# PRACTICAL WIRELESS

www.radioenthusiast.co.uk

DECEMBER 2020 THE UK'S NUMBER ONE AMATEUR RADIO MAGAZINE SINCE 1932


## CONTEST RESULTS | The winners of our 2020 144MHz QRP competition


Practical Wireless REVIEW

# ICOM-705 FIRST UK TEST

**Read why we gave this long awaited portable transceiver top marks**



## Going incognito

The Editor tests the new Bantenna sleeve antenna




## Cheap handheld

Playing with a good value, and practical dual band

## All about capacitors and capacitance

Getting to grips with the basics of this essential electrical device

## HOW-TO Building your 2m all mode transceiver

Why is there no replacement for the single-band VHF multimodes of old

## Get Started!

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## Readers' letters

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Peter Waters G3OJV

ELECRAFT **Brought to you by W&S!**

# GO HF PORTABLE with the BEST!

HF Portable is great fun. It gets you out in the wide outdoors, in fresh air and with fresh challenges. It means less power, less in the way of antennas but lots more in the way of enjoyment. Elecraft are market leaders in this area. The lightweight KX2 and KX3 are powerful radios that can deliver 10W of output power (15W on 20m and below for the KX3). There receivers are legendary in terms of performace and can read the weakest of signals.

The variable selectivity makes copy as good or better than your base transceiver. The large dial is easy to read, even in bright light and the diminutive KX2 even has a built-in microphone! There are a host of different features and you can download the User Manuals from the Elecraft site. And if you want even more fun, you can build the KX3 yourself - easily done in a day.

**Trust Elecraft to bring sunshine and fun into Ham Radio!**

## Elecraft KX2 Portable HF Transceiver

2 Year Warranty

Mic & paddle key are optional extras

Elecraft's KX2 'stealth' transceiver can go wherever your imagination takes you! A rear tilt-foot angles the KX2 for use on any surface, from desktop to park bench to rock.

- 12W Out 80m-10m
- Fits into a coat pocket
- Built-in microphone
- Variable selectivity
- CW audio filter
- On screen data decode
- Very low current drain
- PSK31 and RTTY send
- Backlight can be turned off
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- 2 Channel SSB Recorder
- 3 Channel CW Data Recorder
- 2.8"H x 5.8"W x 1.5"D
- Weight: 13 oz (less options)

**£959.95**

## Elecraft KX3 160 - 6m, 15W

Mic & paddle key are optional extras

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

- All modes
- 3.4"H x 7.4"W x 1.7"D
- 18 oz (less options)
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- Custom high-contrast LCD
- Current drain as low as 150 mA in receive mode

Built: **£1349.95** Kit: **£1299.95**

## Icom IC-705 160m - 70cm

**£1299.95**

The amazing QRP 160m-6m and 2m/70cms All-Mode transceiver. Up to 10 Watts output on Ext. 12V or 5 Watts in battery. Includes speaker mic and DC lead. Battery is charged fron 12V supply. Lovely colour screen with touch control and touch menu system. Similar to IC-7300 control and navigation.

## Elecraft KXPA100 Amplifier 100W 160m-6m

Ideal tor the IC-705, it has a switched input of 5 or 10W for 100W output. We can supply a dedicated PTT lead for the IC-705. Bandchanging is auto sensed.

Easy build, no solder kit **£899.95**
Ready built **£949.95**

## Here are some great accessories

**Pro Audio KX-33 Pocket PSU**
Slips in your pocket yet powers the IC-705 to 10 Watts.
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IC-705 Lead **£12.95**

**Icom LC-192**
Rucksack for the IC-705. Radio can be operated whilst in place.
**£169.00**

**Diamond A144S5R**
5 element 2m Yagi. Lightweight, packs down easily and SO-239
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A502HBR.....2 Element 6m.....£89.95

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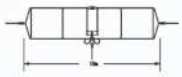

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# Contents

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

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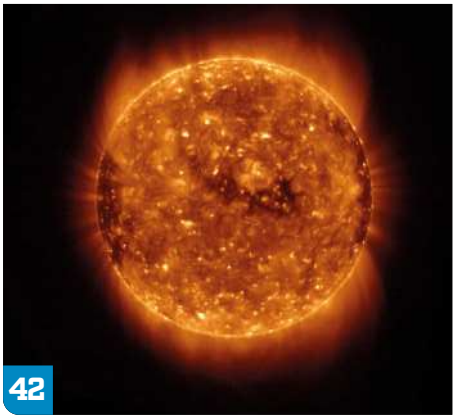


# Keylines

Not a lot of radio for me this month although I have been participating in the RSGB Autumn Series contests on 80m on behalf of the Bristol Contest Group. The good thing about these is that they force me onto SSB and data modes, rather than sticking to my usual CW. I have found the data modes events to be quite interesting, with the mix of 'traditional' RTTY along with PSK63. These autumn series events also have a 'Le Mans' start, with radio silence to be observed for two minutes before the contest starts, which prevents people claiming and hanging on to a frequency before the official start time. It can make for fun and games as everyone jostles for a good spot once the contest starts!

I also did an 'interview' with the Norfolk club, via Zoom, which is available via their Facebook page. The event is very professionally managed by Club Chairman **David G7URP** and his wife **Tammy M0TC**, who were also the force behind one of the online streams of the this year's RSGB Convention (which, of course, was run in 'the cloud').

I didn't actually participate in the RSGB Convention, having had my fill of Zoom of late. I do understand that using Zoom opens such an event up to a much wider audience but, for me, these events are all about meeting friends and catching up – I do hope 'normal' service is resumed next year. Indeed, the organisers of the Friedrichshafen show have already pencilled in the usual June dates – let's hope it can go ahead.

## Operating Away from Home

The results of the 2020 contest feature in this issue. You'll see that participation was down but those who took part found it an interesting 'challenge' to work from home with low power rather than from the usual hilltop locations. It's a reminder that much fun in amateur radio can be had by being out and about, whether for VHF and UHF activity, activating summits for the Summits on the Air programme, running special event stations, helping to run communications for a sporting event or whatever. For some, operating away from home is the only realistic option, to get away from local noise, to be able to put up reasonable antennas or for other reasons.

Fortunately, we can at least do some of these things once again although multi-operator activities are still out of bounds, except within families or with suitable social distancing. As I said above, it will be a blessed relief when 'normal' service is eventually resumed!

## The Annual Index

Yes, not very exciting, but in putting together the annual index I was pleasantly surprised at how much ground we have been able to cover in these pages in the course of the year. I hope you have enjoyed the various articles and I can assure you that there are plenty more great articles in the pipeline.

## Apologies

Once again I have to offer my apologies for carrying over some promised articles. However, this was due, in part at least, to being able to bring an early review of the IC-705. I know this rig has been eagerly awaited and is already causing great excitement and I am grateful to **Richard G3UGF** for pulling out the stops to do an early review for readers. He will follow up in the next month or two with a look at some of the accessories that are already available, both from Icom and from third-party suppliers. Some feature in this month's *News* pages.

And last but by no means least, a Happy Christmas to all of you!

**Don Field**
Editor, *Practical Wireless Magazine*

# Newsdesk

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




## New Products at ML&S

Accessories for the newly-launched Icom IC-705 feature strongly this time. First is the MyDEL Quick Release Antenna Bracket. This is built from a solid billet of aluminium assembly & attaches to the side of an IC-705 allowing a larger PL-259 terminated antenna to sit vertically alongside the transceiver. ML&S realised that using the BNC connector fitted to the IC-705 for anything other than a terminated lead could possibly cause damage to the radio housing. Available from stock at £34.95

**HamRadio.co.uk/QRAB**

ML&S have also introduced a sturdy tripod stand to mount the Icom IC-705 on your shack table. Priced at £24.95, this lightweight alloy construction item has a locking swivel head system allowing you to position the transceiver to the correct angle for operation. The three legs have rubber feet, stopping the entire mount from slipping on the tabletop surface.

**HamRadio.co.uk/IC705Tripod**

ML&S have now received stock of the latest addition to covers for your rigs and accessories. This is the new IC-705 Cover from Prism. Handmade and embroidered in the UK, these well produced covers are ready to ship at £27.95.

**HamRadio.co.uk/IC705Cover**

ML&S are now able to offer a total of 60 months warranty covering parts and labour for Icom's IC-705 portable QRP transceiver. The IC-705 is supplied with 24 months' warranty but for an additional charge a further three years is added to the end of the usual factory guarantee. *"Many of our customers have been requesting 5 year warranty on the IC-705 especially as it's aimed at out and about field work using portable antennas. As the rigs get more compact and complex, so do the repair costs in the event of a breakdown outside the limited warranty period"*, said Dan Lynch, Operations Director and eldest son of Martin Lynch. *"It's as simple as ticking the check box on our website when purchasing the IC-705 and we think it represents excellent value considering just one trip to an approved workshop outside the 2 year guarantee could cost more than the one-off charge of the extended warranty"*.

Moving away from the IC-705, the new TyT TH-9800 QuadBand Mobile 50W 10m/6m/2/70cm FM transceiver is now in stock at ML&S. Compact and ideal for mobile or base station operation, the TH-9800 has a remote head, offers AM receive on Airband (108-136MHz) and 800 memory channels, Dual receive with Dual display. Available from stock £199.95.

**HamRadio.co.uk/TH9800**

Finally, Martin Lynch featured an interview with Expert Electronics from St Petersburg Russia on his weekly *SFTW* YouTube channel. This offers an insight into Expert Electronics on how it started, what new products may be in the pipeline, new updates happening in the near future and reasons they chose ML&S to be their UK distributor. Vasily and Roman from Expert talked to Gary Spiers, ML&S customer support manager, and Martin Lynch for over 30 minutes.

**www.MLandS.tv**

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


# New Battery Pack from Icom

The BP-307 is a new high capacity 7.2V/3350mAh (typ.) Li-Ion battery pack designed for Icom's latest range of IP, LTE radio and selected amateur radio products, including the new IC-705 QRP SDR transceiver. The BP-307 is IP67 waterproof and offers considerably longer operating time.

The BP-307 is compatible with the following models: IP100H IP501H, IP503H, ID-31, ID-51 and the IC-705. It can be charged with the BC-202IP2, BC-202IP3L and VE-SP1.

The BP-307 is available for purchase from your local Icom dealer.

The Icom LC-192 is a new dedicated backpack specifically designed for the Icom IC-705. The multi-function backpack has many features, including space for an external antenna and cables as well as sufficient area to store your IC-705 and all your accessories.

On the top of the backpack is a separate compartment for the radio to sit securely in. Below that is a larger compartment to allow you to store accessories, including, power supply, batteries, cables, etc. An adjustable divider keeps everything well in order and secure.

The backpack is well padded with cushioning to protect the IC-705 and accessories from knocks. The back of the LC-192 is equipped with breathable padding (as well as the carrying straps) so that the LC-192 can be carried comfortably on longer outings.

A light plastic mounting plate is attached to the side, which allows the use of small portable antennas. There are also holes in the backpack to run cables. Alternatively, with the optional VS-3 Bluetooth headset you can use your IC-705 wirelessly.

**www.icomuk.co.uk**


# SSB Electronics SP-400 from Nevada Radio

**Nevada Radio have announced availability of the new SP-400 4m (70MHz) Low Noise Masthead preamplifier, from SSB Electronics of Germany.**

**The SP-400 is housed in a UV and weatherproof casing using N type connectors and with all mounting hardware supplied. It uses coax relays, which can handle up to 750W PEP when sequentially switched, or 200W PEP with VOX operation. The front-end has a noise figure of 0.7dB with gain variable from 9 to 18dB and is designed to handle strong signals without issue and be very stable. This is an ideal addition for the new data modes WJST, etc. where it can handle 400W sequential switching, or 100W VOX switching.**

**The SP-400 sells for £345.95 and is available from Nevada**

**www.nevadaradio.co.uk**

# RSGB Introduces Remote Invigilation

Following the success of the remote invigilation exams for the Foundation and Intermediate licence, the RSGB is now expanding that to include Full licence exams. The automated booking system will now accept exam bookings for all three licence levels. It is important to read the Candidate Instructions before booking an exam. You can find a link to these and the calendar to book your exam on the website:

**www.rsgb.org/exampay**

# New RSGB Videos

The RSGB has launched a series of videos to help the thousands of people who have taken their Foundation exam via remote invigilation while being unable to take the practical assessments.

The full 30-minute video highlights six practical skills and each segment stands alone rather than being part of a single 'story' through the video. As well as this whole video, the Society has published the different segments as separate short videos to make it easier to go back to just one or two parts.

The RSGB is grateful to the clubs and individual radio amateurs who have created other available online training resources. With the launch of these videos, the Society is now pleased to add to the resources that new licensees have available to them. The RSGB would like to thank everyone involved in making these videos, including **Bob** and **Nick** from *TX Factor*.

You can watch the videos on the Society's website at:

**www.rsgb.org/foundation-practicals**

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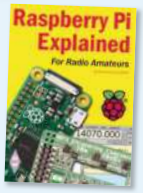


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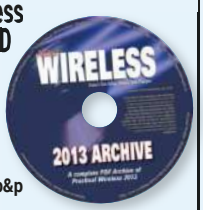


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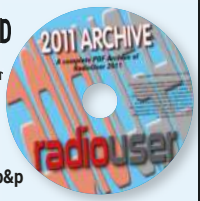


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1

**Richard Constantine G3UGF**
practicalwireless@warnersgroup.co.uk

# Icom IC-705

We bring readers the first review of the exciting new next generation IC-705 portable transceiver.

Icom Incorporated, Japan has come a long way since **Tokuzo Inoue** founded his small radio company in 1954.

With a thousand plus employees and a worldwide presence in most sectors of mobile communications, Icom's global footprint is massive. It's always had a reputation for innovation and in the Amateur Radio market, for being just a little different.

Priding itself on attention to detail rather than marketing hype, Covid 19, component and shipping delays, have contributed to extra excitement for the long-awaited release of the IC-705. Indeed, it's now more than a year since I first discussed reviewing this radio with *PW*'s Editor.

Chinese offerings aside, Yaesu and Elecraft already have feature-rich QRP radios with excellent pedigrees so, what's different about the IC-705?

## Multimode and More

Firstly, it's a full featured, multimode transportable radio, covering all bands, 1.8MHz to 440MHz, including 5MHz and in the UK, receive-only 70MHz. It's a direct RF sampling, SDR transceiver utilising down-conversion IF sampling for 25MHz and above.

RF signals pass through dedicated filters, to the Analogue-to-Digital Converter (ADC) and are processed in the low-noise, Field Programmable Gate Array (FPGA) – excellent for weak signal recovery. While there are some technical differences to big brother IC-7300, the end result to the naked ear is the same, as side by side comparisons proved. It incorporates passband tuning and there are no extra filters to buy. Indeed, the radio auto-selects the appropriate filter bandwidth when switching modes.

Pack in GPS, digital voice gateway (DV), D-STAR, FM Radio, Wireless LAN, Bluetooth, Airband Rx, RTTY Tx/Rx, colour touchscreen, 500 memories, 2,500 repeater memories and, of course, the real-time, point and jump frequency waterfall/spectrum scope display and you begin to get a sense of why this radio really is 'next generation'.

The micro-SD slot accepts a 2GB card or a 32GB SDHC card activating 13 additional features. They include receive logging, voice recording, RTTY decode log, screen captures, picture sharing, GPS memory and more.

## First Impressions and Comparisons

Opening the package, Icom's attention to detail raised a smile. Inside, a small slip of paper detailed exactly how to, and how not to, remove the radio from the box!

Though I suspect many 705s will happily spend much time at home, weight is important for serious portable operations. It weighs 1.185kg, with standard battery attached. That's 185g more than the steel-cased, fully-loaded Elecraft KX3, of the same but shallower footprint. Surprisingly, both



**Fig. 1: The IC-705 Fig. 2: Some of the external connections. Fig. 3: An IC-705 is one third the size of an IC-7300. Fig. 4: In the car. Fig. 5: An internal view. Fig. 6: The menu system will be familiar to users of the IC-7300 or IC-9700.**

weigh less than a Yaesu FT-817 at 1.280kg.

Incidentally, the IC-705 fits snugly into the same padded KX3 bag by Windcamp, for easy carrying and protection.

## Power Consumption

Unlike the competition, its BP-272, 7.4V 1880mAh Li-ion battery is external to the radio. It simply clicks on the back and is easily changed. RF output auto-limits to 5W, unless external power is connected. Charging takes around 2.5 hours, a little longer when 12V is connected and the radio in use.

Excellent for QRPP or FT8 data, transmit power is adjustable from 0.5-10W. An external 5A DC supply is recommended. Switching on, the radio displays battery voltage and has a permanent three block icon, on-screen. The A grade battery cells are excellent operating down to around 6V, before falling off a cliff and shutting down.

With everything on, receiver consumption measured 288mA. Switching off the GPS, wireless Lan and Bluetooth reduced it to 177mA. There's an adjustable screen saver but surprisingly the screen only consumes around 40mA. When portable you can freeze the GPS co-ordinates on the memory card and switch off GPS to conserve energy.

Owners of ID51 and ID52 portables will welcome the 705's battery compatibility. There's also a 3150mAh, BP307 battery available, but it's not cheap.

## Microphone Choice

A compact speaker/microphone is provided. While not a full keyboard it does have up/down controls for frequency or memory channel change, plus two additional programmable buttons.

All external connections are located on either side of the unit and protected by rubber covers. Having no front or rear connections creates space for the large colour display and the excellent sounding speaker. The quality of received audio came as a pleasant surprise, for such a small transducer.

FM reports indicated microphone quality to be acceptable but understandably somewhat 'toppy' compared to a Bluetooth headset, but likely to be an advantage on SSB. Bluetooth works with a wide range of devices. I was easily able to connect a Yaesu SM-10 and use its PTT. Icom have their own version.

A small quirky microphone hanger and strain relief plate is provided. It attaches to the earth screw point. There's a DC cable and spare 4A fuses, plus four adhesive rubber pads (feet) that you fit yourself.

## Handbooks

The manual labelled *Transceptor de Modo* brought back happy memories of the iconic *Fast Show*, until I realised it comes in five languages and I found the English version.

As a reviewer I'm a great believer in the maxim, 'if all else fails, read the handbook'. However, I do want to experience how intuitive a piece of equipment is with no preconceptions or knowledge.

I have to say the IC-705 scores very well in this area. It's quite easy to navigate and most importantly for a complex device, remember how to use. Icom has successfully minimised the number of sub-menus, with frequent user choices spread across top levels of the on-screen display.

Sub-menus are mostly limited to options that, once set, need little or no further attention. Yes, it most certainly helps if you've experienced the IC-7300 but, you soon learn that the IC-705 is not quite the same thing.

With several controls fewer, some options and functions are accessed only by the display. Pressing either the menu or the function buttons reveals that each has two pages to choose from. The buttons that remain are all appropriate but some are double-purpose according to the mode in use.

I particularly like the XFC button that allows checking of your transmit frequency when using a repeater or when working split frequency, in a pile-up.

The short handbook is more user friendly than most and has clearly labelled sections. I couldn't find clear information about setting up for repeater use. Eventually I discovered by trial and error that CTCSS tone and shift settings were on separate pages of the function display, but it took some time to figure it out.

The basic handbook devotes some 18 pages to set mode along with infrequently changed functions that customise the radio, for personal convenience.

I strongly recommend owners or potential owners, to download the 212-page full manual from the Icom website. It not only fills in holes from the basic manual but provides much more information and some surprises. Detailed sections, with easy to follow screenshots, cover scanning, voice memories, audio recording, advanced GPS use linking with digital positioning data, Wireless Lan, DV gateway function, basic and advanced D–STAR operation – much needed by this reviewer. There's a section on interfacing the radio to a computer for RTTY and data transmission. I suspect that interface modules/cables will be available very shortly from third party providers, if not already.

## Practicalities

Ergonomically the IC-705 is a bit of an oddity. It sits flat on a desk and you can't see the

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display. Initially, I had it on its back before placing it on a shelf. The upper and lower rear case edges are bevelled at 45°. Angling it back looked OK, until I pressed the front screen and it repeatedly fell backwards. Investigating the underside revealed an industry standard AMPS pattern of four M4 threaded screw holes, for a mounting plate, not provided.

Additionally, there's a larger, central threaded socket, known in the trade as a ¼in, 20 UNC thread. A wide range of photography brackets or tripods will fit, securing and adjusting to suit, but perhaps not as neatly as a proprietary stand.

It puzzles me why Icom failed to include any kind of angled stand, bail arm or flip-down leg arrangement. No matter, the third-party after market is on the case. Watch this space. It's somewhat annoying, though, and I can't stop thinking this is something of a gaff on Icom's part for a high-end radio.

## Antennas and Tuning

Critics comment that there's no automatic tuner. To me the simple answer is, with all this tech' there's no room left in the box. Do you want a bigger box? A resonant antenna on VHF or UHF presents little problem. For HF a pre-tuned antenna, simple ATU or balun transformer arrangement works. There are plenty of ATU options available in kit form or ready built. There's the usual internal SWR monitor and a superb SWR colour plot function showing SWR bandwidth.

The radio is built on a complex alloy cast housing and metal bracket arrangement attached to which is a small earth terminal bolt, below the BNC antenna socket. It only has a small diameter and a short thread. It's potentially and easily lost when out portable. A wing nut or flying lead might be a better idea.

## How Well does it Perform?

I've been a QRP enthusiast for many years and you develop a sort of mindset, particularly on lower frequencies. It's easier to call a station than call CQ, unless you're on the QRP frequencies. Antenna efficiency is key to maximising power out.

Low noise locations in the countryside are ideal for QRP. Often bands still have good DX potential in low noise locations, when apparently closed in urban environments.

For VHF/UHF 5 or 10W is more than adequate with little problem using repeaters and digital modes, even with reduced power.

It's early days but I've operated on battery power for extended periods on FM nets and repeaters, 3-4 hours on CW and SSB depending on transmit-to-receive duty cycle.

The CW keying waveform is crisp and clean and break-in works well. My paddle key settings first came up as reversed, an easy menu fix. SSB operation requires a little compression, but not too much and none for FM.

## Thoughts

Judging by early sales this radio is already another Icom success story. It appeals to Icom fans and IC-7300 owners. It's appealing for outdoor use, but I suspect some traditionalists might think it too high-tech for hiking to SOTA summits.

Consider this. To date we've seen manufacturers producing remotable head radios, but retaining the clever bits in the main body, with an amplifier and in some cases a tuner. Does Icom's philosophy of being a little different now mean they intend to turn this on its head?

SDR potentially makes it practical to have a comprehensive grab and go QRP radio for portable. Plus, in the not too distant future, an add-on, home and mobile use, 100W amplifier/tuner, possibly repackaged from the IC-7300. Hold that thought.

