & District**  
**Amateur Radio Society**  
10am Sunday 8<sup>th</sup> October 2017



At **ROUGEMONT SCHOOL NEWPORT GWENT NP20 6QB**

A short distance from Junction 25A or 26 of M4. Ample parking, and admission is £2.50 payable on entry to the large hall where there is plenty of room to move around and meet friends. Lectures during the day.

For further info please contact:

**Mike Rackham GW4JKV**  
01495 226149  
[rackhamone@aol.com](mailto:rackhamone@aol.com)  
**Wynn Wright GW8UAM**  
02920 889156  
[wynnwright7@aol.com](mailto:wynnwright7@aol.com)

Refreshments, Trade Stands,  
Bring & Buy, RSGB Book Stall,  
Raffle & Lectures during the day



Plan your rally visits with our comprehensive list of forthcoming events.

PW Publishing Ltd. will be at shows marked\* – come along to our stand for great deals on subscriptions to *Practical Wireless* and *Radiolife*. Club Secretaries and Event Organisers – please send us details of your event if you would like it to be mentioned here.

## AUGUST

### August 11th (Friday)

#### The 24th Annual Mini Rally Night

The Cockenzie and Port Seton Amateur Radio Club 24th Annual Mini Rally Night will be held in the main hall at Port Seton Resource Centre, South Seton Park, Port Seton, Prestonpans EH32 0BQ. It is an opportunity for you to bring along your 'junk' and sell it yourself. The event will run between 6.00pm and 9.00pm. There is no charge for tables (available on a first come, first served basis) and admission for both sellers and buyers will cost £2.00. There will be a prize draw and food and drink will be available. The venue has toilets and disabled access.  
**Bob Glasgow GM4UYZ**  
E-mail: [gm4uyz@cpsarc.com](mailto:gm4uyz@cpsarc.com)  
[www.cpsarc.com](http://www.cpsarc.com)

### August 13th

#### The Flight Refuelling HAMFEST

The Flight Refuelling Amateur Radio Society HAMFEST will be held at the Cobham Sports and Social Club Ground, Merley, near Wimborne, Dorset BH21 3DA. The doors will open at 10.00am and admission will cost £3.50 (under 14s free). There will be talk-in on S22 (145.550MHz), free parking (including spaces for the disabled), trade stands (both indoors and outdoors), a car boot sale, lecture stream and demonstrations, special interest groups, a licensed bar and catering will be available. Camping is available on Saturday night in an adjacent field.  
E-mail: [hamfest@frars.org.uk](mailto:hamfest@frars.org.uk)  
[www.frars.org.uk](http://www.frars.org.uk)

### August 20th

#### The Rugby ATS Annual Radio Rally

The Rugby Amateur Transmitting Society Annual Radio Rally will be held at Princethorpe College, Princethorpe, Rugby CV23 9PY (NGR: SP395710; 52.336N 01.421W). The doors will be open between 10.00am and 4.00pm (8.00am for sellers) and admission will cost £3.00. There will be trade stands, a car boot area and on-site catering will be available.  
**Tony G0OLS**  
Tel: 07759 684411  
E-mail: [rally@rugbyats.co.uk](mailto:rally@rugbyats.co.uk)  
[www.rugbyats.co.uk](http://www.rugbyats.co.uk)

### August 27th

#### The Milton Keynes ARS Rally

The Milton Keynes Amateur Radio Society Rally will be held at The Irish Centre, Manor Fields, Watling Street, Ferry Stratford, Milton Keynes MK2 2HX (opposite Dobbies Garden Centre). The doors will open at 10.00am and admission will cost £3.00. There will be talk-in on S22 (145.550MHz), free on-site parking, trade stands, catering and facilities for the disabled. Full details can be found on the Milton Keynes ARS website.  
**Tim Cowell (Rally Coordinator)**  
Tel: 07866 673192  
E-mail: [rally@mkars.org.uk](mailto:rally@mkars.org.uk)  
[www.mkars.org.uk/mkars/rally](http://www.mkars.org.uk/mkars/rally)

### August 28th (Bank Holiday Monday)

#### The Huntingdonshire ARS Rally

The Huntingdonshire Amateur Radio

Society Rally will be held at Ernulf Academy, Barford Road, St Neots, PE19 2SH. The doors will open at 9.00am and admission will cost £3.00. There will be free parking, trade stands, an RSGB bookstall and catering (hot meals and drinks) will be available on-site. Traders will have access to the venue from 7.00am.