## Things I like, some I don't

What I like:

- The GPS automatically sets the clock for the log, when switching on – great.
- SWR and bandwidth plotting on-screen, excellent for portable, compromise antennas.
- Quality internal speaker gives good sound.
- Love watching the on-screen TX/RX audio monitor display.
- BNC antenna socket.
- Easy battery swap and compatibility with other models makes for a really good operating experience

What I am less enamoured with:

- No adjustable stand, perhaps a serious omission.
- Stock microphone transmit audio bandwidth a little restricted.
- Received audio bandwidth on speaker mic – I've heard better.
- Earthing bolt arrangement, could be improved.
- Black and white stripe, DC lead, give me Red and Black, any day.
- ± tags, very close to DC cable open end, likely to be removed.
- Glass fuses easily damaged but not easy to obtain in the field.
  NB: suggest, mini blade fuses as used in cars tougher and widely available.

## Finally

For the first time I have to consider splitting my personal 5-star rating scale.

Features and benefits wise, ease of use and for its future potential, it's got to be, 4.9.

Physically, I'd describe it as a high-end transportable and a solid brick of a radio, but would definitely insure it and consider extended warranty.

There's no pretence of being rugged, but I appreciate that's not its marketplace.

The internal casting offers some protection and perhaps the cosmetics can be replaced, but there's the stand issue, for this category it's 4.7.

Overall, it's 4.8 stars but, for innovation and future potential it's got to be heading for a 5.

Next time I'll be exploring accessories and after-market products for the IC 705.

My thanks to the ML&S team for a quick launch day delivery, to give a head start on this review. The IC-705 sells for £1300 and is available from most UK amateur radio retailers.

The full specification, software downloads and more are available on the Icom website: https://tinyurl.com/y2tqyk3n

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1

# The Bantenna

**Don G3XTT** takes a look at an unusual portable antenna.

The Bantenna sleeve antenna, launched recently by **David G4YVM** of **bantenna.co.uk**, is something a little out of the ordinary, which is why I wanted to take a look. What is it? The antenna is 'knitted' into a nylon sleeve, **Fig. 1**, that slips over a 7m fibreglass pole, making for a very quick and easy portable installation. And because it doesn't look like an antenna, your neighbours on the campsite won't have a clue what it is you are up to! The antenna wire is 'knitted' into the sleeve, with just a short length protruding at the bottom to connect to the Unun transformer, which comes in a plastic box and with a Velcro tape to attach it to the mast. The connector is a BNC type.

And that, in a nutshell, is the Bantenna!

## In Use

The selling point of the Bantenna is clearly that it is easy to put up and take down in a portable situation so I wasn't really expecting anything remarkable by way of performance. But it does claim to be usable on all bands 160 through 6m (really, thinks I?) with a power rating of 100W.

Because it is just a nylon sleeve, the antenna packs up very small although you do need a 7m fibreglass pole to support it. My first attempt was to use a SOTABEAMS Tactical Mini pole, because this collapses down very small, but unfortunately to do so it has more sections than a typical 7m pole and the lower sections were too chunky for the sleeve antenna to slide over them (I should mention that the guidance with the Bantenna is to remove the thin top section of your fibreglass pole, because it will probably damage the nylon sleeve). Fortunately, I also had a 7m fishing pole (bought for radio use but a fishing pole, for sure, because it still had the ring for the fishing line in the end of the top section!). The Bantenna slid nicely over this (there is a pull strap at the bottom to enable the user to pull the antenna evenly and another at the top for removing it after use).

(I should also mention at this point that the Bantenna normally comes with a suitable fibreglass pole but I had passed on this for the review because I knew I had suitable poles available)

My next challenge was supporting the pole. Bantenna do sell a lightweight guying kit but in my case, trying it out from home, I hammered an old broom handle into the lawn and slid the pole over it, **Fig. 2**.

As I said, the termination is for a BNC connector rather than PL259, **Fig. 3**. This shouldn't be a problem if you plan to use a Bantenna regularly – make up a suitable coaxial lead with BNC on one end and long enough to reach your car, caravan, tent or whatever.

## Checking SWR

First job, before running 100W into the antenna, was to check the SWR on all bands, at low power. While I know that using a Unun does help to hide the 'true' SWR of an antenna, I was pleasantly surprised at what I found. My measured results are shown in **Table 1**. In general, as you will see, SWR was 1.75:1 or less on most bands. The exceptions were 1.8 and 21MHz, where in both cases the SWR was close to 4:1. This put it outside the tuning range of the ATU in my IC-7300 although well within the tuning range of my Elecraft K3 (which can handle SWRs of up to 10:1). The SWR other users will see will depend to an extent on the length of coax they use to tune it, but I wouldn't expect it to depart significantly from the figures I was seeing.

Suitably reassured, I tuned around the bands and was pleased to note the strength of received signals, better

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**Fig. 1: The antenna on arrival.**
**Fig. 2: Connections to the Unun.**
**Fig. 3: The antenna in use.**

than I was expecting, recalling as I did a commercial multiband vertical that I had looked at a while ago that had SWRs that were all over the place and that seemed to be little more than a dummy load by way of performance. So, would the Bantenna work in reverse, i.e. on transmit?

My first excursion was on 20m CW, where I raised R125SE (some sort of Russian special event call) first call, followed shortly by a QSO with EA6NB in the Balearics. Given that the Bantenna is designed primarily for portable convenience and certainly not to compete with the typical home station antenna, and that it doesn't (apparently) require an earth connection, despite being a vertical, this was an encouraging start. The following day, in the CW Ops CWT event I worked 33 stations in an hour, split between 20 and 40m, in 11 countries, including across to Canada and the mid-west of the USA.

While not a definitive result (depends on band conditions, the stations at the other end, etc), I believe this was a good endorsement of the antenna.

Performance on the other bands was similar – not bad for a relatively short vertical without radials.

## Conclusion

When I am out portable, my preferred solution is usually to use a fibreglass pole to support wire antennas, either a half-wave dipole, or quarter-wave verticals. This works well but has the limitation that I can only operate one band at a time. The Bantenna is truly a multiband solution, easy to set up and doesn't obviously look like an antenna. And, in any case, it comes with a fibreglass pole that you can also use for other purposes.

There is a handy video on the Bantenna website, showing how to use the antenna. The Bantenna, complete with Unun and 7m supporting mast costs £125, or £95 without the pole. A three-point guying system is available for £15. Alternative colours are also available - black and 'emergency orange'. Order online: www.bantenna.co.uk

| Freq (MHz) | SWR |
|---|---|
| 1.8 | 3.7 |
| 3.5 | 1.1 |
| 3.8 | 1.3 |
| 7 | 1.4 |
| 14 | 1.6 |
| 18 | 1.6 |
| 21 | 3.7 |
| 24 | 1.6 |
| 28 | 2.1 |
| 29.5 | 1.6 |
| 50 | 1.6 |

**Table 1: Measured SWR**

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## VGC


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**T192** is an IP-67 rated 3G / WiFi Android Radio as above but with the IP rating ..... **NEW LOW PRICE £99.95**

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

## ICOM


**Icom IC-705 All Mode Portable Radio £1299.95**

**NOW SELLING FROM STOCK !**

**RFinder B1 Dual Band DMR 4G/LTE BACK IN STOCK £999.95**

## Mobile Antenna Mounts

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




## Multiband Mobile

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

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


## VHF/UHF Mobiles


**GF151** Glass Mount 2/70cm, Gain 2.9/4.3dBd, L. 78cm complete with 4m cable and PL259 ..... **£29.95**
**MRM-100** MICRO MAG 2/70cm, Gain 0.5/3.0dBd, L. 55cm, 1" magnetic base with 4m coax and BNC ..... **£19.95**
**MR700** 2/70cm, Gain 0/3.0dBd, L. 50cm, 3/8 fitting..... **£9.95**
**MR777** 2/70cm, Gain 2.8/4.8dBd, L. 150cm, 3/8 fitting..... **£19.95**
**MRQ525** 2/70cm, Gain 0.5/3.2dBd, L. 43cm, PL259 fitting (high quality)..... **£19.95**
**MRQ500** 2/70cm, Gain 3.2/5.8dBd, L. 95cm, PL259 fitting (high quality)..... **£26.95**
**MRQ750** 2/70cm, Gain 5.5/8.0dBd, L. 150cm, PL259 fitting (high quality)..... **£36.95**
**MRQ800** 6/2/70cm Gain 3.0dBi/5.0/7.5dBdBd, L. 150cm, PL259 fitting (high quality) ..... **£39.95**
**MRQ273** 2/70/23cm Gain 3.5/5.5/7.5dBdBd, L. 85cm, PL259 fitting (high quality) ... **£49.95**
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Save money buying in bulk – handy 50m as well as 100m drums at discounted prices


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**RG58-DRUM-100** standard RG58 6mm 100m reel..... **£29.99**
**RG58M-DRUM-50** military spec RG58 6mm 50m reel ..... **£24.95**
**RG58M-DRUM-100** military spec RG58 6mm 100m reel..... **£44.95**
**MINI8-DRUM-50** military spec MINI-8 7mm 50m reel ..... **£34.99**
**MINI8-DRUM-100** military spec MINI-8 7mm 100m reel ..... **£64.99**
**RG213-DRUM-50** military spec RG213 9mm 50m reel ..... **£64.99**
**RG213-DRUM-100** military spec RG213 9mm 100m reel ..... **£119.99**
**WESTFLEX-DRUM-100** military speck Westflex 103 10mm 100m reel..... **£159.99**
**RG174-DRUM-100** military spec RG174 2.8mm 100m reel..... **£59.95**
**FORMULA-ZERO 100m** super low loss cable 10mm ..... **£139.99**
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Lightweight medium and heavy duty swaged masts sets from 1.25-2" diameter 5ft sections to create a lovely 20ft mast – choose the correct size needed for the antenna installation. Masts have a lovely push fit for easy of use and to give a strong connection


**MSP-125** 20ft Medium Duty (set of 4 poles) 32mm dia 1.6mm gauge.... **£44.99**
**MSP-150** 20ft Medium Duty (set of 4 poles) 38mm dia 1.6mm gauge.... **£49.99**
**MSP-175** 20ft Medium Duty (set of 4 poles) 44mm dia 1.6mm gauge.... **£59.99**
**MSP-200** 20ft Medium Duty (set of 4 poles) 51mm dia 1.6mm gauge.... **£69.95**
**MSPX-150** 20ft Heavy Duty (set of 4 poles) 38mm dia 2.65mm gauge..... **£69.95**
**MSPX-200** 20ft Heavy Duty (set of 4 poles) 51mm dia 2.65mm gauge..... **£89.95**

## GRP Fibreglass Base Antennas 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


**SQBM100P** 2/70cm 3.00/6.00dBd, RX 25-2000MHz, Length 100cm SO239..... ~~£49.95~~ **SPECIAL OFFER £39.95**
**SQBM200P** 2/70cm, Gain 4.5/7.5dBd, RX 25-2000MHz, Length 155cm, SO239..... ~~£54.95~~ **SPECIAL OFFER £44.95**
**SQBM500P** 2/70cm, Gain 6.8/9.2dBd, RX 25-2000MHz, Length 250cm, SO239..... ~~£74.95~~ **SPECIAL OFFER £69.95**
**SQBM1000P** 6/2/70cm, Gain 3.0/6.2/8.4dBd, RX 25-2000MHz, Length 250cm, SO239..... **£84.95**
**SQBM223N** 2/70/23cm, Gain 4.5/7.5/12.5dBd, RX 25-2000MHz, Length 155cm, N-Type ..... **£79.95**
**SQBM3000N** Triband 2/70/23cm, Gain 4.5/8.3/10.7dBd Length 1.55m .... **£79.99**
**SQBM3500N** Triband 2/70/23cm, Gain 6.8/9.2/11.8dBd Length 2.70m .... **£119.99**

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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**
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**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** 1.8-50MHz 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**

## Yagi Antennas

All Yagis have high quality gamma match fittings with stainless steel fixings!


**YG27-35** Dual band 3/5 element 3.5/12.5 dBd gain with one feed! ..... **£79.95**

## Masts GRP Fibreglass


Ideal heavy duty fibreglass masts for those antennas that need to be insulated from metal hardware or pole – convenient 2m lengths in a light grey

**GRP-150** 2m 37mm OD..... **£29.95**
**GRP-200** 2m 51.7mm OD..... **£39.99**

## Masts Telescopic


We offer both aluminium and GRP fibreglass push up masts ranging from 20-50ft to suit your needs. The aluminium versions are for portable/occasional use and the fibreglass versions can also be used for fixed instillation

**LMA-M** 26ft open 5.5ft closed 50-25mm aluminium mast ..... **£109.99**
**LMA-L** 33ft open 7.2ft closed 50-25mm aluminium mast ..... **£119.99**
**TMF-1** 20ft open 5.6ft closed 50-30mm high quality GRP mast ..... **£199.99**
**TMF-1.5** 30ft open 7.5ft closed 57-30mm high quality GRP mast..... **£299.99**
**TMF-2** 40ft open 9ft closed 57-30mm high quality GRP mast ..... **£349.99**
**TMF-3** 50ft open 8ft closed 65-23mm high quality GRP mast ..... **£399.99**

**Sharman X-510**
**2/70cm 5.2m Super Gainer at a Super Price**
**Just £99.95**


## QRP Antennas

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

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

**Whizz Loop** 20-60m 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**

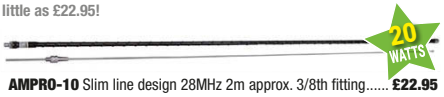

## Base Antennas

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


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

## HF Mobiles

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




**AMPRO-10** Slim line design 28MHz 2m approx. 3/8th fitting..... **£22.95**
**AMPRO-11** Slim line design 27MHz 2m approx. 3/8th fitting..... **£22.95**
**AMPRO-12** Slim line design 24MHz 2m approx. 3/8th fitting..... **£22.95**
**AMPRO-15** Slim line design 21MHz 2m approx. 3/8th fitting..... **£22.95**
**AMPRO-17** Slim line design 18MHz 2m approx. 3/8th fitting..... **£22.95**
**AMPRO-20** Slim line design 14MHz 2m approx. 3/8th fitting..... **£22.95**
**AMPRO-30** Slim line design 10MHz 2m approx. 3/8th fitting..... **£22.95**
**AMPRO-40** Slim line design 7MHz 2m approx. 3/8th fitting..... **£22.95**
**AMPRO-60** Slim line design 5MHz 2m approx. 3/8th fitting..... **£24.95**
**AMPRO-80** Slim line design 3.5MHz 2m approx. 3/8th fitting..... **£27.95**
**AMPRO-160** Slim line design 1.8MHz 2m approx. 3/8th fitting... **£59.95**

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

## Make Your Own? Wire, insulators & bits

Have fun but making your own antenna system and see how it works against the commercial designs


**SCW-50** Enamelled copper wire, 1.6mm, 50m length ..... **£24.95**
**HCW-50** Hard drawn copper wire, 1.6mm, 50m length ..... **£29.95**
**FWPVC-50** high quality flexweave with PVC coating 4mm, 50m ..... **£44.95**
**300-20** Ribbon feeder 300 ohm high quality slotted, 20m..... **£17.95**
**450-20** Ribbon feeder 450 ohm high quality slotted, 20m ..... **£19.95**
**DPC-W** Wire dipole centre with securing clamps ..... **£5.95**
**DPC-S** Wire dipole centre with SO239 socket for PL259 ..... **£6.95**
**DPC-38** Dipole centre for 2 x 3/8th whips antennas to make dipole ..... **£6.95**
**DOGBONE-S** small plastic insulator ..... **£1.00**

## Hardware

We offer all type of mounting hardware to help get you rigged up at home – if you cant see it listed chances are we have it. Check www.moonraker.eu or just give us a call

**TRIPOD-HDA** heavy duty collapsible tripod to suit base mats up to 67mm ..... **£149.95**
**TK-24** wall bracket offers 18" clearance ..... **£29.95**
**TK-12** wall bracket offers 12" clearance ..... **£19.95**
**BB2** mast base plate to suit up to 2" masts/pole ..... **£22.99**
**JOIN-200** clamp 2" poles back to back ..... **£17.95**
**PTP-20** 2" to 2" mast clamp ..... **£5.95**

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**Don't miss out – Register now and start enjoying free WATTS**

# Dual Band Handie on the Cheap

**Paul Beaumont G7VAK** plays with a very cheap but perfectly serviceable handie-talkie from Baofeng.

**Paul Beaumont G7VAK**
practicalwireless@warnersgroup.co.uk

The COVID19 lockdown left many of us with lots of time on our hands. Many turned to watching TV all day but amateur radio, CB and the 446 users saw their chance for experimentation as well as listening or transmitting.

Many older amateurs and radio enthusiasts were taken by the appearance of the 'cheaper' handhelds and mobile units that became available from China. Far from being flimsy and poorly made the units seem a good standard and useable without burning a massive hole in your pocket.

One such radio appealed to me. It was advertised as the Baofeng BF-T1 Mini Walkie Talkie covering 400 to 470MHz with 1W output of narrowband FM, **Fig. 1**.

The price demanded varied between £13.00 to £16.00 for a single unit. Purchasing two at £22 gives an even more favourable price while an order for six means a cost of around £10.50 per unit, and it gets even better as the quantities rise, **Fig. 2**.

I ordered a single unit costing £12.99, which arrived post-free in a very fast time. Unpacking and eventually switching on, the thing bleeped and addressed me in English for every button push. Thankfully, via the menu key, that prompt and the accompanying bleep can be turned off.

1

## Out of the Box

In the box is the transceiver itself, battery, headphone and microphone assembly with four-section 3.5mm plug, an orange lanyard you'll never wish to be seen wearing, a small bag with four screws, a belt clip and a USB plug to USB C plug for charging only.

The radio, as I was to discover, cannot be programmed by button selections. The Program 9100 and a programming lead are easily available. The 9100 program can be downloaded and is also available on a miniature CD.

I purchased my 9100 copy online with the 446 Fill already set. Then I overwrote it, using the channels as I saw fit. It is worth bearing in mind that the limit on 446 channels is 500mW and the antenna is likewise modelled to allow very local communications only.

The antenna used on the BF-T1 is very small. Sight of it would remind those who have worked in the non-licensed radio field of the antennas supplied with each transmitter or receiver of the licence free units.

On programming my unmodified unit I noticed something not stated in the advert. The frequency range stated along the bottom of the panel states frequency ranges of 136 to 174MHz and 400 to 470MHz, **Fig. 3**.

As a result I modified my programming Fill to that seen on my listing, **Fig. 4**. It's notable that the WFM Radio can be programmed to cover 65 to 76 or 76 to 108MHz.

Once programmed I checked the local Caterham repeater GB3NS (channel 10 on the listing as in Fig. 4) as described, 439.6750/430.6750MHz with CTCSS 82.5Hz. The little set was unmodified other than the change of programming. On releasing the transmit pressel I was rewarded with the sound of the repeater carrier, which then closed.

The rough distance as the crow flies between my QTH at Crystal Palace and Caterham is 9.3miles/15km. For 1W and a very poor antenna the result was excellent, **Fig. 5a**.

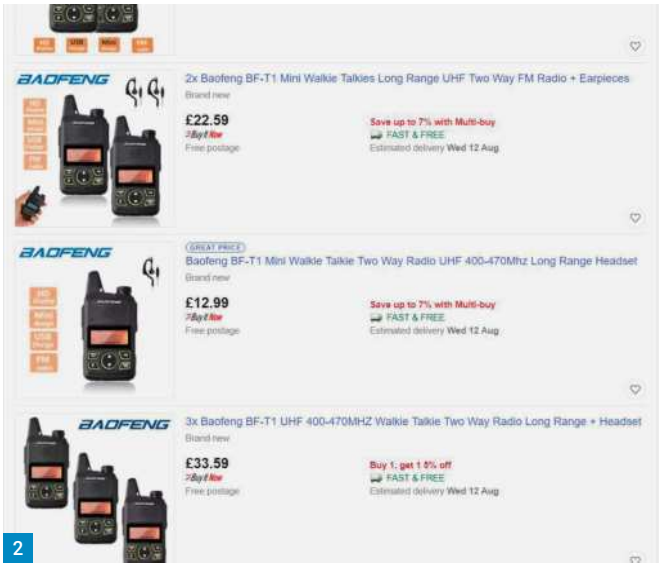
A local VHF repeater is GB3XP situated in Morden, which is around 4.2miles/6.8km distant, F**ig. 5b**. Looking at Fig. 4 and Channel 20 the frequencies can be seen as 145.6875/145.0875MHz with CTCSS of 82.5Hz. Attempts to open this repeater failed miserably but with a tiny antenna not configured for the 2m band (and in my opinion pushing it a bit even with 70cm frequencies) this was not a surprise.

## Thinking about a Modification

Looking again at Fig. 1, it can be seen the BF-T1 sports a light. A single hi-output white LED with a cheaply silvered reflector would not be much use for finding one's way around in the dark. I was considering an antenna modification here, reasoning that the removal of the LED would give sufficient room for a socket of sorts.

While I prefer a BNC socket it was obvious there would be no room to fit one easily, if at all, given the size constraints and the necessity of a very firm base.

Looking through my junk box I discovered a single SMA Female Socket



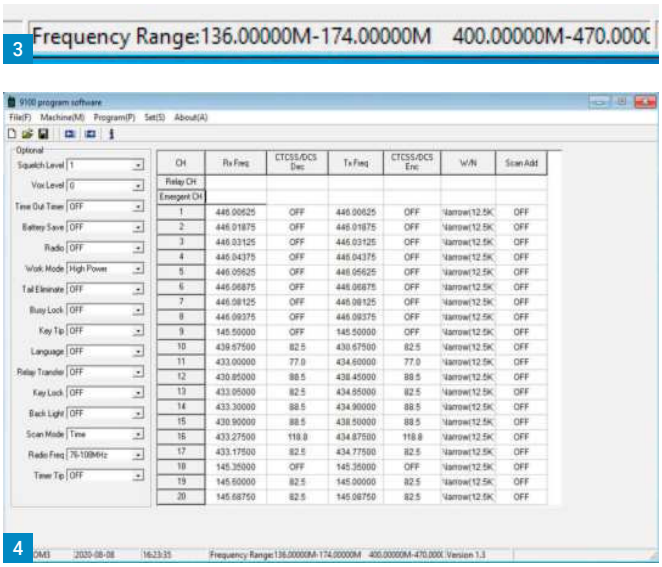




**Fig. 1: The BF-T1. Fig. 2: An ad for the BF-T1. Fig. 3: The frequency range, as displayed in the programming software. Fig. 4: The author's 'frequency fill'. Fig. 5a: The author's QTH to Caterham. Fig. 5b: The author's QTH to Morden. Fig. 6: Opened up and with adapters. Fig. 7: With the back removed.**

with a pigtail attached and another one that had an SMA Male Plug to BNC Female Socket RF Adaptor, **Fig. 6**.