**Malcolm M0OLG**

Tel: 01480 214282

E-mail: [events@hunts-hams.co.uk](mailto:events@hunts-hams.co.uk)

## SEPTEMBER

### September 2nd and 3rd (Saturday/Sunday)

#### The JARL Ham Fair 2017

The Japan Amateur Radio League Ham Fair 2017 will be held at Tokyo Big Sight, 3-11-1 Ariake, Koto-ku, Tokyo, Japan 135-0063.  
[www.jarl.org/English/4\\_Library/A-4-6\\_ham-fair/ham-fair.htm](http://www.jarl.org/English/4_Library/A-4-6_ham-fair/ham-fair.htm)

### September 2nd (Saturday)

#### G-QRP Club Convention Social Event and Buildathon

On the evening prior to the Telford HamFest & G-QRP Convention 2017, the G-QRP Club's Social Event and Buildathon (led by Steve G0FUW) will take place between 7.00pm and 10.30pm at the Holiday Inn Telford – Ironbridge, Telford International Centre, St. Quentin Gate, Telford TF3 4EH. For more information, see the G-QRP Club website.  
**Heather M0HMO**  
Tel: 07802 548938  
[www.gqrp.com/convention.htm](http://www.gqrp.com/convention.htm)

### September 3rd (Sunday)

#### The Telford HamFest & G-QRP Convention 2017

The Telford & District Amateur Radio Society will be holding the 12th Telford HamFest, which is now coordinated with the G-QRP Convention, at the Ingenuity Technology Centre, Coalbrookdale, Telford TF8 7DU. The doors to the HamFest will open at 10.15am and admission will cost £4.00, which includes discounted admission to the hands-on exhibits at Ingenuity. There will be a Park and Ride, ample free car parking at the Aga works, trade stands, a flea market, lectures (including LF Bands Update by Dave G3YXM), family attractions, catering and facilities for the disabled. For more information and e-mail details, see the Telford HamFest website.  
**Martyn G3UKV**  
Tel: 01952 255416  
[www.telfordhamfest.org.uk](http://www.telfordhamfest.org.uk)

### September 6th (Wednesday)

#### The RAOTA Annual General Meeting

The Radio Amateur Old Timers' Association will be holding its Annual General Meeting in a private, ground floor room at The Brunswick Inn, 1 Railway Terrace, Derby, DE1 2RU. The Brunswick Inn almost opposite Derby railway station car park and is easy to reach by train, bus and car. The event will commence with an informal get-together at noon and the AGM will start at 1.30pm. The AGM is expected to take no longer than an hour, at which point the event will then revert to the get-together. **Ian G4EAN**,

RAOTA Secretary, says that the AGM and get-together are excellent ways for the committee and members to meet and discuss RAOTA's activities and make plans for the future. Membership of RAOTA is open to anyone with an active interest in amateur radio. For more information contact, please contact Ian.

**Ian Brothwell G4EAN**, 56 Arnot Hill Road, Nottingham NG5 6LQ.

Tel: 0115 926 2360

E-mail: [gensec@raota.org](mailto:gensec@raota.org)

[www.raota.org](http://www.raota.org)

### September 9th and 10th (Saturday/Sunday)

#### The BATC 2017 Convention for Amateur TV

The British Amateur Television Club 2017 Convention for Amateur Television (CAT 17) will be held at Fittingly Amateur Radio Society, The Hurst Communications Centre, Belton Road, Sandtoft, Doncaster DN9 5SX. The Convention will start at around 1.00pm on Saturday and conclude in the middle of the afternoon on Sunday. For more information, please see the BATC website and Forum.  
[www.batc.org.uk](http://www.batc.org.uk)