Opening the unit is not difficult. The battery is removed allowing the display of the misleading maker's label, **Fig. 7**.

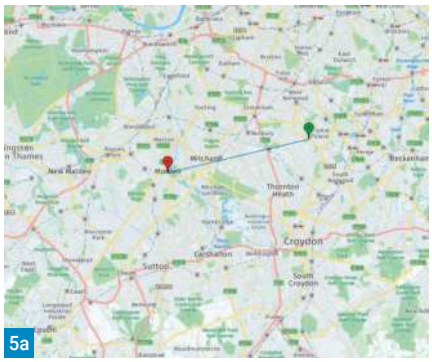
Note the small crosshead screws in line with the battery connector. Two others are situated at the bottom of the unit. All four screws can be removed.

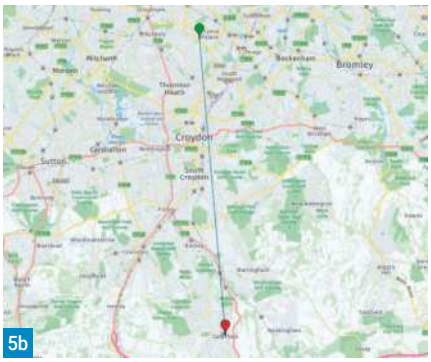
Taking the back off can be fiddly. Obviously no damage should occur during this process and I suggest a screwdriver shaft is inserted into one of the holes vacated by one of the top screws and the lid gently lifted from its mount, which brings the motherboard free from the case. Take care not to rip the audio leads from either the board or the miniature loudspeaker.

Once inside I removed the main board easily. Placing in a small vice I unsoldered the small helical antenna from its pad, **Figs. 8a** and **8b**.

Then I set about fixing the SMA female socket. I had no use for the LED Torch and decided that was the best place to fix the SMA receptacle. The LED unsoldered easily enough and I cleaned the small pads to reduce whatever profile they exhibited in the small space available.

Any intention of using the screened low-profile coaxial lead as fitted to the new receptacle was soon squashed. Its



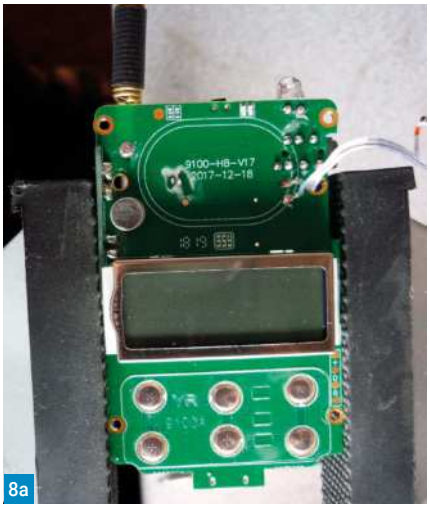




diameter was too thick, causing me to remove the outer sheath and the braid, leaving only the central core.

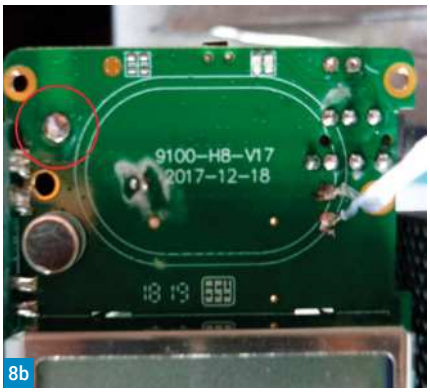
I removed the transparent lens and set it aside. Following this was the silvered reflector. Using my soldering iron, I simply melted a hole into the lens and slowly increased its size with careful use of a small diameter reamer tool. Slipping the SMA receptacle through this access I tightened the lock nut to my satisfaction. Then after mixing a quantity of 'Ten Minute' Araldite Resin I packed the space behind the lens and the reflector and then carefully placing the connecting wire, the coaxial core, through the moulding for the lamp assembly, I placed a splodge of resin to hold the lot in place. In keeping with good practice, I used a wipe soaked in methylated spirit to remove any excess. Ten minutes is a good drying time but I left it overnight to be sure, **Fig. 9**.

In the morning the bond was very strong. The antenna connecting wire was placed along the top of the board, in the unit moulding, and soldered into place.

The battery and rear cover were replaced and after a quick visual check the modified unit, **Fig. 10**, was switched on. It worked

8a



8b


9

10

**Fig. 8a: The antenna pad. Fig. 8b: Ready for surgery. Fig. 9: Fitted to lens with reflector prior to filling with resin. Fig. 10: The completed unit with SMA/BNC adaptor.**

first time. With a claimed RF output of 500 or 1000mW I didn't bother tuning it up.

## In Use

Fitting a short 2m/70cm antenna I was rewarded with activity on the 446 licence-free channels but also opened and received the Caterham Repeater with no problems.

The Morden repeater, GB3XP, on 2m was another matter. I fitted a longer 2m whip claiming 'Nagoya 771' but had difficulty on transmit. Using an SMA/BNC adaptor I connected my stack-mounted 2m/70 colinear. A QSO was in progress and I recognised both parties as being members of the Surrey Radio Contact Club, of which I am a member. I put out a call and was rewarded with RS2/2. Not good but with coaxial losses I was probably putting out around 300mW. No complaints.

The commercial radio side of things worked well for me as I had the misfortune to tune up on LBC with **Steve O'Brien** waxing lyrical. I turned back to the repeater.

With 65 to 76MHz also available it occurred to me there may well be other stuff worth catching, either with skip or some other transmissions closer to home.

## In Summary

So, are these little units worth their cost? Simply, yes.

The audio is a bit duff and needs taming. Being from a standard IC, sorting this will be the matter of raising the data sheet and the placement of a resistor, or two.

Of course, a simple whip antenna could just be added using a central core of coax and an access hole bored through the antenna moulding to allow this to connect to the existing pad after removal of the existing small helical antenna.

It's horses for courses here and much dependent on what you wish to achieve. For less than fifteen quid, though, you can't go wrong!

# Finding inspiration online!

**Tim Kirby GW4VXE**
longworthtim@gmail.com

**Tim Kirby GW4VXE** has been enjoying online links, including participating in the recent RSGB Convention.

1

The online RSGB Convention proved a great success as far as I could see. Although for many people there is a great attraction in meeting up, swapping stories and so on, not everyone is able to (or willing to) travel to a convention venue for the whole weekend. How wonderful it was, then, to be able to listen to some really excellent talks from wherever you were on the day. I can't recommend **Jim Bacon G3YLA's** talk about *VHF Propagation and the Weather* enough. I learned lots about Tropo and Sporadic E, in particular. Jim also mentioned a website that he is collaborating in, which has plenty of information aimed particularly at understanding Sporadic E as well as the change in day-to-day 'local' conditions on 80m. You can find the site, Propquest, at: **www.propquest.co.uk**

All the talks from the convention will be available online by the time you read this, so take a look on the RSGB's YouTube channel and find them. I'm also looking forward to **Palle Preben-Hansen OZ1RH's** talk on *Ionoscatter on 50 and 144MHz*, which I wasn't able to watch live. Whatever your interest and experience, hopefully there is something to inspire and engage you.

Assuming that 2021 allows a more usual convention format, it would be great if there was also some online format like this year, so that people have the choice whether to attend in person or online. I am sure that many would be happy to pay to attend 'virtually' should loss of attendance revenue be a concern.

I was delighted to have the opportunity to present one of the RSGB's *Tonight at 8* webinars on *My The World of VHF* a few weeks ago where I introduced the VHF bands and tried to give a feeling for what you might be able to expect on each of the bands. It was a bit of a whistlestop tour, but if you haven't seen it yet, do have a look at the YouTube clip below and I hope you'll enjoy it.

**https://youtu.be/KfDKQ39z05k**

The new series of Foundation Practical videos are well worth a look too if you're getting started in the hobby, or even if you just fancy a refresher. Again, have a look at the RSGB's YouTube channel (below) to find them.

**www.youtube.com/user/TheRSGB/videos**

It's really great to see technology used in this way, making it possible for talks and information to reach many more than previously.

## Another look at 4m FM

I recently had the opportunity to review a dual-band 70/144MHz handheld, which perhaps you'll read about elsewhere. What I wanted to write about though, was my experience on 70MHz FM using a handheld.

My first 70MHz handheld experience, a few years back, was a bit of a disappointment and I think I had about one contact in a year with the unit and decided to sell it. There was nothing wrong with the handheld itself, though. The limiting factor was the antenna that was supplied with the handheld, which was probably fairly much akin to a dummy load on the band. So, when I got hold of the unit more recently, I was keen to try a few different options.

The supplied dual-band 70/144MHz antenna certainly worked across a distance of a few miles, particularly from an elevated spot. From one of the hills near Fishguard, I worked **Richard GW1JFV** in Haverfordwest, some 30km away, as well as hearing **Peter GW4JQP**, also using a handheld, a bit further off, at a distance of around 45km. I wanted to try and see if I could improve on that and had previously used one of the Spectrum Flexiwhips. This seemed to offer a bit more gain than the standard antenna and provided some weak signals where the stock antenna had produced nothing at all. Finally, I used a quarter-wave magmount, either on a metal roof at home or on the car. That worked very well indeed, better, as you might imagine, than either of the handheld whip antennas.

I was curious to see what would happen with the 70MHz handheld in a more urban environment and brought it to Cheltenham where I knew there was some activity on the band. I was pleased to find that the handheld, running about 5W, was audible across town, on an obstructed path. It did seem to work much better outside than in the house, despite being at ground level rather than on the second storey of the house.

So, if like me, you're tempted by a handheld on 70MHz, have a play with antennas and see what works best depending on how plan to use it. If you are planning portable activity from the hills, then you might even like to try one of the Flowerpot designs, which seem to have worked well for some people. If you aren't familiar with the Flowerpot antenna (I wasn't), you can see a design for a 2m version here:

**https://tinyurl.com/y3mtt32g**

This could be scaled up for 4m, which is shown on M0NFI's website:

**https://tinyurl.com/y4dalquw**

It will be exciting to see if the better availability of 4m handhelds increases FM activity on the band. Don't necessarily expect to make too many contacts on the handheld's supplied antenna and be


**Fig. 1: David M0TFY uses this Trio TS-700 on a regular basis. Fig. 2: Paul Beaumont G7VAK has this lovely Kenwood TR-7625. Fig. 3: Robert PA9RZ has a wonderful collection of Icom portable radios which are all used regularly.**

prepared to try something different.

I was pleased to find in both West Wales and Gloucestershire, that there were plenty of stations equipped with 70MHz FM, perhaps waiting for a little bit of activity.

## The 6m Band

**Jef Van Raepenbusch ON8NT** (Aalter) caught a 6m opening on September 3rd, working GM8IEM (IO78), EA6SA (JM19), EA7M (IM76), EA4BAS (IN80), EA5AL (IN80), LX1JX (JO30), G4IMP (JO01), EA4YR (IM78) and LB3AG (JP53).

## The 2m Band

Jef ON8NT runs 25W from an IC-9700 and a 5-element LPDA and had an exceptional month. Most of Jef's contacts were on FT8, but he did work DL5NEN (JN59) on CW on September 6th. Highlights from Jef's log include OK1VVT (JO60), OZ1CCM (JO55), GM4FVM (IO85), EI3KD (IO51), EC1A (IN73), F6CIS (IN94), GI6ATZ (IO74), G7RAU (IN79), SM7WW (JO65), SP1FJZ (JO64), SP1MVG (JO74), GD3YEO (IO74) and GM3SEK (IO74), all on FT8.

**Jon Stow G4MCU** (Hockley) enjoyed the tropo in September between the 17th and 21st, with the highlights being OZ1BEF (JO46), DK4EE (JO41), DL2RZ (JO54), GM4YXI (IO87), GM0OQV (IO85), DG8LG (JO44), DL0CX (JO43), DL5BBF (JO42), SM4GGC (JO69), OZ1BNN (JO55), OZ6OL (JO65), SM7GVF (JO77), OZ8ZY (JO54), GM4JOJ (IO97) and SM6VTZ (JO58). Jon runs 100W from an IC-9700 and prefers SSB to digital modes.

**Roger Daniel G4RUW** (Newbury) also enjoyed the September tropo. On September 17th he worked SK6QA (JO58) and then on September 20th SM4GGC (JO69). Both QSOs were on FT8. Next day on the 21st Roger worked SM7GVE (JO77) on SSB then went back to FT8 and worked LB7ZH (JO59). Roger says that he also worked OZ, PA, DL, ON, GM and F during the opening.

**Phil Oakley G0BVD** (Great Torrington) was pleased to work OZ1JMN (JO46) during the tropo opening on September 18th.

**Tim Hague M0AFJ** (Helston) has a difficult take off towards Germany and Denmark but did well in the tropo opening, working DB8WK (JO33), OZ1BEF (JO46), DJ8MS (JO54), OZ1CCM (JO55), DL2AKT (JO50), DF9QT (JO30), OK1DOY (JO60), DK2EA (JO50) and DF6PW (JO40). Tim's decided to replace his IC-9700, which he didn't enjoy, with a tri-band transverter system from Q5 Signal, which he is looking forward to trying.

Here at **GW4VXE** (Goodwick) there seemed to be plenty of tropo around through the month, highlights being EC1A (IN73), F6HRO (IN88), F5APQ (JO00), F6BTP (JN09), DG1KDD (JO31), EA2XR (IN83), EA1MX (IN73), OZ1CCM (JO55), DB8WK (JO33), DJ9YE (JO43), PA3BIY (JO22), OK1VVT (JO60), DL3TW (JO44), SM7DTT (JO65), DF5VAE (JO64), OZ2LIN (JO46), DJ8MS (JO54), OV3T (JO46), OZ2ND (JO46), OZ1CCY (JO45), OZ4VV (JO46), OZ5TG (JO45), F6APE (IN97), GM0HBK (IO77), GI0OTC (IO65), EI9KF (IO64) and EI8HH (IO53). Many of these contacts were ones I had not expected to be able to make from the west coast of Wales over a mountainous path. Fascinating!

## The 70cm Band

The highlights of Jon G4MCU's log during the September opening were SM6VTZ (JO58), OZ9FW (JO65), DJ8MS (JO54), DL4EEC (JO33), MM0CEZ (IO75), OZ1BNN (JO55) and SP1MVG (JO74) who was a new country for Jon on the band at a distance of 987km. Jon runs 50W of SSB from an FT-991.

Jef ON8NT worked G1YBB/P (IO82) during the UK Activity Contest on September 8th. Highlights on FT8 were GB8BOB (IO82), G0RQL (IO70), G4RRA (IO80), GD3YEO (IO74), GW3TKH (IO81) and OZ1LWT (JO46).

**Tony Collett G4NBS** (Cambridge) said that when he went on the band on September 20th, during the opening he was pleasantly surprised at the amount of activity – it was almost like being back in the 1980s, except this time on FT8, with many of the same stations being active! Tony worked a couple of stations on CW and SSB (OZ1BNN was using a 144MHz antenna at the time!). On the 21st, Tony was about to switch off, but got caught up with other things and then noticed SM0MDG and OH1ND, who was Tony's best DX of the opening.

**Simon Evans G6AHX** (Twyning) took part in the RSGB UHF contest at the start of October. On 70cm, he had ten contacts with the best DX being OR6T (JO20) at 501km.

Tim M0AFJ worked DK2EA (JO50) on September 17th.

## The 23cm Band

Jon G4MCU runs 10W of SSB from an IC-9700 and lists OZ1FF (JO45) and DB8WK (JO33) from the September opening.

**Robert Van Der Zaal PA9RZ** (Sassenheim) says he had to miss the

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opening during the September 23cm activity contest as he'd had to chair a meeting of his local radio group. He very kindly sent a picture of his 'vintage' Icom corner, covering 6m up to 70cm, and says that when there is a lift, he prefers to use these radios.

Simon G6AHX had eight contacts during the RSGB UHF contest with the best DX being G3R (IO93) but Simon was also very pleased to work *PW* columnist **Bernard G4BXD** on the band. Simon says that he can regularly receive several beacons on 23cm: GB3MCB, GB3USK, GB3IOW, GB3FM, GB3DUN and GB3MHW.

## Satellites

**Tom Morgan ZS1AFS** says that he made a contact with a ZS2 station through the ISS crossband repeater using his special call of ZT1T/P. He's also managed to access the repeater using a handheld and extended rubber duck.

Jef ON8NT enjoyed the SSTV transmissions from the International Space Station (ISS) on September 30th and October 1st. Transmissions were made on 145.800MHz using the PD120 mode.

**Kevin Hewitt ZB2GI** (Gibraltar) made a couple of contacts: EA7P (IM76) and IS0OZK (JM49) via the ISS Crossband repeater using his FT-817. Kevin took part in the ISS SSTV event on September 30th and October 1st, receiving seven full images with three duplicates over four passes. Kevin used an FT-817, a Win 7 Notebook PC running MMSTV and a manually-tracked 2m/70cm log periodic.

Simon G6AHX has made some nice QSOs through the RS-44 satellite, including PD4HDB, F6CTW, OH5LK and ON3ONX, but his main aim was to make a transatlantic contact, which Simon was delighted to achieve on September 23rd when he worked WO3T in Virginia. On October 7th, Simon listened to the ISS Telebridge activity on 437.525MHz FM when a schools contact was being made.

**Patrick Stoddard WD9EWK** (Phoenix) reports, *"AO-92's battery issues have kept it offline, while AMSAT decides what to do next. In the past month, we gained the use of the new Kenwood TM-D710G operating from the ISS Columbus laboratory module. This new radio, with the customized firmware for the ISS provided by JVC/Kenwood, has been busy – first as a cross-band voice repeater, and now as a packet/APRS digipeater.*

*"In addition to being used for school contacts, the new TM-D710G had been operating as a cross-band voice repeater. With an uplink at 145.990MHz with 67.0Hz tone, and the downlink around 437.800MHz (± for Doppler), it drew many stations that have not tried other satellites. In the cross-band voice repeater mode, the ISS radio transmits at 5 watts – more power than any other FM satellite we have, but not high enough to overheat the radio. The 5W downlink was easy to hear. On passes that were not so busy, mostly late at night, I could work the repeater with HTs transmitting at 2 to 5 watts. For other passes, I used my Icom IC-2730 2m/70cm FM mobile radio, switching among its three power levels (5/15/50W) to see how much power I needed to get through the repeater. Sometimes, even 50W was not enough, but most of the time I only had to go up to 15W to make contacts during busy daytime passes.*

*"In the past couple of days, after a school contact that used 437.525MHz as the ISS downlink over Europe, the new TM-D710G was put into packet/APRS digipeater mode. On the new radio, the digipeater transmits at 10 watts, as it is not transmitting as much as in the voice repeater mode. It hears well, and the 10W downlink helps in copying more packets transmitted from the ISS. In the short time I have been using the digipeater, I have had a few contacts with stations across the continental USA and northern Mexico, using my Kenwood TH-D74 and Elk log periodic antenna. ARISS has not announced how long the radio will stay in digipeater mode.*

*"Another new TM-D710G is due to be sent to the ISS by the Russians, to replace their older TM-D710 used for school contacts and SSTV. Once that radio is installed and put into operation, it might be possible to see both the voice repeater and packet/APRS digipeater in simultaneous operation. The voice repeater was in operation during the recent SSTV operations, along with SSTV and a school contact using 437.525MHz. With new TM-D710Gs operating from both the European and Russian parts of the ISS, this will provide more flexibility for amateur radio operations."*

3

Phil G0BVD has been listening to the ISS crossband repeater, having set up his IC-9700 with **Harold M3OPW**. Phil hasn't made any contacts so far, but has heard French and Italian stations

Here at GW4VXE I had some success with the ISS crossband repeater when it was low over the sea to the southwest, out of range of a lot of Europe. Of course, while that limits competition, it also restricts the stations you're able to work! Stations worked include EA1BNF (IN52), 2E0XXI (IO93), EI6FM (IO51), MI0KOA (IO74), EA1PA IN71) and EI3FW (IO54). I'm now looking forward to trying out the APRS digipeater.

Well that's it for this month. Please keep your news – and your pictures of vintage radios still in use – coming. See you next time.

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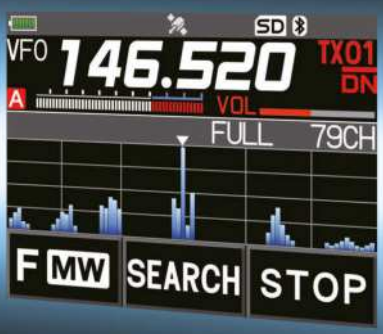


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# 2020 PW 144MHz QRP Fun Contest Results

**Colin Redwood G6MXL**
practicalwireless@warnersgroup.co.uk

**Colin Redwood G6MXL** has the results of the June 2020 2m QRP Fun Contest.

2020 saw 42 entrants submit logs in the 36th *Practical Wireless* 144MHz QRP Fun contest held on Sunday June 14th 2020. This year due to the coronavirus pandemic all stations entered as single operators from fixed locations, depriving many entrants of the use of their favourite portable locations. Despite this, many stations did surprisingly well with low power. Several regulars submitted check-logs.

Government restrictions associated with the world-wide pandemic that is Covid-19 resulted in a very strange contest this year. The combination of being confined to fixed operation, often from a poor location, propagation and weather made for a rather tough and frustrating contest for many entrants. Not only was the number of entries down this year (only one from Wales and the rest from England and Scotland), the number of contacts and squares worked were down as was to be expected.

The entrants made a total of 525 valid contacts with stations in 19 different squares, **Fig. 1**.

## 2020 Winners

The overall winner, leading English station is the **Ossett Amateur Radio Operators M0ORO**, operated by **J. Brown** from Ossett (IO93EQ). He used an Icom IC-911 transceiver and an 11-element Yagi antenna.

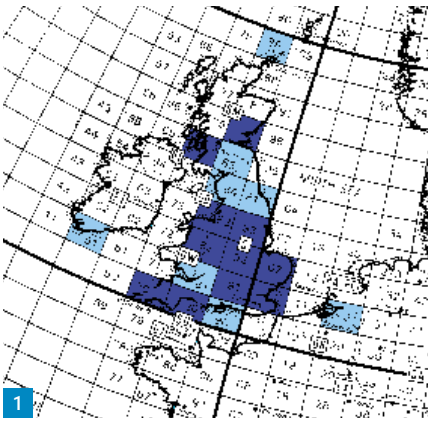
In second place is **Geoff Newstead (Burton On Trent ARS) G8EKG**, operating from Stapenhill (IO92ES). He used a Flex 5000 transceiver and a Cushcraft Antenna

The leading Scottish station is **Martin Mrawczyk 2M0KAU**, operating from Dundee (IO86ML).