### September 9th (Saturday)

#### The Caister Lifeboat Radio Rally

The Caister Lifeboat Radio Rally will be held at Caister Lifeboat Station, Tan Lane, Caister-on-Sea, Norfolk NR30 5DJ. The doors will be open between 9.30am and 3.00pm and admission is free. There will be talk-in on S22, easy parking and disabled access, trade stands, a prize draw and refreshments will be available. Traders will have access to the venue from 8.00am. Indoor tables will cost £10.00 each and outdoor pitches will cost £5.00 per table (booking advisable). All proceeds to Caister Volunteer Lifeboat Service.  
**Zane M1BFI**  
Tel: 07711 214790  
E-mail: [m1bidx@ntlworld.com](mailto:m1bidx@ntlworld.com)  
[www.m1bidx.wix.com/el-radio-rally](http://www.m1bidx.wix.com/el-radio-rally)

### September 10th

#### The Torbay Communications Fair

The Torbay Amateur Radio Society Annual Communications Fair will be held indoors at Newton Abbot Racecourse, Newton Abbot, Devon TQ12 3AF. The doors will open at 10.00am (9.30am for disabled visitors) and admission will cost £2.00. There will be free parking, trade stands, a Bring & Buy, an RSGB bookstall, a prize draw, catering and facilities for the disabled.

**Pete G4VTO (Bookings)**

Tel: 01803 864528

**Mike G1TUU (Bookings)**

Tel: 01803 557941

E-mail: [rally@tars.org.uk](mailto:rally@tars.org.uk)

[www.tars.org.uk](http://www.tars.org.uk)

### September 10th

#### The Wildern Radio and Computer Boot Sale

The Andover Radio Amateur Club will be holding its autumn Radio and Computer Boot Sale at Tangleby Parish Village Hall, Wildern (just north of Andover), Hampshire SP11 0JE (Grid Reference SU350510). The doors will be open between 10.00am and 4.00pm and

admission will cost £2.00. There will be trade stands, a Bring & Buy, a car boot sale, a prize draw and on-site catering. Tables in the Hall will cost £10.00 and car boot pitches in the field will cost £8.00. Sellers will have access to the venue from 9.00am.

**Paul G4KZY**

Tel: 07775 738200

E-mail: [paul.g4kzy@gmail.com](mailto:paul.g4kzy@gmail.com)

[www.arac.org.uk](http://www.arac.org.uk)

### September 17th

#### The Weston-super-Mare Radio Rally

The Weston-super-Mare Radio Rally, hosted by the Weston-super-Mare Radio Society, will be held at The Campus Community Centre, Highlands Lane, Weston-super-Mare BS24 7DX. The doors will open at 10.00am and admission will cost £3.00 per adult. There will be free parking, trade stands, a Bring & Buy (with an auction of remaining items), family attractions and lectures. The venue has level access and facilities for the disabled.  
**Mike Jones**  
Tel: 01278 786684  
E-mail: [mjones129@btinternet.com](mailto:mjones129@btinternet.com)  
[G4WSM.club](http://G4WSM.club)

### September 22nd, 23rd and 24th (Friday/Saturday/Sunday)

#### The WACRAL Conference and Fellowship Weekend 2017

The World Association of Christian Radio Amateurs and Listeners Diamond Year Conference and Fellowship Weekend 2017 will be held at the Elm Conference Centre, De Walden Road, West Malvern, Worcestershire WR14 4DF. For further information, please see the Conference website.  
[www.wacral.org/conference-2017](http://www.wacral.org/conference-2017)

### September 24th

#### The Pencoed ARC Table Top Sale

The Pencoed Amateur Radio Club Table Top Sale will be held at Pencoed Rugby Football Club, The Verlands, Felindre Road, Pencoed CF35 5PB. The doors will open at 10.00am and admission will cost £2.00. Refreshments will be available. Sellers will have access to the venue from 8.30am and tables (which will be available on a first come, first served basis) will cost £10.00 each.

**Madeline Roberts (Bookings)**

Tel: 01639 767056 or 07738 375775

### September 29th/30th (Friday/Saturday)

#### The National Hamfest\*

The National Hamfest, organised by the Lincoln Short Wave Club in association with the RSGB, will be held at the George Stephenson Pavilion, Newark Showground, Lincoln Road, Winthorpe, Newark, Nottinghamshire NG24 2NY. Admission will cost £5.00. The outside display area will open at 9.30am and the doors to the main hall will be open between 10.00am and 4.00pm on both days. There will be free parking, trade stands, a Bring & Buy, a car boot/flea market, special interest groups, catering and facilities for the disabled. In addition, there will be a range of RSGB stalls. Morse proficiency tests will be available.  
[www.nationalhamfest.org.uk](http://www.nationalhamfest.org.uk)



# Classified Adverts



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

## Antennas

**SB SOTABEAMS™**  
AMATEUR RADIO FOR THE GREAT OUTDOORS



Everything you need for portable operating

Over 150 products. Mostly unique!

W: [www.sotabeams.co.uk](http://www.sotabeams.co.uk) T: 07976 688 359

**G4TPH MAGLOOPS** Remote tune and manual tune models. 40m through 10m, 100 Watts, SSB. See *PW* review on website. Details at [www.g4tph.com](http://www.g4tph.com)

## For Sale

**CTCSS ENCODER AND DECODER KITS.** DTMF kits and modules. Pic development kits. <https://cstech.co.uk>

## For Sale

**MICROPHONES & ACCESSORIES.** Replacement microphones for a wide range of transceivers. Cables for Heil and studio microphones, headsets and mixers, PC headset adapters, PTT switches and replacement curly cords, DTMF microphones for echolink. For these and more great items go to [technofix.uk](http://technofix.uk)

## Repairs

**REPAIRS TO RECEIVERS, TRANSMITTERS ETC.** New/old, valve/transistor. Call 07903 023437 for details. Web: [www.kent-rigs.co.uk](http://www.kent-rigs.co.uk)

## Valves

**VALVES AND ALLIED COMPONENTS IN STOCK** Ring for free list. Valves/books/magazines wanted. Geoff Davies (Radio). Tel: 01788 574774.

**TOP PRICES PAID**  
for all your valves, tubes, semi-conductors and ICs.  
**Langrex**  
Unit 4, Daux Road, Billingshurst,  
W. Sussex RH14 9SJ  
Tel: 01403 785600 Fax: 01403 785656  
[www.langrex.co.uk](http://www.langrex.co.uk)

While prices of goods shown in advertisements are correct at the time of going to press, readers are advised to check both prices and availability of goods with the advertiser before ordering from non-current issues of the magazine.

## ORDER FORM FOR CLASSIFIED ADVERTS

PLEASE WRITE IN BLOCK CAPITALS

The prepaid rate for classified advertisements is 42 pence per word (minimum 12 words), box number 70p extra. Semi-display setting £13.90 per single column centimetre (minimum 3cm). Please add 20% VAT to the total. All cheques, postal orders, etc., to be made payable to PW Publishing Ltd. Advertisements, together with remittance, should be sent to the Classified Advertisement Dept., Practical Wireless, Tayfield House, 38 Poole Road, Westbourne, Bournemouth, Dorset BH4 9DW. Tel: 01202 751611.

Please insert this advertisement in the ..... issue of *Practical Wireless* (if you do not specify an issue we will insert it in the next available issue of *PW*) for ..... insertion/s. I enclose Cheque/P.O. for £..... (42p per word, 12 minimum, please add 20% VAT to total).

Please photocopy this form or write on a separate sheet if you prefer

Category heading: .....

Name: .....

Address: .....

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Telephone number: .....