The leading Welsh station is **Tom Brady GW8HEB**, operating from Welshpool (IO82KP).

Full details of the results can be found in the tables in this article. As usual certificates will be sent to all the leading stations above and the leading station in each square.

Checklogs were received from **Andrew Lancaster G0JCC, Steven Clements G1YBB, Roger Piper G3MEH** and **Robin Thompson G3TKF**.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## Home QTH

Being limited to fixed station operating presented a challenge to some, but not all. Those who already had a 144MHz station setup at home enjoyed the convenience of operating from home. One station commented, *"After a leisurely breakfast and quick look at the Sunday papers I was ready to hit the radio on switch and start making contacts in the contest"*. Others had to set up a 2m station at home especially for the contest.

Several stations concluded that their home locations are poor for VHF contesting. **Dave Tarbatt G7KSR** said that, *"After four hours shouting CQ using a 5-element ZL-Special at 25ft on a temporary push-up mast in the back garden, I think it's safe to conclude that my home QTH is poor for VHF contesting. Four QSOs really does not a contest make!"* **David Smith GM0KCN** lives in a valley at river level with hills all around. He wasn't expecting to make many contacts but, *"I did think that one single contact was a lot worse than I anticipated"*.

Even with a good QTH, some had QRM to deal with. **Martyn Wright G4RLF** has recently been suffering with a local faulty solar panel inverter, so despite having a good QTH, contacts are difficult, with about a 20dB noise floor.

## No Midges

There were some benefits from staying at home. **Ron G0BNC**, says, *"I missed going out portable on the hills and getting a suntan, but did not miss the midges using my blood as their dinner. I used to enjoy the contest in the early 80s when I would often stop for a chat as it is the taking part with me, not the winning. I had a few stops to chat for a few minutes, which was good because some were good contesters normally with 59 reports and gone. The contacts were very slow coming, and I am glad I was using my voice caller, or I would not have a voice left. Only one contact in my 1325 afternoon session, and G4UXC said I was the only station he had heard"*.

## Equipment

Entrants were determined to participate with whatever equipment they had to hand. A wide range of equipment was deployed, ranging from state-of-the-art multi-band SDR transceivers to single-band transceivers of the 1980s and earlier. Several entrants resurrected some older transceivers. **Ross Wilkinson G6GVI** says he got his *"old IC-202 back in action, after repairing its dial-knob"*. **Martyn Wright G4RLF** says that his Liner 2 overheated at times and stopped transmitting, **Fig. 2**. He has modified it to improve the sprogs and it now boasts a GASFET RF and mixer stage. Others used some old antennas, including two stations using Jaybeam antennas, which must be roughly 30 years old.

## Thunderstorms

A couple of stations felt that in addition to poor conditions in general, thunderstorms were probably responsible for the lack of stations working.

## Back in Touch

The contest enabled some entrants to make contacts with friends they hadn't heard on the air for some time. **Ross Wilkinson G6GVI** got in touch with **Terry Hampson G6DEG**.

## First Contest

The *PW* 144MHz QRP contest has always welcomed newcomers to contesting, so it was good to see some new calls amongst entrants. **Billy Starkey M7AJT** passed his Foundation exam in September 2019, and this was his first contest. Billy is a member of the Cornish Radio Amateur Club.

## KST

Several entrants commented on the use of the ON4KST chat facility during the contest. The contest rules are designed to encourage the greatest possible participation, particularly among newcomers to contesting using simple gear. Therefore, use of the ON4KST chat facility is not permitted. I received suggestions that stations may have logged on to the ON4KST chat facility, without actually entering into a chat, thus enabling them to see information from other stations on the band. The rules for future *PW* 144MHz QRP contests will clearly prohibit this practice.

## Date for Your Diary

Several entrants hoped that things would be back to normal in 2021. Government regulations permitting, it is certainly my aim to revert to normal operation. The provisional date for the 2021 *PW* 144MHz QRP Contest is Sunday June 13th 2021. Hopefully, the usual format, including multi-operator portable operation, will be possible along with 5W power limit. As usual the event will be arranged to run alongside the RSGB 144MHz Backpackers contest for the benefit of entrants to both contests. Keep an eye on *Practical Wireless* and the *PW* Contest website at:
www.pwcontest.org.uk

## Thanks

Many entrants expressed thanks to other stations taking part or giving points away. I would like to thank everyone who participated in 2020, and **Neill Taylor G4HLX** for devising the contest in the first place.


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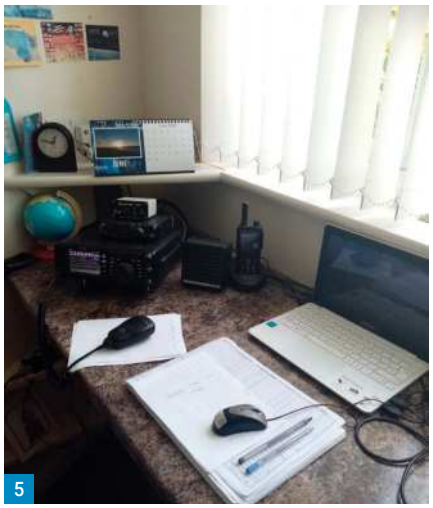
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**Fig. 1: Map showing locator squares of stations that entered (in dark blue) and other stations worked (light blue). Fig. 2: Martyn Wright G4RLF operating his modified Liner 2 transceiver. Fig. 3: Dave Hewitt G8ZRE working on his antenna system. Fig. 4: Peter Knight G6EPN operating from his garden. Fig. 5: Roger Lapthorn G3XBM operating position. Fig. 6: John Wake M0JPA operating position. Fig. 7: The antennas at Cambridge & District Amateur Radio Club's station G2XV. Fig. 8: Huw Hallybone G8IBL operating from his garden.**


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| Description | Name/Team | Callsign |
|---|---|---|
| Overall Winner | Ossett Amateur Radio Operators | M0ORO |
| Runner Up | Geoff Newstead (Burton On Trent ARC) | G8EKG |
| Leading English Station | Ossett Amateur Radio Operators | M0ORO |
| Leading Welsh Station | Tom Brady | GW8HEB |
| Leading Scottish Station | Martin Krawczyk | 2M0KAU |

**Table 1: Leading stations.**

| Square | Name | Call | No. entries |
|---|---|---|---|
| IO70 | Billy Starkey | M7AJT | 1 |
| IO75 | Roy Kavanagh | GM5LOW | 1 |
| IO80 | Ian Carter | G0GRI | 1 |
| IO82 | Simon Pryce | G0EIY | 6 |
| IO83 | Dave Hewitt | G8ZRE | 5 |
| IO85 | David Smith | GM0KCN | 1 |
| IO86 | Martin Krawczyk | 2M0KAU | 2 |
| IO91 | SADGIT | G4RLF | 6 |
| IO92 | Geoff Newstead (Burton On Trent ARC) | G8EKG | 4 |
| IO93 | Ossett Amateur Radio Operators | M0ORO | 10 |
| JO01 | Malcolm Bryan | G8MCA | 3 |
| JO02 | Philip Holt | G4LPP | 5 |

**Table 3: Square winners**

| Pos | Call | Name | QSOs | Squares | Score | Locator | Transceiver | Antenna | Ht. m asl |
|---|---|---|---|---|---|---|---|---|---|
| 1 | M0ORO | Ossett Amateur Radio Operators | 45 | 9 | 405 | IO93EQ | Icom IC-910 | 11-ele Yagi | 110 |
| 2 | G8EKG | Geoff Newstead (Burton On Trent ARC) | 34 | 8 | 272 | IO92ES | Flex 5000 + Khune TVTR. | Cushcraft 13B2 | 95 |
| 3 | G4RLF | SADGIT | 29 | 9 | 261 | IO91BB | Liner 2 Modified + LNA | 17-ele Tonna | 77 |
| 4 | G4PGJ | David Ward (Burton ARC) | 23 | 9 | 207 | IO92ET | Icom IC-7100 | 7-ele LFA | 133 |
| 5 | G8MCA | Malcolm Bryan | 34 | 6 | 204 | JO01BK | TS590 + Elecraft TVTR and Airspy SDR on | 5-ele LFA | 12 |
| 6 | G0EIY | Simon Pryce | 31 | 6 | 186 | IO82OR | Yaesu FT-897D | 10-ele Yagi | 77 |
| 7 | M1AEA | Mark Waldron | 25 | 7 | 175 | IO82WM | Yaesu FT 817 | 4-ele Cushcraft Yagi | 219 |
| 8 | G4LPP | Philip Holt | 22 | 7 | 154 | JO02SS | Yaesu FT-991a | 9-ele xy Tonna Yagi | 4 |
| 8 | G2XV | Cambridge & District Amateur Radio Club | 22 | 7 | 154 | JO02AH | Kenwood TS790E | Stacked pair of 9-ele Tonnas | 16 |
| 10 | G8ZRE | Dave Hewitt | 19 | 7 | 133 | IO83NE | Yaesu FT-897 | 8-ele XY Yagi | 30 |
| 11 | G0BNC | Ron Flemming | 15 | 5 | 75 | IO91GT | Kenwood TS-711E | 10-ele Jaybeam | 92 |
| 12 | G4HZG | Michael White | 14 | 5 | 70 | IO93HE | Flex5000a | 12-ele yagi | 15 |
| 13 | G8XYJ | Matt Porter | 11 | 6 | 66 | IO82PJ | Icom IC-9700 | 6-ele DK7ZB | 117 |
| 14 | G8ITB | Cray Valley Radio Society | 15 | 4 | 60 | JO01AI | Icom IC-7300 | Diamond X-5000 vertical colinear. | 92 |
| 15 | G8EVY | Cambridge & District Amateur Radio Club B Station | 11 | 5 | 55 | JO02AD | Icom IC-9100 | 7-ele Yagi | 15 |
| 16 | G0AJJ | Linda Leavold | 18 | 3 | 54 | JO02QT | Icom IC-910 | 17-ele Tonna | 43 |
| 17 | G8EQD | David | 13 | 4 | 52 | IO93HK | Yaesu FT-991 | 8-ele | 76 |
| 17 | M0WID | David Wilde | 13 | 4 | 52 | IO91WF | Yaesu FT-817 | 8-ele LFA | 100 |
| 19 | GX5TO | Sheffield & District Wireless Society | 10 | 4 | 40 | IO93HL | Icom IC-7100 | Jaybeam 8-ele | 73 |
| 19 | 2E0PKS | Richard J Harlow | 10 | 4 | 40 | IO92EU | Yaesu FT-897D | 3-ele beam HB | 48 |
| 21 | G0GRI | Ian Carter | 12 | 3 | 36 | IO80SX | Icom IC-9700 | CX725 tri-band colinear | 108 |
| 22 | 2M0KAU | Martin Krawczyk | 7 | 4 | 28 | IO86ML | tf571 and 3 element beam | 3-ele beam | 20 |
| 23 | G6DEG | Terry Hampson | 8 | 3 | 24 | IO83UO | Yaesu FT-817nd | 7-ele zl Yagi | 120 |
| 24 | G8IBL | Huw Hallybone | 7 | 3 | 21 | IO91QE | Yaesu FT-817 | 5-ele Sota beam | 48 |
| 25 | 2E0VCA | Antony Hill | 10 | 2 | 20 | IO93DU | Icom IC-7000 | Diamond 10-ele 2m Yagi | 205 |
| 25 | G4BZI | Roger Bracey | 5 | 4 | 20 | IO83SB | Icom IC-202E | 7-ele ZL Special | 70 |
| 27 | G6GVI | Ross Wilkinson | 5 | 3 | 15 | IO83SN | Icom IC-202 | 5-ele Yagi | 114 |
| 28 | M7BOO | Hardy Whiteley-Boocock | 6 | 2 | 12 | IO93BR | Yaesu FT-991 | Diamond X510N | 0 |
| 29 | GM5LOW | Roy Kavanagh | 10 | 1 | 10 | IO75QN | Trio TR-9000 | Coaxial Dipole (White Stick) | 16 |
| 29 | M6XUT | Dean Baker | 5 | 2 | 10 | IO93AR | Yaesu FT-991 | Diamond X510 | 5 |
| 31 | G6EPN | Peter Knight | 4 | 2 | 8 | IO91DK | Trio TR-9130 | 4-ele Yagi | 140 |
| 31 | M0JPA | John Wake | 4 | 2 | 8 | IO93CS | Yaesu FT 847 | 5-ele Crossed Yagi | 220 |
| 31 | M0RPK | Richard | 4 | 2 | 8 | IO93FJ | Yaesu FT-897D | 3-ele Yagi | 140 |
| 31 | G8VEN | Harold Chapman | 4 | 2 | 8 | IO92KN | Yaesu FT-817 | 4-ele Yagi | 80 |
| 35 | M7XOZ | Richard Coffey | 3 | 2 | 6 | IO93DT | Yaesu FTM-7250D | Diamond X50N | 156 |
| 36 | G7SKR | Dave Tarbatt | 4 | 1 | 4 | IO83RI | Icom IC-9100 | 5-ele ZL Special | 65 |
| 37 | G3XBM | Roger Lapthorn | 3 | 1 | 3 | JO02DG | Yaesu FT-991A | 2m big-wheel omni | 20 |
| 37 | M0JCF | Mark Hales | 3 | 1 | 3 | JO01BK | Yaesu FT-817 | J pole and 5-ele Yagi | 30 |
| 39 | GM4FYH | Catherine Waddington | 2 | 1 | 2 | IO86NF | Yaesu FT-818 | Homebrewed 6-ele Yagi | 3 |
| 39 | GW8HEB | Tom Brady | 2 | 1 | 2 | IO82KP | Yaesu FT-817ND | 2/70cm Vertical | 149 |
| 39 | M7AJT | Billy Starkey | 2 | 1 | 2 | IO70IF | Yaesu FT-897 | Diamond X50 | 147 |
| 42 | GM0KCN | David Smith | 1 | 1 | 1 | IO85NN | Yaesu FT-991 | Diamond dual band vertical. | 118 |

**Table 2: Overall results table, Practical Wireless 144MHz QRP Contest 2020.**

# TOP WINTER CHOICES

## With a HUGE range of Radios & Accessories

## ...and fast, friendly service you can trust

NOW IN STOCK!

**Icom IC-705**
VHF, UHF, HF, D-Star all mode
10W QRP portable transceiver
**£1299.99**
• LC192 Optional Carrying Case.....£156.00

SEE WEB FOR OFFERS!

**Icom 9700**
2/70/23cms Transceiver
The Boss's choice!
GENEROUS Part X CALL NOW! **£1795.95**

SEE WEB FOR OFFERS!

**Icom 7300**
Top selling HF/50/70MHz
100W SDR Transceiver
GENEROUS Part X CALL NOW! **£1195.95**

SEE WEB FOR OFFERS!

**Icom 7610**
SDR HF+6m 100W transceiver
7" full colour touch display
GENEROUS Part X CALL NOW! **£2999.95**

£90 YAESU CASHBACK

**Yaesu FTdx-101D**
SDR HF/50/70MHz 100W Transceiver
Cashbacks valid until 31 December 2020
Price after cashback ~~£3149.95~~ **£3059.95**

£90 YAESU CASHBACK

**Yaesu FTdx-101MP**
New 200W version
Cashbacks valid until 31 December 2020
Price after cashback ~~£4199.95~~ **£4109.95**

£90 YAESU CASHBACK

**Yaesu FT-991A**
Full coverage HF/VHF/UHF Transceiver
Cashbacks valid until 31 December 2020
Price after cashback ~~£1239.95~~ **£1149.95**

NEW!

**Yaesu FTM300DE**
Dual Band Digital/FM Transceiver
Latest updated version!
**£399.95**

£70 YAESU CASHBACK

**Yaesu FT-818ND**
Portable Multi-Band with 6W output
Cashbacks valid until 31 December 2020
Price after cashback ~~£599.95~~ **£529.95**

with FREE SSM-BT10

£35 YAESU CASHBACK

**Yaesu FTM-300DE**
50W Dual Band Digital Transceiver
Cashbacks valid until 31 December 2020
Price after cashback ~~£399.95~~ **£364.95**

£70 YAESU CASHBACK

**Yaesu FTdx-3000**
100W Classic HF/50MHz Transceiver
GENEROUS Part X CALL NOW! **£1399.95**

£70 YAESU CASHBACK

**Yaesu FT-450D**
100W HF/6m Transceiver with ATU
Ideal 1st radio
**£649.95**

**Yaesu FTM-400**
Dual Band UHF/VHF Transceiver
C4FM Digital
**£389.95**

**Icom IC-7100**
HF/VHF/UHF 4m Transceiver
Remote control head
**£999.95**

**Icom IC-R8600**
Wideband Communications Receiver
GENEROUS Part X CALL NOW! **£2499.99**

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

NEW!

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

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

**Alinco DJ-MD5-GPS**
Professional quality DMR Digital/Analogue
Handheld with GPS
**£159.95**

**DJ-MD5**
Standard version as above - but no GPS
**£149.95**


## Low Loss Coax Cable

You only fit it once so fit the best!

**ECOFLEX series**
- Extreme low loss
- Flexible
- Lightweight
- Good to 8GHz
ECOFLEX 15,10

**AIRCELL series**
- Low Loss
- Flexible
- Small bending radius
- Good to 6GHz
AIRCELL 7, 5

**SEATEX 10** Marine/outdoor cable

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# Your ORDERS are still being shipped SAME DAY - where possible!

## ACOM AMPLIFIERS

**Acom 1200S**
1.2kW Solid State Amplifier
- Covers 1.8-54 MHz
- RF sensing for auto band changing or CAT interface for full rig control.
- Interfaces with AT-04 Auto tuner/Antenna switch

**£2799.95**

NEW 

**Acom 700S**
700W Solid State Amplifier
- Covers 1,8-54MHz

**£2499.95**

**Acom Valve Amplifiers**
**1500**..1.5kW PEP (1.8-54)MHz.....**£2999.95**
**1000**..1kW PEP (1.8-50)MHz..~~£2299.95~~ **£2199.95**
**1010**..700W PEP (1.8-54)MHz.....**£1599.95**
**Acom Antenna Switch**
**AT-04**.1.5kW auto ATU 4 way ant switch.**£999.95**

## ALINCO

NEW!

**Alinco DM-30G**
30A power supply
- Variable Voltage 9 - 15V DC
- Low Noise - offset control
- Digital Display, Short circuit protection.
- 2 x Anderson 5A Power Pole connectors
- 1 x 30A terminals
- Weight 1.5kg

**£109.95**

**Alinco DM-330MW MkII**
Communications Grade 30A Supply

**£149.95**

**DM-330FXE** ..30A standard filtered supply..**£129.95**
**DM-30E**.....30A (peak) digital display .....**£99.95**
**DM30G** .....30A Anderson Power poles..**£109.95**

## AOR

NEW!

**AOR AR5700D**
Digital Communications Receiver for the professional user!
- Frequency range: 9 kHz - 3.7GHz
- Analog modes: FM, AM, SSB, CW, FM video, analogue I/Q
- Huge range of digital modes - full details on our web

**£4595.00**

**MFJ-1782X**
Super Hi-Q loop with tuning controller
- Ideal for limited space
- Frequency: 10-30MHz (including WARC bands)
- Power: 150W
- Diameter: 3 foot

£599 **£479.95**

## AOR

**AOR AR DV-1**
The Professionals' Choice
Advanced Scanning Receiver
- 100 kHz - 1,300 MHz
- SD card slot & record facility
- Decodes virtually all popular Digital modes including TETRA

**£1199.95**

**Palstar AT-2K**
- Covers 6-160m
- Output: 2000W PEP
- Optional 4:1 Balun for balanced wire feeders

**£669.95**

## MIDLAND

**CT-3000 - Ideal Novice radio**
- 10W/25W Dual Band Mobile
- IP54 rated • Colour display
- Customisable control buttons

**PRG-3000**
Optional software ....**£26.95**

**£149.95**

## MIDLAND

**CT-990** High Power 10W Dual Band
- 2m/70cms colour
- IP67 Rated - fully featured
- Colour LCD display
- Fully featured
- Affordable price!

**£99.95**

## MetroVna Network Antenna Analysers

NEW 

**Metropwr FX-700**
Portable Vector Network Analyser
- Covers 100kHz-700MHz
- Touch screen Colour display
- Measures R, Z, X (sign), SWR, Phase, Return Loss, TDR, L, C
- Smith chart, TDR, Cable length
- SD card for data storage

**£349.95**

**MetroVna Deluxe Model**
- Frequency: 1-250MHz
- SWR, R, Z, X, phase, filters, return Loss & more!

**£274.95**

**MetroVna Pro Mode** .....1-180MHz .....**£259.95**

## DAIWA METERS

NEW 

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

**£249.95**

**CN-103LN**....140-525MHz 20/200W N type.....**£99.95**
**CN-501H**.....1.8-150MHz 15/150/1.5kW.....**£109.95**
**CN-501H2** ...1.8-150MHz 20/200/2kW..... **£119.95**
**CN-501VN** ...140-525MHz 20/200W N type.....**£99.95**
**CN-901HP** ...1.8-200MHz 20/200/2kW.....**£149.95**
**CN-901HP3** .140-525MHz 20/200/3kW N type ..**£179.95**
**CN-901VN** ...140-525MHz, 20/200W N type...**£119.95**
**High Quality Switches**
**CS-201A** .....2 Way 600MHz, 1kW SO239.....**£24.95**
**CS201G11** ...2 Way 1.3GHz, 1.5kW HF N type ..**£39.95**

## NEVADA

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

**£129.95**

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

## ANYTONE

With DTMF Mic

**AT-588**
70MHz 50W FM Transceiver
- Frequency: 66 - 88MHz
- Memories: 200
- Power: 10W/25W/50W

**£169.95**

NEW 

**AT-779**
70MHz 15W FM Transceiver
- Freq: 66 - 88MHz
- Power: 15W/10W/5W
- Includes programming lead

**£89.95**

## ROTATORS

**YAESU**

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

**We carry a full range of Yaesu Rotators and Accessories**

**SPID**
Double Worm drive with almost zero backlash. PC control & near silent operation.

**SPID RAU**.....medium duty .....**£545.95**
**SPID RAK**.....medium to heavy duty.**£595.00**
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**SPID RAS-HR**.Az/elevation, hi-res.....**£1795**
**More on our web site!**

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

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

**£1289.95**

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

**£899.95**

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

## ULTRA LOW LOSS COAX

**Seatex 10**
**New!**
**Outdoor cable**

**Resistant to UV, oils & moisture!**
**Install on ships, marinas, oil rigs, Amateur Radio**
Freq: up to 8GHz, Dia: 10.2mm , VF: 0.85
Loss @ 500MHz per 10m = 0.96 dB
per metre.....£4.65 price per 102m drum ..**£440**

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

## INRAD

**INRAD W-1**
Competition Headset
Ham radio never sounded so good!
- Super comfortable & great audio
- Headband tilt-back feature like pro broadcast headsets
- Large high response speakers
- Boom mic with great transmit audio

**£179.95**

Requires optional adaptor
select Icom, Yaesu, Kenwood .....**£22.95**

## AIRSPY

NEW 

**Airspy HF+ Discovery**
- HF - 0.5 kHz, 31MHz
- VHF - 60, 260MHz
- Pre-selectors

**£199.95**

**AIRSPY R2**
- 24MHz-1,800MHz
- 10MHz spectrum
- Tracking RF filters

**£199.95**

**AIRSPY Mini**
- SDR Dongle
- 24 – 1,800MHz

**£119.95**

## SDRplay

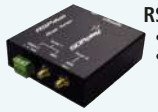
NEW 

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

**£194.95**

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

**£99.95**



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

**£239.95**

## SSB

**SSB Masthead Preamplifiers**

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

**MHP-200R**.....1.5kW 2m (T-Bias) .....**£599.95**
**SP200**.....750W 2m (T- Bias) .....**£320.00**
**SP70**.....500W 70cm (T-Bias).....**£320.00**
**SP400**.....750W 4m (T-Bias) .....**£345.95**
**SP13B** .....50W 2.4 GHz (T-Bias).....**£499.95**
**DCW-2004B**...Sequencer 6/2/70cm .....**£279.95**

**MUCH MORE ON OUR WEBSITE 24/7 - BACKED BY FRIENDLY, KNOWLEDGEABLE STAFF**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Portsmouth Hampshire PO6 1TT

**023 9231 3090**

NEW

# Vibroplex End Fed Wires

1kW power rated! No external tuner required!