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Send your advert to PW Publishing Ltd, Bargain Basement, Tayfield House, 38 Poole Road, Westbourne, Bournemouth, Dorset BH4 9DW. Or e-mail your advert to: [tex@pwpublishing.ltd.uk](mailto:tex@pwpublishing.ltd.uk) (if you don't want to include your credit card details on your E-mail, just 'phone us on 01202 751511).

Please write your advert clearly in BLOCK CAPITALS up to a maximum of 30 words, plus 12 words for your contact details on the form provided.

and send it together with your payment of £5 (subscribers can place their advert free of charge as long as they provide their sub number or mailing label). Cheques should be made payable to PW Publishing Ltd., credit card payments also accepted.

Please help us to help you by preparing your advert carefully. Any advert which contains ?? marks indicates that the advertising dept. could not read/interpret the wording.

Advertisements from traders or for equipment that it is illegal to possess.

use or which cannot be licensed in the UK will not be accepted

No responsibility will be taken for errors and no correspondence will be entered into on any decision taken by the Editor or any of these conditions.

You should state clearly in your advert whether equipment is professionally built, home-brewed or modified. The Publishers of Practical Wireless also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

## CATHODE RAY TUBES

5in types from dismantled  
oscilloscopes, 4-10kV working.  
Complete with mu-metal  
screens and bases. £5 each.  
Tel: 01425 610669 (Hants)  
Email: [libria@waitrose.com](mailto:libria@waitrose.com)

## HEWLETT PACKARD H1471A

NEW! The Tekrand 1141A dual-beam, 100MHz storage oscilloscope, has a timebase fault, but comes with a comprehensive service manual. Only £16 for the lot.  
Tel: 01425 610669 (Hants)  
E-mail: [libria@waitrose.com](mailto:libria@waitrose.com)

## ICOM SM-8 DESKTOP

microphone c/w additional cable for dual tx inputs as new unmarked condition from non-smoking environment, c/w operating manual, £100. Kenwood LF-30A lowpass filter 50Ω 1-30MHz 1kW PEP c/w insertion loss plot. £40.00. MFJ-815B deluxe cross-needle

1.6 to 60MHz PWR/SWR meter,  
switched 200 or 2000 watts  
forward, as new condition  
c/w operating manual, £30.  
All items from non-smoker  
environment!

Tel: David GOGPE 01892  
611389 (East Sussex)  
E-mail: david@excess.net

**JVC NRD535** with 'Lowe  
Mods', manual, box, etc, £625,  
**Yaesu FRG100**, manual, etc,  
£265. **Uniden UBC9000**, PSU.

includes manual, £100. All one  
and excellent/good condition.  
Space needed!  
Tel: Steve 01582 503806  
(Luton)

**NISSEI 25A PSU**, switch-mode regulated voltage type, in near new condition, complete with original box and instructions, £40 (cost £75) plus £8 P&P. Tel: John G3EGC 01204 301502 (Bolton)  
E-mail: [ijvhoba@gmail.com](mailto:ijvhoba@gmail.com)

**RF SYSTEMS DX-1 Pro**  
Mk2 active antenna, 20kHz  
to 60MHz. Stainless steel  
construction, good condition.  
Very high 2nd and 3rd order  
intercepts. Control box  
includes switchable medium  
wave suppression. Manual  
included, £75 ono.  
Tel: Noel 0747 9520285  
(Clacton)  
E-mail: [pnocelw@yahoo.com](mailto:pnocelw@yahoo.com)

## WANTED

**Redifon 100W HF SSB Transportable**  
Communication Station Type GR479A. Ideally in working condition but anything considered, even just an empty outer housing. Required for project to recreate an RAF Desert Rescue Land Rover circa 1973. Price negotiable.  
Tel: Ray M0XDL 01305 833699 (S. Dorset)  
E-mail: raycoles96@gmail.com

**TIPP-EX CORRECTION PAPER**, typewriter, white, top copy. Don't throw your stock just

because of going on to word processing!  
Tel: Godfrey G4GLM. 020 8958 5113.  
63 The Drive, Edgware, Middlesex HA8 8PS.  
E-mail: cgm2@btinternet.com

**YAESU FT-2500 144MHz FM transceiver**, must be in very good condition and working order.  
Contact me after 6pm please.  
Tel: Ray G4OWY 07909 383475 (Weymouth)  
E-mail: g4owwy6@gmail.com

We know a lot of people use the internet for second-hand sales nowadays but this is a free service for subscribers and very cheap otherwise so please **USE IT OR LOSE IT**.

Don't forget to make cheques and postal orders payable to PW Publishing Ltd.

**ONLY  
£5**

Please make any cheques or Postal Orders for advertisements payable to P-V Publishing Ltd

Please insert this advertisement in the next available issue of **Practical Wireless**

☐ For Sale      ☐ Wanted      ☐ Exchange

**PLEASE NOTE** as a security measure, you must include your house number and postcode.

Name \_\_\_\_\_ PW & RU

Address ..... ☐Post code [illegible]

CARD NUMBER \_\_\_\_\_

Signature ..... Security number .....

Last three digits on the back of the card

Switch issue number (if on card) .....

Start date of card ..... Expiry date of card ..... 

My Subs Number is.....(or send mailer label)

[illegible]

CONTACT DETAILS FOR ADVERT: Please only write in the contact details you wish to be published with your advert, i.e. do you want your name & address, or just your telephone number? Your advert, you decide! PLEASE - No FAXED Ads! (12)

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# Traders Table

The equipment for sale on these pages is second hand or ex-demonstration



## Nevada 023-9231 3090

|                                                                    |         |
|--------------------------------------------------------------------|---------|
| 1. Acom 2000 U Tube 2kW Auto Amplifier with manual .....           | £4250   |
| 2. Yaesu FTDX-5000MP U + SM5000 Station Monitor .....              | £2695   |
| 3. Yaesu FTDX-5000 U + XF-126N 300Hz roofing Filter .....          | £2595   |
| 4. Yaesu DMU-200 U data management FT2000/FT5000 .....             | £749    |
| 5. Yaesu FT2000 + FH2 Keypad U HF/50MHz .....                      | £1199   |
| 6. Yaesu FT950 U quality 100W HF/6M Transceiver .....              | £749    |
| 7. Yaesu FT8900 U quad bander mobile transceiver .....             | £245    |
| 8. Yaesu FT-991 U HF/VHF/UHF transceiver .....                     | £799    |
| 9. Yaesu FTM-3200DE ED 65W VHF C4FM/FM Mobile .....                | £179.95 |
| 10. Yaesu SP-102 U Classic extension speaker .....                 | £89     |
| 11. Yaesu MMB-80 U Mobile Bracket for FT-897 .....                 | £15.95  |
| 12. Kenwood TS-2000E + SP23 Speaker U .....                        | £999    |
| 13. Kenwood TS-2000E U Shack in a box .....                        | £899    |
| 14. Kenwood TS-870S U 100W HF DSP Transceiver .....                | £799    |
| 15. Kenwood TS-570DG U HF Transceiver with ATU .....               | £499    |
| 16. Kenwood D-72E U VHF/UHF Handheld + GPS .....                   | £259    |
| 17. Icom IC-7600 U HF+50MHz Transceiver .....                      | £1,450  |
| 18. Icom IC-7000 U HF/VHF/UHF Mobile transceiver .....             | £699    |
| 19. Icom SP-33 U Quality extension speaker .....                   | £99     |
| 20. Alinco DX-R8E U Communications Receiver .....                  | £379    |
| 21. Alinco DM30E-ED..NEW 20-30A power supply .....                 | £85     |