(40 - 10)m ....65ft....£159.95
(80 - 40)m ....130ft..£169.95

## HIGH PERFORMANCE BEAMS

### DUAL Antennas by YU1CF

High Performance Beams using Professional 3D EM modelling

**6M Yagis**

| | | |
|---|---|---|
| PA-50-4-3B | 4 el. 9.2 dBi 2.92m boom | £139.95 |
| PA-50-6-6BG | 6 el. 11.5dBi 5.84m boom | £245.00 |
| PA-50-7-9BGP | 7 el.12.7 dBi…8.68m boom | £299.95 |

**Dual Band 6/4**

| | | |
|---|---|---|
| PA5070-7-3 | 6m 3el 4m 4 element 3m boom | £199.95 |
| PA5070-11-6 BG | 6m 5el 4m 6 element 6m boom | £259.95 |

**4M Yagis**

| | | |
|---|---|---|
| PA70-5-3 | 4m 5 element Yagi 3m boom | £199.95 |
| PA70-6-4 | 4m 6 element Yagi 6m boom | £219.95 |

**Dual Band 2/70cms**

| | | |
|---|---|---|
| PA144-432-8-09RA | 2m 3el…70cms 6 element rear mount | £89.95 |
| PA144-432-37-7-2CBGB | 2m 12 el 70cms 25 el 2 connectors | £289.95 |
| PA144-432-13-1.5-2CB | 2m 5 el 70cms 9 el 2 connectors | £134.95 |
| PA144-432-17-2 | 2m 6 element 70cms 12 element | £149.95 |
| PA144-432-19-3-2C | 2m 7 element 70cms 12 element | £199.95 |
| PA144-432-21-3B | 2m 7 element 70cms 14 element | £199.95 |
| PA144-432-13-1.5A | 2m 5 el. 70cms 9 el 1.5m boom | £134.95 |
| PA144-432-34-6-2CBG | 2m 11el, 70cm 23 el. 2 conn | £249.95 |
| PA144-432-38-6BG | 2m 11 el. 70cms 28 element | £225.95 |

**2M Yagis**

| | | |
|---|---|---|
| PA144-5-1.5 | 2m 5 element Yagi 1.5m boom | £94.95 |
| PA144-6-2 | 2m 6 element Yagi 2m boom | £119.95 |
| PA144-8-3 | 2m 8 element Yagi 3m boom | £135.95 |
| PA144-9-5A | 2m 9 element portable 4.67m | £174.95 |
| PA144-11-6BG | 2m 11 element guyed 5.72m | £199.95 |
| PA144-12-7BGP | 2m 12 element Yagi | £259.95 |

**70cms Yagis**

| | | |
|---|---|---|
| PA432-8-1.2R | 70cms 8 element Yagi 1.2m boom | £89.95 |
| PA432-14-3 | 70cms 14 element Yagi 3m boom | £145.95 |
| PA432-23-6 | 70cms 23 element Yagi 6m boom | £199.95 |
| PA432-30-8BG | 70cms 30 element Yagi 8m boom | £269.95 |

**23cms Yagis**

| | | |
|---|---|---|
| PA1296-13-1R | 23cms 13 element 1m rear mount | £99.95 |
| PA1296-18-1.5AR | 23cms 18 el1.5m rear mount | £139.95 |
| PA1296-36-3BRG | 23cms 36 element 3m RG Balun | £169.95 |
| PA1296-36-3BUT | 23cms 36 el 3m Teflon Balun | £189.95 |
| PA1296-70-6RG | 23cms 70 element 6m RG Balun | £225.95 |

**Power Dividers**

| | | |
|---|---|---|
| PD1024 144MHz | 2 way power divider, 1.5kW | £79.95 |

**Passband Filter**

| | | |
|---|---|---|
| DUAL BPF2 | 1.5kW 2m BandPass Filter 144-148)MHz | £225.00 |

## CREATE - ANTENNAS

As used by the 'Professionals'

**CLP-5130-1N**
21 Element Log Periodic Beam
- 50-1300MHz
- 500W
- Gain: 10-12dBi

£379.95

**CLP-5130-2N**
17 Element Log Periodic Beam
- 105-1300MHz
- 500W

£299.95

## SPIDERBEAM

Telescopic Masts and Poles

**Fibreglass Telescopic Poles**

| | |
|---|---|
| 12mtr Heavy Duty | £99.95 |
| 18mtr Standard | £199.95 |
| 22m 'Long John' NEW | £399.95 |
| 26mtr Standard | £499.95 |
| Base Plate for Fibreglass Poles | £28.95 |

**Aluminium Telescopic masts** *German engineered!*

| | |
|---|---|
| 10 metre Standard (1.35m retracted) | £339.95 |
| 10 metre Heavy Duty (1.7m retracted) | £359.95 |
| 12.5 metre (1.65m retracted) | £399.95 |
| 14.5 metre Heavy Duty (2m retracted) | £499.95 |
| 15 metre Standard (2m retracted) | £459.95 |

## MAT -Tuners – factory direct!

**MAT-1500 NEW! High power tuner!**

- Power: 1.5kW
- Freq: 3.5-54MHz
- Fast tuning!

£499.95

**MAT-705** for Icom 705

- Freq: 1.8 - 54MHz
- Powered by 9V Alkaline battery

£229.95

**MAT-40** Outdoor Auto-tuner

- Freq: 1.8-54MHz
- Power: 0.1-120W
- Tunes from 10ft + wires

£244.95

Requires adaptor cable for your rig
Request when ordering, Icom, Yaesu, Kenwood

**MAT-30** For Yaesu radios

- Freq: 1.8-54MHz
- Power: 0.1-120W
- Interface cable supplied

£189.95

**MAT-125E** General purpose Auto Tuner with internal battery

- Freq: 1.8-54MHz
- Power: 0.1-120W

£189.95

**MAT-180H** For modern Icom & Kenwood radios
(Supplied with Icom interface lead). Allows manual tuning also

- Freq: 1.8-54MHz
- Power: 0.1-120W

£174.95

**MAT-10**
'One touch' tuner for Yaesu FT-818/817
Can also be used with any QRP transceiver

- Freq: 1.8-54MHz
- Power: 30W

£219.95

**MAT-K100** For Icom & Kenwood radios
(Kenwood lead included)

- Freq: 1.8-54 MHz
- Power: 0.1-120W

£189.95

## SIRIO ANTENNAS

Quality Antennas from Italy!

**WY400-10N**

SPECIAL!
~~£119.00~~
£99.95

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

**VHF/UHF Verticals**

| | | |
|---|---|---|
| CX4-68 | (68 – 73)MHz 4m 4.15 dBi | £69.95 |
| CX440 | (440 – 455)MHz pmr 4.15 dBi | £ 39.95 |
| CX455 | (455 – 470)MHz pmr 4.15 dBi | £39.95 |
| TORNADO 50-60 | (50 – 60)MHz 6m 3.5dBi | £59.95 |

**HF/VHF/UHF Beams**

| | | |
|---|---|---|
| SY3 | 3 element (26-28)MHz 10.65 dBi | £99.95 |
| SY4 | 3 element (26-28)MHz 13.15 dBi | £119.95 |
| SY50-3 | 3 element 50MHz 8.5 dBi | £99.95 |
| SY50-5 | 5 element 50MHz 10.5dBi | £129.95 |
| SY68-3 | 3 element 70MHz 7.0 dBi | £79.95 |
| WY108-3N | 3 element 108-137MHz 3 el. Air Band | £89.95 |
| WY140-6N | 6 element 144MHz (wide band) 10.5dBi | £99.95 |
| WY400-6N | 6 element 432MHz (wide band) 11.0dBi | £79.95 |
| WY400-10N | 10 element 432MHz (wide band) 14.0dBi | £119.00 |

## HUSTLER HF VERTICALS

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

**Mobiles for HF and CB radio in stock too!**

## COMET

**HF BASE ANTENNAS**

| | | |
|---|---|---|
| CHA-250BX11 | ..3.5 - 57MHz (RX: 2.0 - 90MHz) | 349.00 |
| CWA-1000 | Multi Band dipole 3.5/7/14/21/28MHz | 124.95 |
| AB1230H | Handheld Airband Antenna - RX only | 29.95 |
| AB380 | Civil/Military Base Antenna -RX only | 89.95 |

**VHF/UHF FIBREGLASS BASE ANTENNAS**

| | | |
|---|---|---|
| GP-15N | 50/144/430MHz, length 2.4m N Type | 109.95 |
| GP-1M | 144/430MHz length 1.2m (SO239) | 59.95 |
| GP-3M | 144/430MHz, SO-239 Lgth 1.78m (SO239) | 69.95 |
| GP-6M | 144/430MHz, SO-239 Lgth 3.07m (SO239) | 99.95 |
| GP-93N | 144/430/1200MHz, Length 1.78m N Type | 99.99 |
| GP-9M | 144/430MHz SO-239 Lgth 5.15m (SO239) | 149.95 |
| GP285 | VHF 5/8 Collinear 135 - 175MHz 3.34m | 89.95 |

**VHF/UHF BEAMS**

| | | |
|---|---|---|
| CYA-1216E | 16 Element 1200MHz, N Type | 99.95 |
| CA-52HB | 2 Element HB9CV for 50MHz | 79.95 |
| CA-52HB4 | 4 Element HB9CV for 50MHz | 129.95 |
| CYA2414 | 2.4 GHz 14 Element Yagi 15.5 dBi .0.75m | 99.95 |

**MOBILE ANTENNAS**

| | | |
|---|---|---|
| SB7500 | Hi Gain 144/430MHz length 1.05m | 59.95 |
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| X-200PL | 2m/70cm 6.0/8dB, 2.5m PL | £79.95 |
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# Getting Started (Part V)

**Colin Redwood G6MXL** looks at starting on the data modes.

**Colin Redwood G6MXL**
practicalwireless@warnersgroup.co.uk

This month I am introducing readers to data modes. I'll be covering the absolute basics this time, and I'll look at them in more depth in a future issue. I'll also look at some additional resources for those studying for their UK amateur radio exams.

## What Are Data Modes?

Data modes are ways of communicating over amateur radio frequencies using computers at each end, without using a microphone or Morse key. To avoid confusion, I am not talking about digital voice modes such as DMR, Fusion and D-STAR. The data modes most commonly encountered on the HF bands include FT8, RTTY, PSK31 and SSTV, although I should point out that there are numerous others. Data modes are also used on the VHF/UHF and SHF bands particularly for various weak signal activities.

As I'll show, you don't have to be a flash-fingered typist to operate data modes, as most programs enable macros to be used to handle common items such as your callsign, QTH etc. In fact, it is possible to have basic contacts without using a keyboard at all – just by clicking with a mouse!

One particular advantage of data modes is that they are quiet in a domestic setting enabling operating when others are asleep. No shouting *"CQ"* is needed! They are ideal modes for those with hearing difficulties. Data modes generally don't need high power, so you can make the most of your Foundation licence power.

## Equipment Needed

You'll need a computer and an SSB transceiver (although you could use them on FM if you really want to). Somewhere in your setup, you'll need to have a sound card. This can be in the computer (almost all computers have a built-in sound card these days), your transceiver or in a stand-alone box between the computer and transceiver. If you are considering using the sound card built into your computer, you'll need to make sure you switch off anything that might generate sounds from the operating system – email, internet, CD player, videos etc. – otherwise you risk them being transmitted and violating your licence conditions.

Quite a few modern transceivers (generally the more expensive models) have built-in sound cards (**Table 1**). If you have such a transceiver, then I'd suggest using the sound card in your transceiver.

1

There are many commercial interface units on the market that incorporate built-in sound cards, **Fig. 1**. If you buy one of these, you'll need to make sure that you get one with a suitable lead to connect to your particular transceiver. Just because the plug has the right number of pins doesn't mean it is wired correctly for your particular transceiver. You'll also need to check this if you subsequently buy a new transceiver.

If you are using a sound card that is not part of your computer, then you'll also need a Universal Serial Bus (USB) lead to go between a USB socket on your computer to the interface or transceiver with the sound card in it.

While a suitable lead is usually supplied with the interface, you may need a longer one. These can readily be obtained in a variety of lengths from multiple suppliers (e.g. eBay and Amazon).

## Software Needed

You'll need to run the correct software for the data mode that you intend to use. **Table 2** lists some suggested programs for the various modes. There is a greater choice for Windows than other platforms.

## Various Modes

As I mentioned at the start there are many different data modes. They each have various characteristics, which will no doubt appeal more to some amateurs than others. The good thing is that you can try any or all of these modes as long as you have a reasonably modern computer, sound card and SSB transceiver. You don't have to stick to one data mode.

## RTTY

Radio Teletype (RTTY) can be considered as the grandad of the data modes. The signal actually transmitted is the same as that transmitted by the old electro-mechanical teleprinters. You are limited to transmitting capital letters and numbers, **Fig. 2**. There are no constraints on the length of messages that are transmitted. There is no error correction in RTTY, so any man-made noise (QRM), natural noise (QRN) or fading (QSB) can corrupt the message.

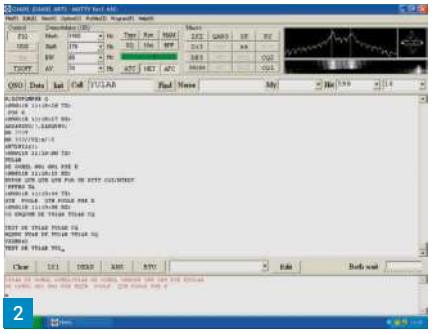
Unlike phone contacts made with a microphone and the other data modes, you'll normally need to use Lower sideband (LSB) rather than Upper sideband on all the HF bands, although this varies with the software you are using. But, in any case, expect your software to have a reverse (REV) facility to decode signals that are sent in the reverse polarity.

## PSK31

Until the arrival of FT8 about four years ago, PSK31 and the faster PSK63 had established themselves as very popular data modes. PSK31 and PSK63 allow upper- and lower-case letters, numbers and punctuation to be transmitted. Messages of any length can be transmitted. Some limited error correction is built-in, so it is not as prone to QRM, QRN or QSB as RTTY, **Fig. 3**.

## FT8

The arrival of FT8 a few years ago and more recently FT4 developed by American Nobel Prize laureate **Joe Taylor K1JT**, has completely transformed the amateur radio data mode world. These modes are all based on a meticulously prescribed message format with strict timing of overs (e.g. every 15 seconds with FT8, every 7.5 seconds with FT4). QSOs are limited to the exchange of callsigns, reports and locators. Powerful software, WSJT-X, is used to pull weak signals containing the messages out of the noise. If you are tempted try WSJT-X, make sure that you download a current version – this is an evolving area, and occasionally transmitted message formats are not compatible with those from previous versions. High levels of error correction are incorporated, so you'll either get 100% of a message or none at all.



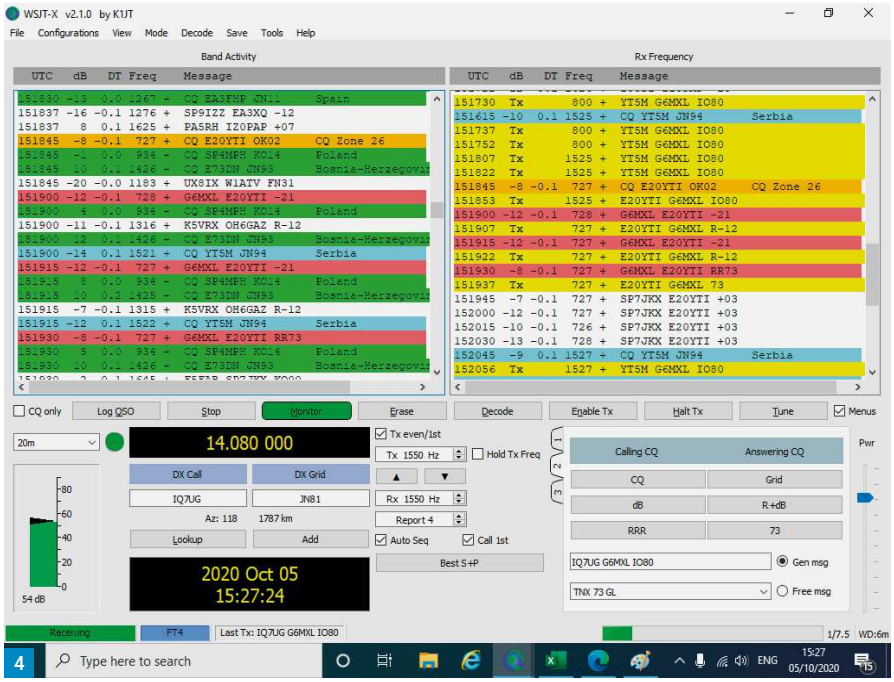




**Fig. 1: The SignaLink USB is a popular interface between computers and transceivers. Fig. 2: RTTY messages can become corrupted due to QRM, QRN and QSB. Fig. 3: The Elecraft K3S transceiver includes a built-in sound card. It can be connected to a computer simply with just a USB lead plugged into the rear panel shown here. Fig. 4: An FT4 contact with Thailand on 20m using just 10 Watts to a dipole antenna at about 6m above ground level. Fig. 5: An SSTV picture received from the International Space Station (ISS). Fig. 6: The Full Licence Manual is essential reading for those studying for their Full Licence exam. Fig. 7: The Exam Secrets book contains some additional material for all three exams as well mock exam questions.**

Many amateurs dislike the constraints of these weak signal modes or claim that they take away all the skill of an amateur radio operator, and that it is too automated. Despite these claims, FT8 and FT4 have enabled many DX contacts to take place during periods of poor HF propagation associated with the current sunspot minimum, **Fig. 4**. These modes all require your computer's clock to be accurate to within a second or so. I normally synchronise the time on my computer each time before I start an operating session using FT8 or FT4, which I find quite sufficient. Apart from this, operation of FT8 and FT4, is remarkably simple and in practice certainly doesn't need any more skill than other data modes.

## SSTV

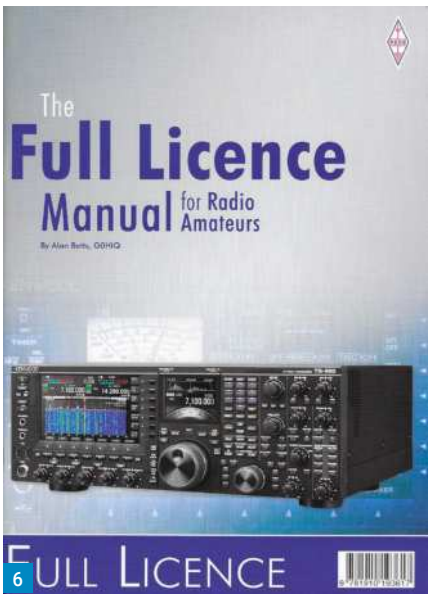
Slow Scan Television (SSTV) is a way of transmitting still pictures over the air as audio tones. The picture is transmitted and received one line at a time, so that the picture builds up on the screen of the receiving station over a period of typically one to two minutes. There is wide choice of SSTV modes, which offer various trade-offs of picture size and resolution for speed of transmission. Both the transmitting and receiving stations must be using the same SSTV mode if a picture is to be successfully received. There is little if any error correction in most analogue SSTV modes. There are also some pure digital SSTV protocols. If you like to show off to your friends and colleagues, then it is quite easy to receive SSTV pictures from the International Space Station (ISS), **Fig. 5**.

## Don't Overdrive

Data modes are not forgiving of overdriven transmitters. By this I mean that when transmitting, the audio level must be kept down to a level where the transmitter's automatic level control (ALC) doesn't need to operate.

Switch off any audio compression and any other processing that you might use with normal voice transmissions. You can then adjust the signal going into your sound card either on your computer or on the interface unit.

You may find that you'll need to make small adjustments between different programs. A really clean signal will get you more contacts than an overdriven signal. You'll also find that you don't need to run high power to make contacts.

| |
|---|
| Elecraft K3S |
| Flex-6400 |
| Icom IC-705 |
| Icom IC-7100 |
| Icom IC-7300 |
| Kenwood TS-590S & SG |
| Yaesu FT-991 & 991A |
| Yaesu FTDX3000 |

**Table 1: Transceivers with built-in sound cards.**

| Program | Windows | Linux | Mac | Main Modes |
|---|---|---|---|---|
| WSJT-X | Yes | Yes | Yes | FT8, FT4, Others |
| Fldigi | Yes | Yes | Yes | PSK31/63, RTTY, Others |
| MixW | Yes | No | No | PSK31/63, RTTY, others |
| MMVARI | Yes | No | No | PSH31/63, RTTY, others |
| MMSSTV | Yes | No | No | Analogue SSTV Modes |
| MMTTY | Yes | No | No | RTTY Only |
| 2Tone | Yes | No | No | RTTY only |
| Airlink Express | Yes | No | No | PSK31, PSK63, RTTY |

**Table 2: Some popular software for various data modes.**

## Macros

Most programs for RTTY, PSK31 and PSK63 allow operators to build macros to reduce the amount of typing needed for operating, particularly for basic QSOs involving just the exchange of callsigns, reports etc. Some have ready-made macros that can be used to get started.

## Configuration

Data mode programs can be installed in the usual way you install any other software on your computer. Once installed you'll need to do some configuration. As a minimum, you'll need to tell the software which sound card to use. You'll also need to set your callsign. There will be other aspects that you'll need to configure according to the mode and program.

## Intermediate Courses

In the October 2020 issue, I mentioned the videos from the Harrow club, **William McFarland GM6DX's** Intermediate Course and The Online Amateur Radio Community's fast-track Intermediate Course. The Bath Distance Learning Team (BDLT) are restarting their training for the Intermediate Exam.

The BDLT established a reputation for high quality training under the old syllabus and helped hundreds of students to pass exams with pass rates consistently above the national average. The first new BDLT course will be for the Intermediate level and will run from November 2020 to March 2021. Students will receive weekly work packages via a virtual classroom and will have access to weekly online tutorials and revision quizzes. Students will also have access to one of the remote tutors who will provide feedback and additional guidance when required.

The BDLT course will include lots of practical exercises to bring the theory to life. Students will be expected to do the exercises at home and report their results. At the end of the course there will be a number of mock exams. There will be no charge for the training but a refundable deposit of £30 will be required to secure a place. Students will need to provide their own textbooks, electronic parts and toolkits. Students will also have to arrange their own exam at the end of the course, but advice will be provided. It seems likely that the exams will be on-line with remote invigilation. To register your interest, please e-mail BDLT Leader, **Steve G0FUW**, via g0fuw@tiscali.co.uk

## Full Licences

Readers who are studying for their Full Licence will no doubt be pleased with the announcement from the RSGB that Full Licence exams are now available online with remote invigilation.

At present I am not aware of any online or remote training courses for the Full Licence exam, although the BDLT are planning to run a Full level course running from March to July next year, which will follow on from their Intermediate course. A further announcement will be made in the New Year when that course is ready for enrolment.

## Full Licence Book

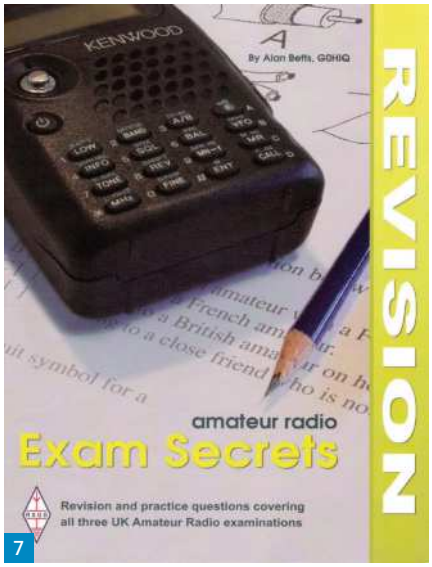
As with the Foundation and Intermediate exams, you should obtain an up-to-date copy of *The Full Licence Manual for Radio Amateurs* by **Alan Betts G0HIQ**, **Fig. 6**. You can obtain the book from the *PW* Bookshop or the RSGB.

You should also visit the RSGB website and download and print the reference data booklet for the Full exam as you'll find it will assist you in answering several questions: https://tinyurl.com/y6eb8st8

I'd also suggest downloading a copy of the Full exam syllabus from the RSGB website. It clearly distinguishes between things you need to just remember ('recall') and topics where you need to 'understand' something. You'll note a higher proportion of 'understand' topics than at Foundation and Intermediate levels. https://tinyurl.com/yxu6zll8

## Exam Secrets Book

I'd certainly recommend obtaining a copy of the *Exam Secrets* book, also by Alan




Betts G0HIQ, **Fig. 7**. It has material that will help those preparing for the Foundation and Intermediate exams but it really comes into its own for those studying for the Full Exam. It covers a number of topics that candidates have found to be difficult, and includes mock questions for just about every item of the syllabus. This book should be considered as an addition, rather than an alternative, to the respective Foundation, Intermediate and Full Licence books.

## Remotely Invigilated Exams

The arrangements for remotely invigilated online exams are still proving immensely popular, with about 600 candidates sitting exams every month. If you're considering booking an exam, don't delay, as at the time of writing in early October, the earliest available slots are over a month away.

## RSGB Foundation Video

Many newcomers over recent months will have missed out on the Foundation practical exercises. To make up for that, the RSGB have produced a 30-minute video that covers the material in a very digestible manner. The video is also available in six bit-size chunks: https://tinyurl.com/y4cx4v6f

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*For more info see HamRadio.co.uk/ZUMspot*

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**Roger Cooke G3LDI**
roger@g3ldi.co.uk

# CWops Rationale

**Roger Cooke G3LDI** talks about a change of policy at CWops before discussing other Morse-related topics.

The CWops activity periods are becoming supported even more here in the Norwich area. Some of this is due to the encouragement we provide for people to learn CW. That is evidenced in the amount of Morse Classes we provide in this area alone. We now have six classes promoted by the Norfolk ARC. The latest is on Friday evenings at 2000 local time on 145.250MHz and it is *Morse with Doctor Phil*. This is a class for raw beginners starting from scratch. **Phil G4LPP** has four students starting that way. Students then progress to other classes at ever increasing speed and complexity.

Once they reach a certain standard, they are encouraged to get on the air to do 'real-time' practice with normal QSOs. I don't mean those meaningless 599 73 type contacts, I mean conversational CW. It tests the nerves for the first few QSOs, but after a time they enjoy it and then make real progress by sticking with CW most of the time.

Two locals have done just this and now take part in the CWops CWT activity periods on a Wednesday. These are daunting enough because lots of the participants operate at speeds in excess of 25wpm, some even at 40+wpm. However, these two locals have persevered and now take part most weeks.

The reason for mentioning this is that the requirement for becoming a member of CWops has changed from being able to conduct conversational Morse at 25wpm to just taking part in these activity periods. Even though some of the participants take part using a reader, they are still keen enough to take part.

I am not too comfortable with this latest decision, but it was not mine to take. However, I don't nominate anybody using a reader. They have to prove that a simple exchange of a name and number is no real barrier to using that material between their ears before I will nominate.

That happens to be a personal opinion though, but in my opinion the ability to read everything without using a reader is an essential part of calling yourself a good CW operator.

Saying that, I do not mean that everybody has to be able to copy 40wpm in order to be called a good operator. I often listen to the Old Timer's net on 3525kHz in the mornings. The speed there is no greater than around 20wpm, but the operating and the Morse is extremely good. They are also 'good operators'. I guess it's horses for courses in that respect, but never frown on anybody sending at a slow speed, especially if the Morse is good.

1

2

## CWCOM

If you aspire to become a good operator and live in a flat, or somewhere that forbids any antennas, live in a nursing home or similar, you must be really frustrated at not being able to get on the air and talk to friends, make new friends anywhere in the world, keep skeds and so on, in which case give this a try. It could be just what you are looking for.

I was sent this information by **Gerry**, who is not a licensed radio amateur but was a Royal Navy Wireless Telegraphist 1960 to1972. Gerry lives in Portsmouth and only uses straight keys, and keys at about 23wpm with about 95% accuracy.

It is possible to use paddles, and keyers too. Gerry explains: *"When Morse Code was first used, the operators used simple Morse keys, like an on/off switch, to send a current down a telegraph line to a distant station. The series of on/off connections was governed by the Morse Code. It was primarily used between large towns and cities, and invariably by the railways of the time, to pass messages. As the system grew, and spread, around the various countries, it became the original internet. And so, with CWCOM we have come full circle, so to speak, as we can now use the modern version of the internet, to communicate around the world, using Morse Code.*

*"To this end, I have written a series of tutorials, about the setting up and configuration of the program, although there is an excellent 'help' page embedded in the program for quick reference.*

*"You can download CWCOM for free. Download the installer from:* https://archive.org/details/cwcom

*"Scroll down the page a bit, on the right-hand side is a small window: WINDOWS EXECUTABLE FILES*

*"Click on Windows Executable 2 files, and then choose 1.5 (latest & last version) or 1.47 (the earlier version)."*

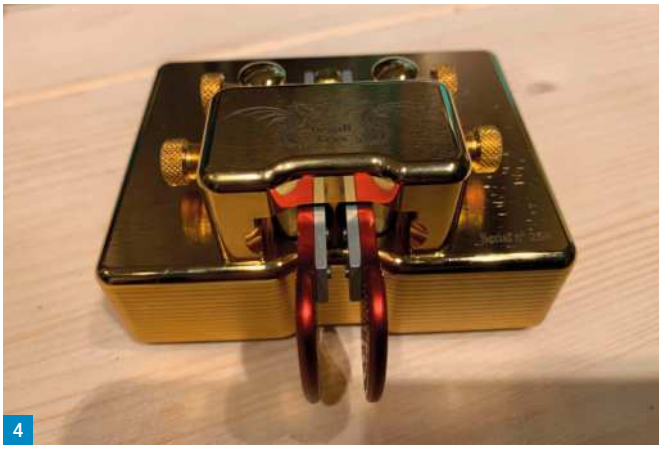
Two amateurs that have been helped by Gerry are **Martin 2W0NKS** in Abergele (North Wales Amateur Radio Group) and **Ross M7RSS** in Exeter.

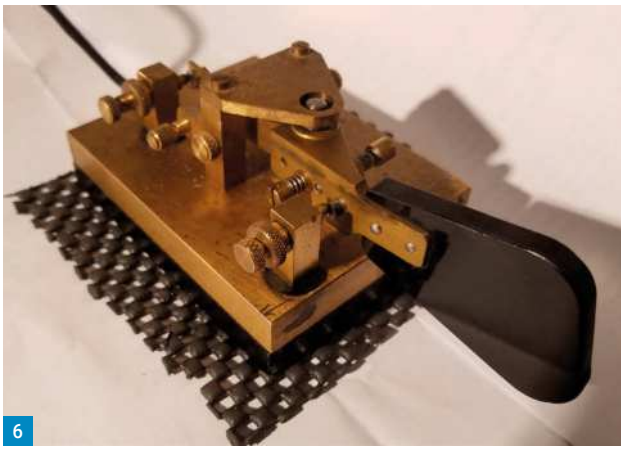
## E-mail from a Reader

I received this interesting e-mail from Bob Barrett, who omitted to give his callsign: *"Hi! I enjoyed reading the article in* PW, *recommending the learning of Morse Code. Seeing as we are now well into the 21st Century, old Sam Morse must have had some shrewd ideas more than 180 years ago!*

"I am in my 82nd year and received my teaching from the RAF in 1964, prior to starting my aircrew career on the Shackleton aircraft. I am sure you must have many colleagues who have also been service trained.

"The manner of our training was based on the rhythms of the signals, starting with just four letters (if I remember correctly, P-W-F-Y). The second lesson another four letters with a short test on the eight letters covered to that date. With four more letters at a time, plus some recaps/revision and





the progress tests, we worked our way through the alphabet. By then the speed had increased slightly and that was the next stage we worked upon.

We worked up to about 25wpm but 20wpm was generally an acceptable speed for a dark night in rough weather, at low level out over the Atlantic!

"I still keep up with the Code but due to illnesses over the last three years, I have been off the air for some time. I look forward to giving you a shout when I get back. Keep going, you are doing a grand job".

## New Paddles and Keys

As CW operators, our paddles are a prized possession and something to be coveted. I guess it's a bit like the knight being proud of his sword!

Two local amateurs who have recently 'found' CW again and have become super-keen, have devised a weekly competition between themselves in order to improve their on-air skills. They still join our classes and are now taking part in the contests that Norfolk ARC take part in, such as the RSGB CC series and CWops.

**John G4PFZ**, **Fig. 1**, has mounted his straight key on a block of wood with a steel base to give it weight and takes part in our SK nights on 80m. He has made a nice job of the key too, **Fig. 3**.

He let his enthusiasm run away with him, has bought a Begali Contour paddle, **Fig. 4**, and now has lots of QSOs every day using it. His ambition is to be at 25wpm and ragchew at that speed.

The other member of this duo is **Mike G4KQY**, **Fig. 2**. Mike uses a Chinese straight key, **Fig. 5**. Like John, he has mounted it on a wooden base and it looks very smart.

Variously known as the D-117, the K4, or just the 'Chinese Army Key', these heavy-duty straight keys were made for the Chinese People's Liberation Army (PLA) in factories owned by the PLA, from the early 1960s to the present.

The Chinese phrase on the key's nameplate 'changshu dianxun qichai chang' translates as 'Changshu Telecommunication Equipment Factory', which was the last of several factories to make telegraphic equipment.

John and Mike are typical of amateurs who become really enthusiastic CW ops. Their keys become their swords and become prized possessions and we are all striving to own the holy grail of keys!

**Fig. 1: John G4PFZ. Fig. 2: Mike G4KQY.**
**Fig. 3: John G4PFZ's straight key.**
**Fig. 4: G4PFZ's Begali Contour key.**
**Fig. 5: Mike G4KQY's straight key.**
**Fig. 6: G4KQY's paddle.**

Mike's paddle is unknown but he would be interested in finding out its origin if anybody knows, **Fig. 6**.

It really is satisfying as a tutor to see how some ops are really taken with CW and it makes it all worthwhile.

As lots of us are in solitary confinement it would be great to see more take up CW, and more tutors take advantage of the GB2CW scheme of tuition on the air to a group from their club. It's easy to do, free, and well worth it because you can then tutor several in a class at the same time, something that the amateur licence does not normally allow as it is termed 'broadcasting'.

If you are interested in taking part, e-mail me at roger@g3ldi.co.uk and I can issue a letter of authorisation. The only prerequisite is that you must be an RSGB member. It is very rewarding and you will be helping promote CW.

73 and May the Morse be with you.
Roger G3LDI.

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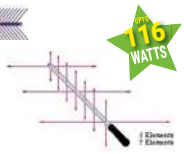


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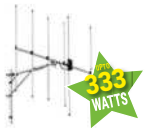


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**Steve Telenius-Lowe PJ4DX**
teleniuslowe@gmail.com

# New Cycle Starting?

**Steve Telenius-Lowe PJ4DX** asks whether we are seeing the start of the next solar cycle and has news of the Bonaire 10/10/10 event.

Welcome to the December *HF Highlights*. Even though this is being written in mid-October, the Christmas movies have already begun to appear on the television, so perhaps it is not too early to wish all readers a very Happy Christmas!

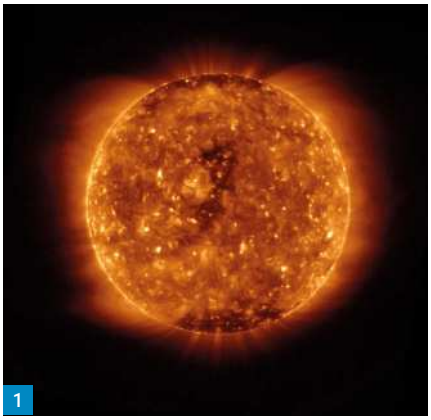
With a new year coming along soon it is time to look forward to a new solar cycle too. Although we have been seeing sunspots from the new cycle for some months (see, for example, the March 2020 *HF Highlights* column), we are now officially at the start of Cycle 25, according to an interesting article from the USA's National Weather Service.

Entitled *Hello Solar Cycle 25,* the article states that the solar minimum between Cycles 24 and 25 occurred in December 2019 (see **Fig. 1**), *"when the 13-month smoothed sunspot number fell to 1.8, according to the Solar Cycle 25 Prediction Panel, co-chaired by NOAA and NASA. We are now in Solar Cycle 25 with peak sunspot activity expected in 2025".* The article went on to say that Cycle 24 was average in length at 11 years, but had the fourth-smallest intensity since records began in 1755 and was the weakest cycle for 100 years. The maximum occurred in April 2014 with sunspots peaking at 114, well below the average of 179.

The article continued: *"Solar Cycle 24's progression was unusual. The Sun's Northern Hemisphere led the sunspot cycle, peaking over two years ahead of the Southern Hemisphere sunspot peak. This resulted in solar maximum having fewer sunspots than if the two hemispheres were in phase."* This explains why Cycle 24, in common with many solar cycles, appeared to have two peaks rather than the one that might be expected.

Cycle 25 is forecast to be another weak one: the maximum is expected in July 2025 with a predicted peak of 115 sunspots. However, the good news is that the Solar Cycle 25 Prediction Panel has *"high confidence"* that the new cycle will break the trend of weakening solar activity seen over the past four cycles. **Dr Lisa Upton**, the panel co-chair and a solar physicist with Space Systems Research Corp, was quoted as saying: *"We predict the decline in solar cycle amplitude, seen from cycles 21 through 24, has come to an end... There is no indication we are approaching a Maunder-type minimum in solar activity."*

**weather.gov/news/201509-solar-cycle**



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This latest report is in contrast to an earlier paper by five American and British scientists which concluded that Cycle 25 will be one of the best yet (see the September 2020 *HF Highlights*). It has to be said that this is a minority view, though, and the authors themselves admit their conclusion is *"in stark contrast to the community consensus estimate of sunspot cycle 25 magnitude"*. We will know which of the two predictions is correct in only a few years' time. What everyone seems to agree on, though, is that HF propagation has now passed its current nadir and it should start to improve, although initially only gradually.

## Bonaire 10/10/10 Event

October 10th marked the 10th anniversary of the dissolution of the country of the Netherlands Antilles when Bonaire, along with the islands of St Eustatius and Saba, integrated more closely with the Netherlands itself. At the same time, Bonaire became a new DXCC entity. To commemorate the 10th anniversary, Bonaire's amateurs are taking part in a month-long operating event (see the October *HF Highlights* column).

As of the time of writing (October 11th) unfortunately there has not been as much activity as I had hoped due to a number of issues, including equipment failure, high local noise levels and in one case a move of house meaning no antenna was available. However, **Bert PJ4KY** and I have been active on SSB, **Gerard PJ4GR** has been on FT8, and all three of us have also operated using the special event callsign PJ4TEN, **Fig. 2**, which will continue to be active until the end of the month.

## Readers'News

**Reg Williams G0OOF** wrote to *"apologise for the lack of reports for* PW HF Highlights *over the last few months... As far as radio goes, I have not worked any contacts particularly inspiring on SSB or FT8 other than a few DX stations that pop up now and again... I will be looking forward to working PJ stations for the PJ4TEN Bonaire Island Award in October with hopefully more time on my hands."* I'm pleased to report that Reg does appear to be more active again now as I worked him on 14MHz SSB on October 10th, the exact anniversary of 10/10/10.

**Owen Williams G0PHY** shows that even if you are not a dedicated contest operator you can still use contests to find and work the DX. He reported that *"there was lots of activity this month with the Worked All Europe contest and the Scandinavian Activity Contest although conditions for the RSGB DX contest were disappointing with only one contact, namely PJ4DX (thanks also for the QSO in the WAE contest). In the RSGB contest I was only running 100 watts. Since the RSGB contest, conditions seem to have improved with 10m being open one day last week, S01WS in Western Sahara and ZD7FT both being audible. On 20m S79KW in the Seychelles has also been audible; he uses 100 watts to a loop antenna and he turned the power down to 10 watts during one QSO and was still audible with me. Conditions to the USA were also good during the month with contacts with stations in California, Washington state, Nevada and Alaska. The best DX in the month was on 40m during the Saturday evening of the Oceania phone contest when I managed to contact VK6NE*

**Fig. 1: Solar minimum, as seen by the Solar Ultraviolet Imager aboard GOES-East in December 2019. (Photo credit: NOAA).**
**Fig. 2: QSL of special event station PJ4TEN, active during October.**
**Fig. 3: Members of the Riviera Amateur Radio Club in Torbay at the GB1BOB site.**
**Fig. 4: G3JNB's downsized, all-band, QRP CW station with the popular Yaesu FT-818, computer controlled by Ham Radio Deluxe and a Wolfwave processor.**
**Fig. 5: John King ZB2JK/MM live streaming on the Ham Radio Operator Facebook group.**
**Fig. 6: The DX Commander vertical on the sack trolley used by Ken EA5/G4VZV/M.**

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*for a new band slot. I think I also worked 4U75UN* [UN HQ in New York, celebrating the UN's 75th anniversary – *Ed] for an all-time new one yesterday, although his online log has yet to be updated so fingers crossed on that one. I also bagged PJ4TEN yesterday* [10/10/20 – *Ed*]*... All contacts SSB with power between 100 and 400 watts (I turned the amplifier on for part of the WAE contest and also to work PJ4TEN) to a quarter-wave inverted-L on 7MHz and a dipole on 14MHz."*

**Etienne Vrebos OS8D/ON8DN** in Brussels has had a problem with his Acom 1500 amplifier, bought new in February. It is probably the mains transformer that has broken down and the amplifier is back at the retailer for repair. Consequently, most of Etienne's QSOs this month were made with 'barefoot' power. He comments that he looked on 5MHz but could find no SSB activity. That is also my experience: we have had access to the band here in Bonaire for a few years now and although there were some CW and SSB signals on the band early on all I ever hear there now is FT8 activity.