| 22. Alinco DR138H-ED..high power 145MHz FM mobile .....            | £139    |
| 23. Alinco DRB185-ED..85w 145MHz FM mobile transceiver .....       | £149    |
| 24. Alinco DR638H-ED..high power 145/433MHz mobile .....           | £235    |
| 25. Alinco DR735E-ED..NEW MODEL twin band 145/433MHz .....         | £269    |
| 26. Alinco DX-SR9E-ED..hybrid SDR/100w HF transceiver .....        | £579    |
| 27. Alinco EDX2-ED..automatic HF antenna tuner .....               | £269    |
| 28. Antex 690D-ED pro-style digital soldering station .....        | £175    |
| 29. Antex TCS-ED soldering iron with temp control .....            | £59     |
| 30. Anytone AT588-U..145MHz FM mobile transceiver .....            | £99     |
| 31. Anytone QHM-02-CL..DTMF hand microphone AT5189 .....           | £19     |
| 32. Bearcat UBC30XLT ED 200ch AM/FM handheld scanner .....         | £49.95  |
| 33. BHI NES10-2 U Noise Eliminating Speaker .....                  | £69     |
| 34. Cable 100M Drum U 8D-FB Japanese Low loss .....                | £199.95 |
| 35. Cable 50m length U 10D-FB Japanese Low Loss .....              | £99.95  |
| 36. Cable 50m length U 8D-FB Japanese Low Loss .....               | £99.95  |
| 37. Cable 100m length U LDF450 U Low Loss .....                    | £299    |
| 38. Comet TF-400 U 400W current Balun .....                        | £69     |
| 39. Fody Tempus Pro-ED Bluetooth (BLE) weather station .....       | £69     |
| 40. MFJ 998 U 1.5kW Automatic HF Intelligent tuner .....           | £659.95 |
| 41. MFJ 969 300W U 160m - 6m Antenna Tuner .....                   | £179    |
| 42. Midland Arctic-ED waterproof marine handheld radio .....       | £89     |
| 43. Midland D200-ED..digital/analogue PMR licence free radio ..... | £125    |
| 44. Midland G7Pro-U latest style Pair PMR 446 handhelds .....      | £49     |
| 45. Nevada PS30M-ED..30amp variable voltage power supply .....     | £90     |
| 46. Nevada PS40M-ED..40A variable voltage linear PSU .....         | £99     |
| 47. Nevada PSW50-ED..50A switch mode supply .....                  | £119    |
| 48. Palstar AT2KD -ED..2Kw manual antenna tuner .....              | £569    |
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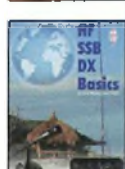
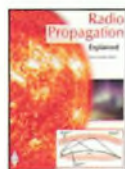
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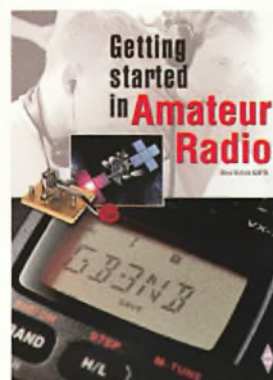


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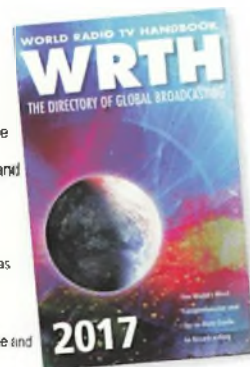
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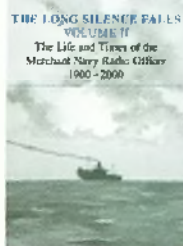
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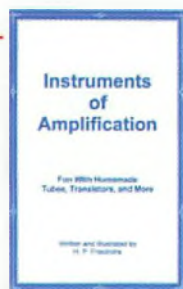
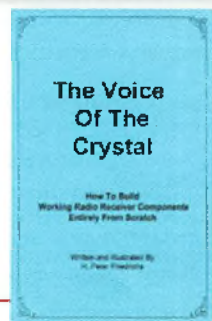
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**The Big Digital Challenge! - Part 2** In the second part of their guide to long-distance reception of digital TV multiplexes, our DXTV experts Keith Hamer and Gary Smith look at tuning and scanning, receivers, signals, antennas and more