**Tony Usher G4HZW** says that he *"decided to try and disprove the saying that 'you can't teach an old dog new tricks' by purchasing a Kent Keys twin paddle Morse key. It's not easy to say the least! Perhaps the expression will be proved correct! I thought I'd buy British but I was surprised to see they appear to be made in Germany. In the meantime I continue with FT8/FT4 on 28MHz and 7MHz... 28MHz is open to EU most days and has been good to South America in the late afternoon and early evening on a number of occasions. On 7MHz, despite the ongoing noise problem, I worked VK a number of times, lots of east coast Ws plus Monaco and Kenya, new ones on 7MHz FT8."*

**Steph Foster G4XKH** of the Riviera ARC in Torbay operated as GB1BOB in September in commemoration of Battle of Britain Day, **Fig. 3**. Steph wrote, *"We were active on CW, phone, data and VHF/UHF FM. The club is affiliated to the RAF Amateur Radio Society and I'm former RAF so it meant a lot to us."*

*"Conditions were atrocious for the first week of September"* said **Victor Brand G3JNB** and it took him until the 7th to open his log with his 'regulars'. *"FY5KE and OV1CDX were unusually weak but worked on 30m while a watery TZ4AM Mali, CQing on 40m, was simply not hearing many of his callers, including me! But later, on 20m, T6AA in Kabul and AA3B in PA both obliged. My annual SSB contact with PJ4DX was on 20m during the Worked All Europe contest. Conditions were so poor I had to attract his attention on CW!*

*"With no DXpeditions in prospect, it seemed to me that working mostly the same DX stations every month (those regulars) was daft. Additionally, the inevitable strictures of age, suggested that my third and possibly final 'downsizing' should be brought forward. So, I stripped out the entire station, retired the FT-2000 and reinstalled my QRP FT-818 as the main rig,* **Fig. 4**.*Supported by the Ham Radio DeLuxe suite, it is computer controlled, operating from 'Top Band to Two' and feeding five antennas. Backup is my venerable Heathkit HW8. Testing completed, on the 19th I checked 20m and heard* ***Robert T6AA*** *in Kabul running a pile-up. Tentatively, I called three times and waited. He continued working the 'big guns' then*

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*just stopped... until there was silence. The cacophony having ceased, I heard "G3JNB 599"! A confirmatory e-mail said 'I thought it was you, but weaker than usual!' Further QRP loggings include* ***Jeff TZ4AM*** *Mali, VE2CSI Sept-Isles* [in rare Zone 2 – *Ed*] *and OH0/DL2SWW Åland Islands.*

*"Meantime, following retirement and over the past 27 years of DXing (330 DXCC confirmed), it was pleasant to just indulge in a two-way QRP, 40m rag-chew with* ***Olaf DL4HG/P*** *and his K1. But, my 'contact of the month' was surely a 20-minute chat with* ***Martin VE2WU*** *in Quebec who reported that I was 'armchair copy!' Amazingly, PSK Reporter showed that, over on the West Coast, K7FE's long wire had copied my signals – 5191 miles! I do seem to be 'getting out more'. Funny that!"*

**Kevin Hewitt ZB2GI** wrote that despite going up the Rock four times during September he did no HF operating from there. *"I did some maintenance on the 10m wire, repaired the 5V DC/DC converter for the WSPR Flexi and received some SSTV images from the ISS. I also operated Maritime Mobile in the Bay of Gibraltar with* ***John King ZB2JK****,* **Fig. 5.** *John made three contacts on 20m and streamed to the Ham Radio Operator Live Stream Facebook group.*

*"National Day is celebrated in Gibraltar on the 10th September to commentate the sovereignty referendum of 1967. I used the special prefix ZG2 from the 5th to the 10th to mark the occasion. The Gibraltar government cancelled all National Day events this year"* [due to coronavirus].

**Bill Ward 2E0BWX** wrote with *"Just a very short report from me this month. I've been quite busy at work so very little radio time unfortunately."* Bill's report is in 'Around the Bands': I believe this is the first time I have received a report from anyone using PSK31 since starting to compile the column in 2015!

**Ken Churms EA5/G4VZV** wrote about his pedestrian mobile activities from the salt lagoons of Santa Pola, 20km south of Alicante, Spain. Ken has been active with his two-wheel sack trolley station, **Fig. 6**, and says he has managed some radio time despite regional lockdowns due to Covid-19. In September Ken managed some excellent DX contacts into VK, ZL and the Pacific. From his CQ calls he managed E51JD (South Cook Islands) and FK4RD (New Caledonia). He spoke to **Yves FK4RD** on 40m using the full-size quarter-wave vertical wire on the DX Commander antenna attached to his trolley. **Jim E51JD** was worked on 20m with the shorter quarter-wave vertical, again attached to the trolley station. As winter time approaches Ken is hoping to work more from the Pacific via long path from his salt lagoon location.

## Around the Bands

**Owen G0PHY 7MHz SSB:** 5B4AIF, N9NB, RM9I, UP0L, VK6NE. **14MHz SSB:** 4U75UN, 5B4AIF, A42K, AE7KI, D4Z, KL7SB, KW7Y, NO6T, NP4Z, PJ4A, PJ4DX, PJ4TEN, PT5J, RU9I, UP0L, VE2IM, VE5MX, W7WA.

**Etienne OS8D/ON8DN: 7MHz SSB:** HB0/OP2D. **14MHz SSB:** 9M63MJ, BY1CY, D4Z, JH4UTP, JQ1BVI, KL7SB, PJ4A, PZ5RA, S79VU, TO0Z, UN0LM, VR2XAN, YB0AR, YC9BHJ, ZA1E. **18MHz SSB:** E20WXA. **21MHz SSB:** 4L2M, FR4QT, OD5OJ. **28MHz SSB:** S01WS.

**Tony G4HZW: 7MHz FT8:** 3A/IW1RBI, 5Z4VJ, 8P4JB, AA2PQ, C31LK, CO8VWZ, HI8RMQ, KC1HXR, LU5DF, VK2WJ, VK3FCBR, W3L, WP4EJH. **7MHz FT4:** 4Z5ML, AB8JL, HI8RD, K1DJE, K2CYS, KD4JS, KP4DVM, N3YEA, VA3TIC. **28MHz FT8:** C31RP, CX2AQ, LU1DG, LU5FF, LU6HR, PP5JR, PT2VHF, PU7KRK, PY3JFS, PY5XD, ZD7MY.

**Kevin ZB2GI: 14MHz SSB:** 9Z4AH. **14MHz FT8:** AC5AV, AK0MR, CU3AT, HF90TPCG (90yrs PZK), K6EI, K7KB, KA9FOX, KV4GA, N2PC, N3SL, VE3HLM, VE7NZ. **18MHz FT8:** 2U0WZY, 9K2DB, EA8KH, EA9BO, K0RS, TF1A, W6IZT. **28MHz FT8:** WP4SD.

Kevin also operated as **ZG2GI: 5MHz FT8:** PA9CC. **7MHz FT8:** EA6SA, EA8W, TK5IH. **10MHz FT8:** 9H1SR, K1KA, KD5M, N4AWP, VA2PM, WE2X. **14MHz SSB:** 9Z4FE, AL7AF, K1DSK, K2AR, K4CNF, K7ZZX, KD3TB, KP4M, KP4S, N9CQB, PY6HD, VO1CH, W5SV. **14MHz FT8:** 4X4MF, DQ100SL (100yr Versailles Treaty), EA8ZG, J69DS, K4EA, SX300ML (2500yrs Battle of Thermopylae). **18MHz FT8:** 4X4MF, CU3AC, EA8MU, K0DEQ, K3LA, K4CIA, K6ZH, K9MK, KC0V, KD5M, NP3XF, TA0S, W1OP, W5AP, WB2QJ, VE3XN. **21MHz FT8:** HB9MFL.

**Bill 2E0BWX: 7MHz FT8:** DM1AD, F5AOW, IU1DXU, PD0WAG. **14MHz FT8:** EA9ACD, RK4FF. **14MHz PSK31:** HA8LD. **18MHz FT8:** RN3DEY, UX7QV.

## Signing Off

Thank you to all contributors. Please send all input for this column to teleniuslowe@gmail.com by 11th of each month. Photographs would be particularly welcome! For the February issue the deadline is December 11th. 73, Steve PJ4DX.

# Practical Wireless Christmas Quiz

This year's Christmas Quiz is in two parts: firstly radio people, and some general radio questions in Part Two. There are no prizes.

## Part One: Radio People

**Q1.** What is the occupation of the holder of the callsign VU2AMY?

**Q2.** The most popular mode of 2020 has been FT8. It was developed by **Joe Taylor K1JT** and who else (name and callsign)?

**Q3.** WB6ACU is better known to non-radio amateurs as – who?

**Q4.** A well-known radio amateur once stood as the Republican candidate in a US Presidential election. Who was he, and what was his amateur radio callsign?

**Q5.** **Karl Ferdinand Braun, Fig. 1**, won the Nobel Prize for physics, but with whom did he share the prize?

**Q6.** What is the amateur radio connection of the son of **Sir Hiram Maxim**, who famously invented the Maxim machine gun?

**Q7.** The dB is named in honour of which distinguished scientist and engineer?

**Q8.** The Hollywood movie star **Hedy Lamarr, Fig. 2**, contributed towards the invention of a 'Secret Communication System'. What was it?

**Q9.** **Sean G0OAN** had a successful career in a punk band and as a solo artist. He is known to the general public by his middle name. Who is he?

**Q10.** Who started the Islands On The Air (IOTA) programme in 1964?

## Part Two: General

**Q11.** The *Titanic*, **Fig. 3**, used what callsign?

**Q12.** Which companies made the following pairs of vintage HF amateur radio equipment (1 point for each company)?
(a) 30L-1 and KWM-2, (b) Vanguard and Viceroy, (c) T-4XC and R-4C, (d) DX-100 and HW-101, (e) AT5 and T28?

**Q13.** Which country's radio amateurs are represented by the following national societies? (1 point for each):
(a) WIA, (b) ARABH, (c) USKA, (d) UBA, (e) LABRE.

**Q14.** What do these frequencies have in common – 14,100, 18,110, 21,150, 24,930, 28,200kHz?


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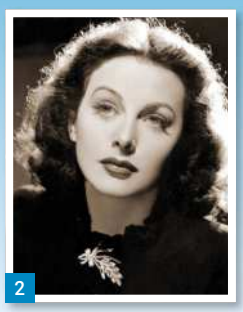
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3

**Q15.** What do the initials 'APRS' actually stand for?

**Q16.** Approximately how many QSOs had been uploaded to 'Club Log' (**Fig. 4**) by October 2020: (a) 68,000, (b) 680,000, (c) 6,800,000, (d) 68,000,000 or (e) 680,000,000?

**Q17.** Within amateur radio, what do Sydney (Australia), New York, Helsinki, Montreal, Kiruna (Sweden), Wellington (New Zealand) and Kaliningrad all have in common?

**Q18.** In which month do the following operating events take place? (1 point for each):
(a) The International Lighthouse / Lightship Weekend (ILLW); (b) International Marconi Day; (c) Jamboree On The Air (JOTA); (d) VHF National Field Day (VHF NFD); (e) CQ World Wide DX Phone Contest.

**Q19.** What is the approximate height, in kilometres, of (a) the D-layer, (b) the E-layer, (c) the F1/F2 layers? (1 point for each)

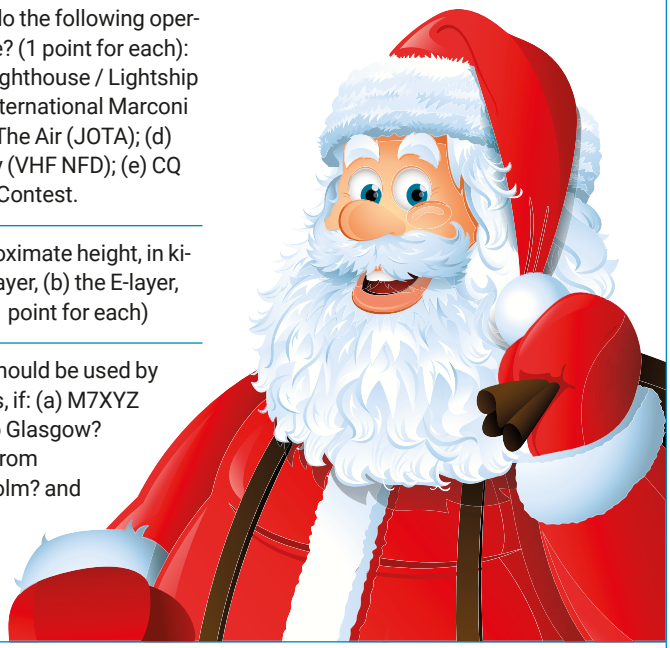
**Q20.** What callsigns should be used by the following amateurs, if: (a) M7XYZ moved from London to Glasgow? (b) if SM6XYZ moved from Gothenburg to Stockholm? and (c) if W2XYZ moved from New York to San Francisco? (1 point for each)

CLUBLOG

4

**Fig. 1: With whom did this man share the Nobel Prize for physics? Fig. 2: Hedy Lamarr (Photo: The Heavenly Body, 1944, Wikipedia) Fig. 3: What was the Titanic's radio callsign?**

The answers can be found on on page 64



# Barbara Mary Dunn G6YL: An Amateur Radio Trailblazer

**Scott A. Caldwell**
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**Scott Caldwell** asks, "Who was the United Kingdom's First Female Amateur Radio Operator?"

Barbara Mary Dunn (1896 to 1979) is quoted as saying that "I don't like phones". Just as well she was fascinated by wireless communications from an incredibly early age. She later recalled her first experience of the magic of wireless telegraphy communications:

"The first time I heard and sent Morse code was when I was about ten years old, at boarding school. I remember a man in a wheelchair talking about wireless and giving demonstrations on the stage of our concert hall. At the end of his lecture, he asked if any young lady in the audience would like to step up on the stage and stand between his aerial and his receiver, and see whether she could prevent the Morse signals passing over from one side of the stage to the other! Of course, I volunteered! The man keyed SOS and he let me do the same. I was thrilled".

She successfully obtained her licence on April 14th 1927 (Table 1) and then took to the airwaves for the first time on November 21st 1927. It is claimed that she became the first female amateur radio operator in the United Kingdom (UK) and Europe and opened the door to the hobby for female operators throughout the world. The aftermath of the First World War (1914 – 1918) was a catalyst for social change and female suffrage. However, there is evidence to suggest that Dunn was in fact not the first female amateur radio operator in the UK. It is suggested that B. Saltmarsh 6SF of Sandridge obtained her licence in 1926, and she never admitted to being a young female operator until approximately seven years later when her logbook entries were subsequently changed to Miss B. Saltmarsh. A literature search reveals some interesting results. The December 1927 edition of The Wireless Engineer contains an article by B. Saltmarsh 6SF entitled "A Radio Signal Intensity Recorder" and details the purpose of making a direct record of the intensity, or strength of an incoming radio signal and consequently of showing variations in such intensity. It is also interesting to note that Jane Dicks, callsign G6JN, also became licensed in 1927. However, it is claimed that her licence expired after only two years of operation.

## An Interest Sparked

Dunn's interest in wireless communication was enhanced in 1923, when her father bought a receiver that had five general purpose valves standing up in a row on top of a wooden cabinet. She was put in charge of the family radio and they enjoyed listening to the newly established British Broadcasting Corporation's (BBC) transmissions from 2LO in London on 350m (857kHz). However, the broadcasts were often subjected to bad levels of interference of a rasping nature. She tried repeatedly to tune the QRM out. She decided to try and investigate the source of the interference. This was the catalyst for her to learn Morse code and her prolonged periods sat in front of the family radio, where she concentrated and copied down the dots and dashes as fast as possible.

Her parents supported her passion for wireless and allowed her to drill holes through the window frames to accommodate the lead-in wires from various outdoor antennas. After leaving school she had many interests and hobbies in addition to amateur radio: outdoor tennis, shooting, bird watching, motor driving, piano and organ playing, and embossing books into Braille for the National Library for the Blind. John R. "Reg" Witty was her half-brother. They shared the same father. Reg built much of her equipment. They remained close throughout their lives and kept in contact over the airwaves, while he sailed around the world. Reg went silent key in 1975.

One of her greatest achievements was when she received her first SOS message with the crucial Latitude and Longitude coordinates. Her father was initially skeptical and confirmed the information with Lloyds of London, the next day. He returned quite satisfied and extremely impressed at her wireless and Morse code ability.

At her Morse code examination, the examiner gave her a column from the London Times newspaper to send. He soon interrupted and instructed her to stop sending as she was including brackets, colons, and semi-colons. He then politely informed her that amateurs never used them in their communications. The pace of the examination soon increased from 12 to 25 words per minute. He eventually informed her that she had passed with flying colours and she was in fact far better than the vast majority of her contemporary male operators.

| Operator | Callsign | Year Licensed |
|---|---|---|
| B. Saltmarsh | 6SF | 1926 |
| Barbara Mary Dunn | G6YL | 1927 |
| Jane Dicks | G6JN | 1927 |
| Nell Corry | G2YL | 1932 |
| Constance Hall | G8YL | 1936 |

**Table 1: The Pioneering Female Amateur Radio Operators.**

## Early Operations

When she was first licensed, Dunn operated from her home address at Lilystone Hall, Stock (Essex) where she regularly operated on both the 45 and 23m wavelengths. She was able to indulge in her amateur radio passion as her family was financially secure due to their investments in the railway industry. She subsequently did not need to work, and this also allowed her to devote more time to the demands of the hobby. She even had the relative luxury of a housemaid and chauffeur who handled the domestic chores, allowing even more time for her interests. She never married and seemed quite content to live by her own, against the social norms of the time, when society expected a woman to be a wife and mother first.

Her first contact was made on November 21st 1927, with GI6YW who operated from Ireland. She always valued this QSL as the most important one. Her next QSOs were with GC6NX (Scotland) and G2ZC (Jersey, Channel Islands). Her first QSO with the USA occurred on April 12th 1928, when she worked with NU1ASY.

In 1928, she moved to Acton House, Felton in the county of Northumberland. Acton House is located in picturesque surroundings, on a hillside that slopes down


1

2

**Fig. 1: A QSL Card from G6YL 1934 (Public Domain/ Pinterest) Fig. 2: Voluntary Interceptor Meeting (Barbara Dunn is Standing, and Nell Corry is Sat Down – Front Row) (RSGB)**

to the River Cuquest and the North Sea. Visitors to Acton House often remarked on her antenna that was suspended between a 30ft pole, attached to the robust structure of an oak tree, and a chimney. This ultimately formed the structure of a slightly bent 60ft support, with the antenna at an average height of 40ft. This antenna configuration provided Dunn with exceptional DX results.

In 1930, she visited Sweden and during the railway journey from Stockholm to Goteborg, she kept receiving bouquets of flowers from her admiring fellow radio amateurs, every time the train stopped at a station. She also recalled many amusing experiences when she conversed with foreign stations. Shortly, after she started operating on 45m, she was working with a Polish station who had limited command of English. When they were exchanging addresses for QSL confirmation, he translated her name as the "S.S B. Dunn" and he wished to know her next port of call.

## Dunn's Equipment

Her original transmitter employed an LS5 in a Hartley circuit, with about 350V derived from a Mortley rotary converter running off a 6V car accumulator (no electrical mains), feeding a half-wave Hertz antenna. Some idea of the enthusiasm of those days may be gained when it is realised that the accumulator supplied current for the generator, LS5, and the two bright emitters in the receiver, and had to be taken six miles to be fully charged. However, with the aid of a spare battery, this equipment did very good work on 45m with an input of 6 to 10W on CW only.

## Cultural Changes

In the 1930s female operators rarely attended the local Provincial District Meetings of "The Society" that would later become "The Radio Society of Great Britain". Her personality had been described as quiet and retiring, and her attendance at the 1930 Convention took considerable persuasion from Gerry Marcuse (G2NM, RSGB President 1929 – 1930). Her presence at the Convention dinner caused a sensation, especially during the awards ceremony when she became the first female to be awarded a society trophy. She won the RSGB Top Band Contest silver cup in the SWL classification.

In July 1939, Dunn achieved yet another radio first, when she utilised a long lines transmitter (a self-oscillator with long lines at 5m). It was while scanning on her 56MHz receivers that she became the first to hear the hissing sound from a solar burst on this band. The start of hostilities in September 1939 left Dunn feeling extremely disappointed as she was only four countries short of achieving a DXCC (DX Century Club), amateur radio's premier award.

## G6YL and the Voluntary Interceptors

MI5 approached RSGB President, Arthur Watts G6UN, who through the membership network handpicked and recruited radio amateurs with exceptional Morse abilities.

Dunn answered the nation's call and assisted in the war effort (1939 – 1945). She and approximately 1500 radio amateurs were recruited as Voluntary Interceptors (VIs) in the clandestine Radio Secret Service. They were instructed to intercept German military transmissions. Details of her wartime service were not made public until 1979 when the BBC produced a television series called "Secret Listeners", presented by Rene Cutforth.

Records that identified the VIs were destroyed at the end of the war and it was assumed that their roles would remain forever a secret. Author, Geoffrey Pidgeon (The Secret Wireless War, The Story of MI6 Communications 1939 – 1945) concluded "that the VIs, involved the greatest gathering of amateur radio talent ever in a single endeavour".

The VI role was vital to the successful prosecution of Britain's war effort as they discovered and monitored the encrypted communications network of the Abwehr, the German Secret Intelligence Service. The intercepted messages were copied onto log sheets and forward to a PO Box with a Barnet address, where they were sorted and forwarded to Bletchley Park for final decryption. T & R Bulletins for 1939 and 1940 under "Khaki and Blue" refer to Dunn but there was no disclosure on the vital war work undertaken by her and fellow radio amateurs.

## The Old Old Timers Club

The Old Old Timers Club (OOTC) was established in 1947, by the pioneering amateurs who had defined the very concepts of the hobby. The requirement for membership was a two-way communication by wireless, 40 years or more before 1947. Dunn was member number 910.

In later years, Dunn became more outspoken on topical and controversial issues that impacted on the amateur radio hobby. An extract from a letter written in 1973 over the dominance of competitions on the bands reflects this viewpoint:

"Having read the letter of W2OHF in QST of February, under the heading Contest Quandary. I have checked the latest list of contest dates in 1973 and find that between February 17 and November 11 there are only three weekends free from contests (excluding the SS contests). Several weekends

**Continued on page 50**

# More on FT8

**Mike Richards G4WNC**
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**Mike Richards G4WNC** continues with his primer on operating FT8.

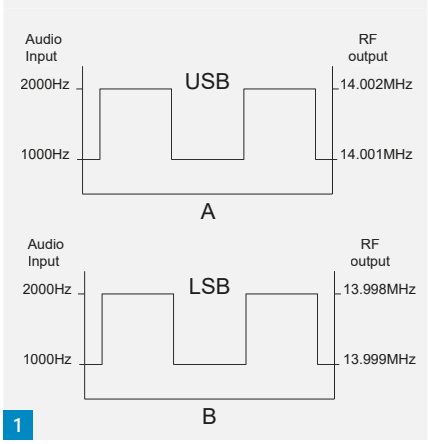
This month I'm continuing my introduction to FT8 with a selection of operating tips to help you get the most from the mode.

## FT8 Operating Tips

**USB or LSB?:** Those new to data modes are often confused as to whether or not they should follow the SSB convention and use LSB for transmissions on 7MHz and below. This convention is often built into the firmware of your rig so can happen inadvertently. The correct setting for all bands is USB. Data modes operators use USB because we are sending audio tones, AFSK (Audio Frequency Shift Keying), to emulate true FSK (Frequency Shift Keying). In this system, a 1kHz audio tone will raise the carrier frequency by 1kHz and a 2kHz tone will raise it by 2kHz, **Fig. 1A**. If we were to use LSB, the 1kHz tone would lower the carrier by 1kHz and the 2kHz tone would lower it by a further 1kHz to 2kHz, **Fig. 1B**. While this still produces an FSK-like signal, the shift would be inverted, thus making it unreadable. Remember, you should always use USB for data modes, regardless of the operating band.