**Scanning Scene** Bill Robertson offers a data signal mystery, gives advice on correct ways of installing antennas and on using one antenna for multiple scanners and explains blocking and image problems

**Book Review** David Harris reviews TX Pirate Radio Dispatches from Eighties London by Stephen Hebditch

**News & Products, including Corrections**

**Decode** Mike Richards delivers an update for those using SpyServer with a Raspberry Pi 3 and expands on the Signal History feature in SDR Console Version 3 Preview 6

**Military Matters** Pat Carly notes an emergency incident, reflects on this summer's military celebrations and lypasts so far and reports on exercises in the Baltic region

**Sky High** Godfrey Manning explains some key aircraft manoeuvres under the control of pilots and their reflections in radio communications, before updating you on frequency and operational news

**DXTV, FM & Satellite News** Keith Hamer and Gary Smith examine single and double hop Sporadic-E reception and FM DX during the Eta Aquarids meteor event, prior to informing us on new services and technologies

**Maritime Matters** Robert Connolly looks at traditional sound and visual maritime signalling systems still in place, assesses anti-piracy precautions in the Middle East and search and rescue news closer to home

**Erecting a Wall Mounted Antenna Mast** Roger Bunney reports on his project of putting up an antenna mast mounted on his garage wall and supporting both a rotator and his Wellbrook ALA1530 loop antenna

**Airband News** David Smith looks at The Skyway Code resource and at ways of making military aircraft communications systems harmonise with one another through an 'Einstein Box'

**LMAs Broadcast Matters** Chrissy Brand finds vintage at a garden party and makes a point about the links between short wave radio and art, before a comprehensive review of the medium and short wave summer catches so far

**NBS DXing** Robert Connolly constructs a reserve power supply for himself, advises on keeping your antennas in shape and provides his comprehensive compilation of beacon loggings, including one surprise

**The Sinking of the RMS Republic - Jack Binns a Real Hero** Scott Caldwell profiles Jack Binns, wireless operator on the RMS Republic and a true working-class hero whose devotion to duty saved lives when the vessel sank

**Radio Websites** Chrissy Brand assesses a wide range of websites connected to radio, looking at the New York Festivals International Radio Awards and readers' favourite internet radio websites on her way

**On the Record** Oscar the Engineer reports on the licence award to Radio Caroline on 648kHz and the aftermath of Ofcom's rejection of other applications while placing free radio in a wider media framework

**Comms from Europe** Simon Parker shares the results of his recent competition, assesses a limited-edition transceiver, re-lives a CB-related memorial event and evaluates future equipment

**Software Spot** This month, QSP73 Services offers another wide-ranging software collection to accompany and support your radio hobby, especially activities such as propagation monitoring and data modes

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### Review - the Kenwood TH-D74

Editor Don Field G3XTT recently acquired a Kenwood TH-D-74 handheld, a dual-band transceiver that supports D-STAR and APRS as well as FM operation and has a host of other features. He brings you his initial impressions and experiences of using it.

### Review - the Icom ID-4100E

Tim Kirby G4VXE reviews a new dual-band mobile transceiver from Icom, featuring D-STAR, integrated GPS, a detachable front panel and more.

### Improving HF Band Signal-to-Noise Ratio

Gwyn Griffiths G3ZIL and Nigel Squibb G4HZX describe their quest to understand and improve signal-to-noise ratio (SNR) on the 40m band.

### In the Shop

Harry Leeming G3LLL relates some strange faults that he ran across in his workshop days and reminisces a little on the occasion of his 80th birthday.

### V&V

Michael Marinaro WN1M takes a look back at communication developments during WW1.

### Carrying on the Practical Way

Eric Edwards GW8LJJ is back, this time with some thoughts about the development of a direct conversion receiver using modern technology.

### What Next

Colin Redwood G6MXL covers the new R5GB operating awards, open to all radio amateurs.

There are all your other regular columns too, including The Morse Mode, HF Highlights, World of VHF, Data Modes, Buying Second-hand and Technical for the Terrified.

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