**RTTY and USB/LSB:** While you should generally use USB for all data modes, there are dual standards in operation for RTTY. North American operators normally use LSB while USB is often used in Europe. This situation is exacerbated because some data modes software assumes you will be using LSB. For this reason every RTTY program has a Reverse button that's used to correct inverted tones. If you're using FLDIGI, then you should use USB. For other software packages, check the user guide and select the appropriate sideband.

**Audio Drive:** While we are all aware of the splatter problems associated with overdriving an SSB transmitter, the use of software generated audio signals introduces an, often neglected, link in the chain. While digital audio systems produce excellent fidelity, they are unforgiving and produce hard clipping and severe distortion products when overdriven. This distortion can pass to the SSB modulator and have a disastrous effect on your signal. You will not be popular! Once aware of the issue, it is easy to control. For those of you with recent transceivers using a USB link for the soundcard and CAT, life is much easier because the audio remains in the digital domain. In this case you should start by configuring your rig for the desired output power.



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As FT8 is a weak signal mode, you should always use the minimum power required to support the link and I generally start at 5 watts. Once you have configured your rig, connect a dummy load and click the Tune button in WSJT-X. This will put the rig into transmit and send an audio tone to the transmitter. You can adjust the audio tone level using the Power slider at the bottom right of the WSJT-X main screen, **Fig. 2**. I aim to run the Power slider at around 75%. If all is well, you should see your transmit power change as you move the WSJT-X Power slider. If the output power doesn't change, you are probably overdriving the audio and need to investigate. Those with older rigs that are feeding the audio from WSJT-X to the Mic or accessory input of the rig need to watch the rig's mic or data gain setting. With the tune button activated, set the WSJT-X Power slider to about 75% and adjust the rig's Mic or Data gain controls for the desired output power. When complete, make sure you can control the output power with the WSJT-X Power slider. If the transmit power stops rising as you increase the WSJT-X Power slider, that's an indicator that some part of the chain is limiting and you should back-off slightly.

Once you're confident that you have the drive levels under control, you can move on to set the optimum drive level for each band. This is often required because many rigs need different drive levels to achieve a given output power across the bands. WSJT-X can help with this by remembering the drive level for each band. Leave your dummy load connected and do the following:

In the File menu choose: Settings - Audio

Ensure that 'Remember power settings by band - Transmit' is ticked.

Click OK

For each of the bands you intend to use, do the following:

Retune to the desired band

Click the CQ message and Enable TX

During the transmit cycles, adjust the Power slider for the desired output

**Choosing the transmit power:** As FT8 is a specialist weak signal mode you can generally operate with low powers in the region of 5 watts. However, you can use the received signal reports to trim the transmit power. Most expert users suggest adjusting the RF power so that your received signal strength is between 0 and -10dB. As WSJT-X measures your signal-to-noise ratio at the far end, these signal reports are far more useful than the manually reported 599 results given in some other modes.

**Signal monitoring:** The availability of so many cheap SDRs means that it is easy to build your own off-air signal monitor to check the quality of your transmitted signal. In most cases, you will only need a very small whip antenna of just a few inches to gather sufficient signal. Another technique, for those fortunate enough to have a digital scope, is to take a tap off the transmit line and feed it to a scope in spectrum analyser mode. For my setup I use a home-made 40dB RF tap that feeds a sample of my signal into a PicoScope 3203D 50MHz scope in spectrum analyser mode, **Fig. 3**. That way I can see a 50MHz wide spectrum and directly measure the harmonic distortion of my signal.

**Split Frequency Operation**: Most newcomers to FT8 operate using the default settings and these are a great way to get started. In its default state, you select a station to call by double-clicking on the desired callsign. This sets both your transmit and receive frequencies to those of the called station, just as you would for a normal SSB QSO. However, when you do that, your transmit signal is directly competing with any other stations that are calling. This is fine if the bands are quiet or you have a booming

**Fig. 1: Shows the RF output from audio tones when a 14MHz SSB rig is set to USB (A) and LSB (B). Fig. 2: The WSJT-X power slider that controls the audio to the transmitter. Fig. 3: My signal quality monitoring setup with a PicoScope. Fig. 4: WSJT-X receive panel with two callers responding to my CQ. Fig. 5: WSJT-X WideGraph set to display the receiver passband. Fig. 6: WSJT-X waterfall control sliders.**

signal, but not so good if you're running a QRP station. As WSJT-X can simultaneously receive all signals in the receive passband, we can use split frequency operation and transmit on a clear channel. Not only does that improve our chances of being received, but it helps the called station because WSJT-X will display a list of all the calling stations, **Fig. 4**. That station can then stay on air until everyone has been contacted. Finding and setting separate transmit and receive frequencies is done using the Wide graph display and there are a few things we need to configure to get the best from this helpful display.

There are two sections to the Wide Graph. At the top is a waterfall display that is useful for showing band occupancy, while the boittom section is a spectrum display that gives a better view of the signal levels. The first task is to set the display to match the passband of your transceiver. We can use the spectrum display to measure that passband. Begin by doing the following:

Set your transceiver to the mode you will be using with WSJT-X

Set Bins/Pixel to 4

Start to 0Hz

N Avg to 3

Palette to Default

Adjust the two lower sliders for a display similar to **Fig. 5**

Using the spectrum display, you should be able to clearly see the passband of your receiver, Fig. 5. The next step is to match the display to your passband as follows:

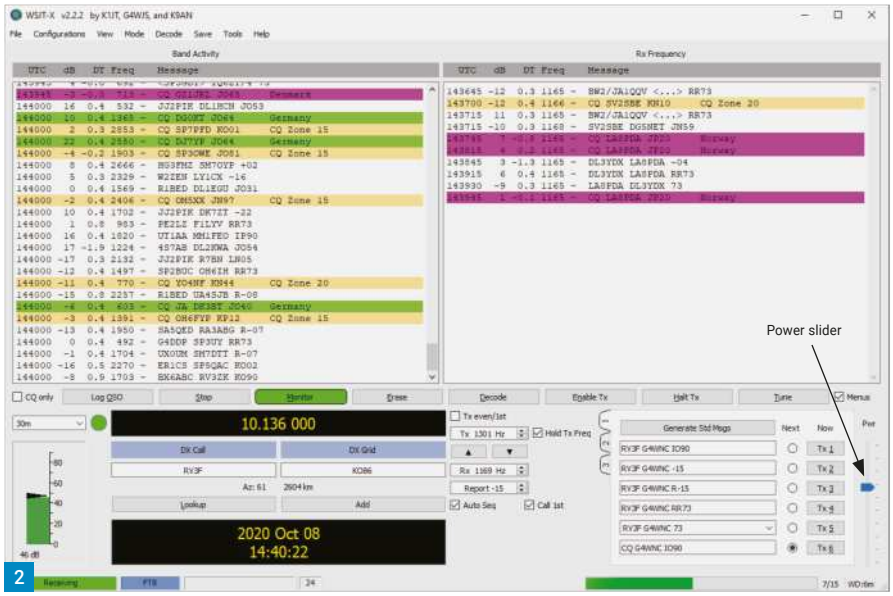
Adjust the Start frequency to the lower edge of your passband, typically around 300Hz.

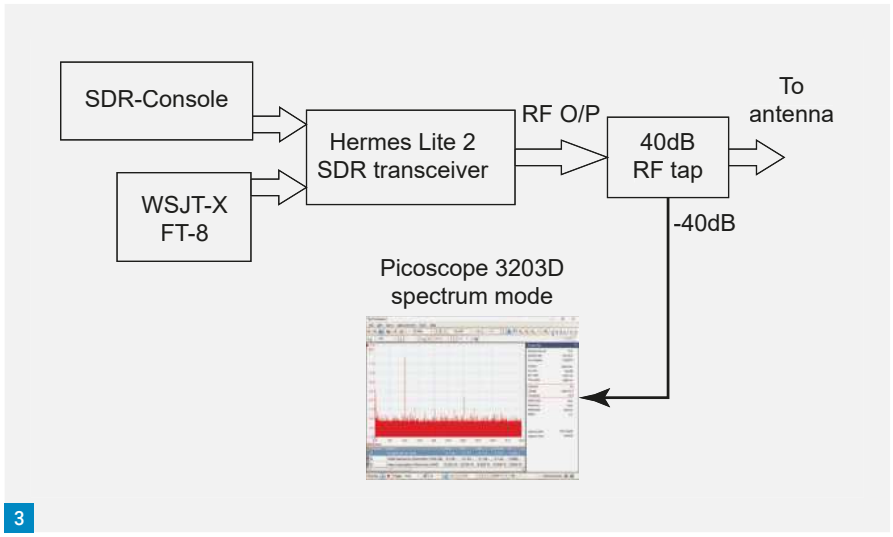
Resize the Wide-Graph window to the width that works best for your screen size.

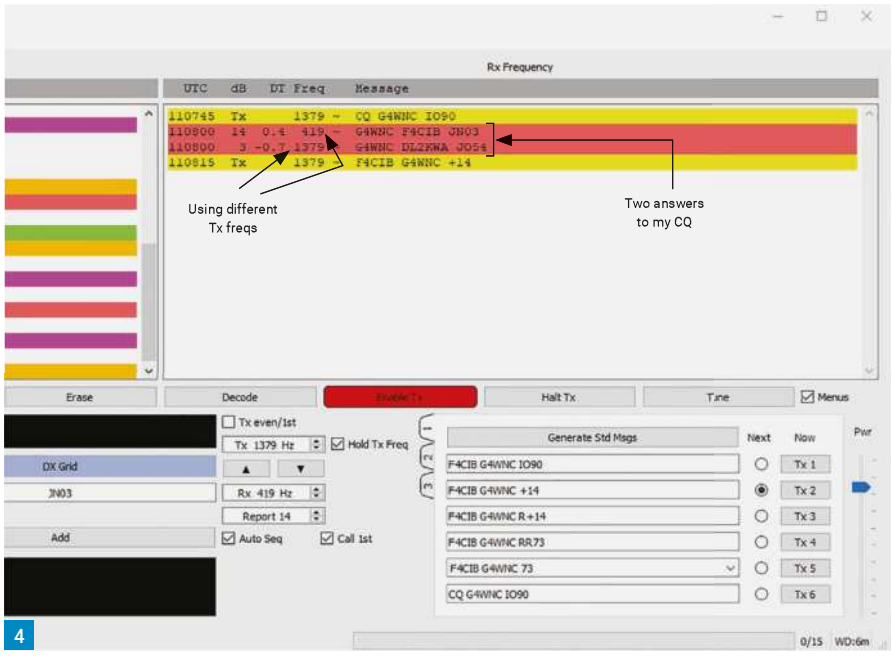
Adjust the Bins/Pixel so that the top-end of your receiver passband fits within the resized Wide Graph window.

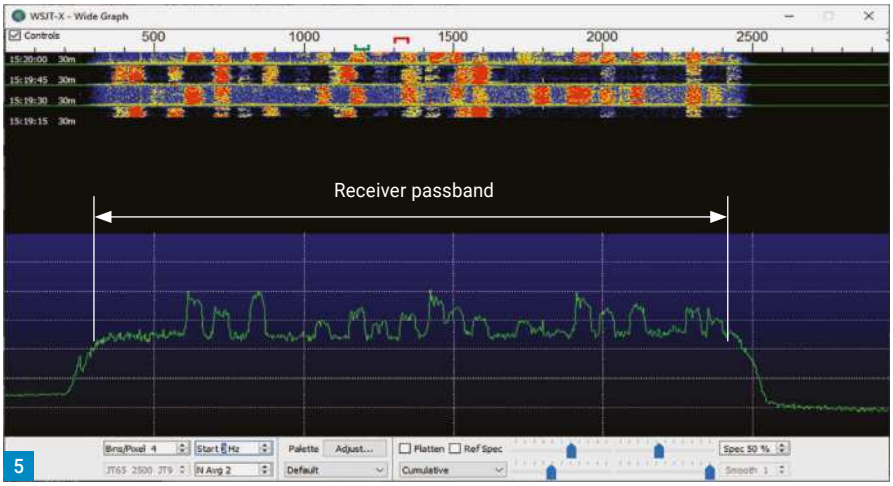
## That's it!

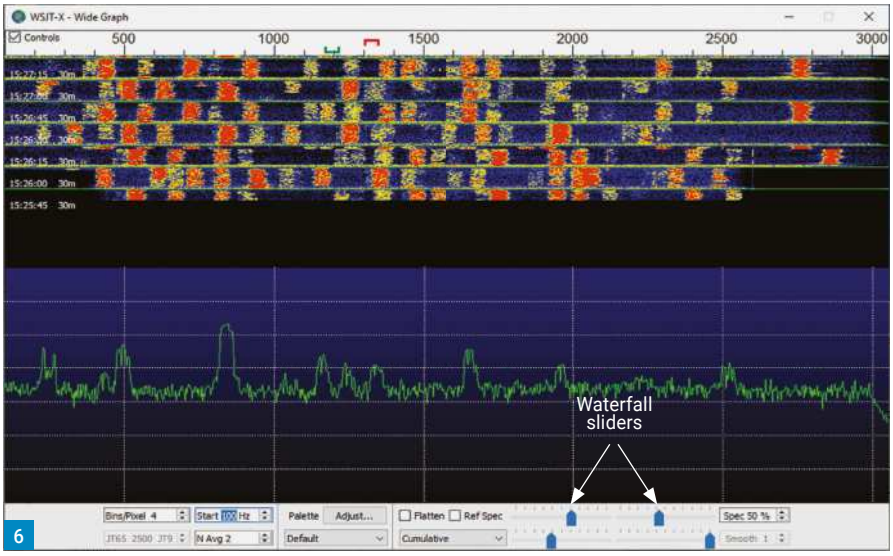
Those of you with SDR receivers will generally be able to set a wider passband. Now that you have the Wide-Graph passband configured, you can move up to the waterfall as that's what we'll be using to run split frequencies. The first task here is to trim






the two waterfall sliders, **Fig. 6**, to give the clearest display. With the Wide Graph optimised you can start using it for split-frequency operation.

The first task is to return to the WSJT-X main window and ensure Hold Tx Freq is ticked. When this is ticked the transmit frequency will remain wherever you place it. On the Wide Graph you need to observe a few 15 second FT8 cycles to spot an empty or lightly used channel. When you find that channel, press and hold the Shift key while clicking with the mouse on the left-hand edge of the slot you have chosen. You will see the red square bracket symbol appear on top of the slot. That shows your transmit frequency. There's no need to set the receive frequency because that will be determined by the station you want to work. You can now put out a CQ call by enabling Tx and clicking message 6 to start calling CQ in the next available timeslot. If you don't have any success, try moving your Tx frequency as there may be QRM on that frequency at the distant end.

**Managing your CQ calls:** For those new to FT8, trying to scan the list of received stations and to choose which station to work can be just too confusing. To solve that problem, the Call 1st option was introduced. When ticked, Call 1st will automatically select and start an automated QSO to the first operator to respond to your CQ call.

**Working multiple stations after a CQ call:** This is very easy to do. All that's required is to reselect Enable Tx at the end of each QSO and WSJT-X will automatically pick up anyone who is still calling you.

**Errata:** In Fig. 3 of my August column, I incorrectly highlighted the WSJT-X Call 1st tickbox when I should have highlighted the Tx even/1st box. It is the Tx even/1st box that forces FT8 to transmit on the 1st and even timing cycles. This is a convention used when calling for DX contacts. Under normal operation, the software automatically looks after cycle selection when you double-click on the station you want to work.

That's it for this month, but I'll have more on FT8 and some other modes next time.

**Continued from page 47**

have three or four different contests on the same dates, and many of the European contests are CW/Phone, which means phone all over the bands. I am only interested in QRP (40W) CW work, but it is almost impossible for DX work at weekends nowadays. I can well understand the frustration of W2OHE as he only has 15 minutes each Saturday and Sunday in which to pursue his hobby. I am much luckier as I can do so during the week and keep off the air during the many contest weekends.

He asks in his letter – What is the answer? How about doing away with all contests (except UHF ones) for a year, at weekends? This would give many amateurs, especially the really low power stations a fair deal. I know this is only a pipe dream! Barbara M. Dunn G6YL, Carlisle, Cumberland, England".

## Conclusion

The internet has many articles that claim that Barbara Dunn remained the United Kingdom's only YL transmitting amateur until 1932, when Nell Corry of Tadworth, Surrey, became G2YL. However, my research and the assistance of the RSGB, now indicates that Miss B. Saltmarsh was the first female operator in the UK and unlike Dunn she did not openly seek the limelight in the amateur radio hobby.

The exploits of Dunn are still quite remarkable in a hobby that was male dominated. The transmitter, that Dunn operated on 23 and 45m is housed in the museum at RSGB head office. By the mid-1970s she had worked/confirmed with 144 countries, despite suffering from ill-health. A true pioneer of social change in amateur radio.

## Acknowledgements

Thanks to Elaine G4LFM – RSGB Editorial Desk – for additional insight on the early female radio amateurs.

## Suggested Further Reading

- *Tribute to Barbara Dunn G6YL* The K8CX Ham Gallery: **http://hamgallery.com/Tribute/G6YL**
- British Young Ladies Amateur Radio Association *England's First YL Radio Operator:* **https://tinyurl.com/yylyfla3**
- Southgate Amateur Radio News: 90th Anniversary of G6YL: **https://tinyurl.com/y47wxglo**

# Capacitors & Capacitance (Part I)

**Eric Edwards GW8LJJ**
ericgw8ljj@outlook.com

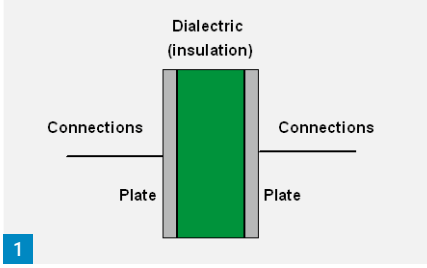
**Eric Edwards GW8LJJ** explains the basics of capacitance, in the first of two parts.

Capacitors along with resistors are the most used components in an electronic circuit. A capacitor is a two-terminal electrical device used to store electrical energy in the form of an electric field between the two plates, **Fig. 1**. The unit of capacitance is the Farad (F) and is named after the English physicist **Michael Faraday** (1791 – 1867). The Farad measures how much electric charge is accumulated on the capacitor. One Farad is the capacitance of a capacitor that has a charge of one coulomb (C) when applied a voltage drop of one volt. The coulomb is the amount of electric charge (Q) by a constant electric current of one ampere flowing for one second. The higher the capacity, the higher is the amount of (DC) electricity a capacitor can hold.

Capacitors are used in circuits for many different purposes and are common components of filters, oscillators, power supplies, amplifiers and other electrical and electronic circuits. They come in various shapes and sizes, depending on their capacity, working voltage, type of insulation, temperature coefficient and other factors and their capacitance values can be fixed or variable. The photo, **Fig. 2**, shows a selection of capacitors, while the symbols for capacitors are shown in **Fig. 3**.

## Capacitor or Condenser

We use the term capacitor when referring to capacitance but condenser was the name that many old timers (and I am one) used when describing the component. The name came from the year 1746 when the capacitor (condenser) was invented by a Dutch scientist, **Van Mussenbrock**. There were others and as with all inventions and discoveries there is always more than one person experimenting and developing alongside and from the works of others. The original condenser was a Leyden (Leiden) Jar, which stores a high-voltage electric charge (from an external source) between electrical conductors (foil) attached on the walls of the inside and outside of a glass jar. A terminal in the jar lid makes contact with the inner foil. Electricity, which was 'condensed' in the jar, was capable of storing charge in a very small space and consequently was named condenser. There are microphones that are still called condenser types but generally the term capacitor is used for the actual component. Many of you will have replaced the points and condenser in your petrol car!



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## The Capacitor at DC

A capacitor is similar to a battery, but whereas a battery generates energy, a capacitor is a much simpler device that can't produce new electrons but stores them. Unlike a battery, it does not use a chemical reaction and can only hold a very small charge. Inside the capacitor the terminals are connected with two metal plates separated by a dielectric material (such as paper (waxed), mica, ceramic, air, gas and other insulating materials). These separate the plates and allow them to hold opposite electrical charges maintaining an electrical field. Capacitors can be useful for storing charge and quickly discharging into a load. A large (several Farads) capacitor also works as a small rechargeable battery and is used as a temporary 'battery' for maintaining the data in EEPROMs. A very large capacitor can only light up an LED for a few seconds because of the current (milliamps) required by the LED, but can supply a backup voltage for some considerable time as the EEPROM draws very little current (nanoamps).

## Charging a Capacitor

The term 'charging' simply means the transfer of electrons from a battery or other power source to the plates of a capacitor. The positive terminal of the battery is connected via its connecting leads (for through-hole capacitors) to one plate of the capacitor. If a polarising capacitor is used, such as an electrolytic type, the positive of the battery must be connected to the positive connection of the capacitor. The negative terminal of the battery is connected to the other plate (connection) of the capacitor, **Fig. 4**.

Most capacitors are of the non-polarising types but usually larger capacitor values (1µF, 10µF, 100µF, 1000µF and so on) are polarised and are either electrolytic or tantalum types. It is very important to observe the polarity of these as they can get hot and even explode if incorrectly terminated, especially the tantalum types. The voltage rating of all capacitors must also be observed otherwise that could also be destructive. When using capacitors, the safe voltage rating is about 50% above the voltage applied to the capacitor. If a capacitor is used to decouple (place across) a 12V DC supply, the voltage rating should be 18V but a higher voltage working such as 22V will also be suitable. This applies for non-polarised as well polarised capacitors.

## How it Works

Whenever voltage is applied across capacitor plates (also known as charging of a capacitor), current starts to flow and continues to do so until the voltage across both the plates becomes equal to the voltage of the source (applied voltage). The two capacitor plates are separated by a dielectric material, which is an insulator, so no current can pass through it. The dielectric is also used to increase the capacitance of the capacitor. The thickness or amount of the dielectric plays an important part in the capacitance along with the size of the capacitor plates. Capacitance increases with the size of the plates, the gap between them and the nature of the dielectric.

When a DC voltage is applied across the plates of a capacitor, the current is maximum at first but as the voltage across the capacitor plates rises to the same level as the applied voltage, the current decreases, to zero once the voltages equalise. Thus, voltage across a capacitor lags current.

## The Capacitor at AC

Immediately an AC (Alternating Current) waveform is applied to the plates of a capacitor, maximum current will be flowing, and minimum voltage will be across the capacitor as when applying a DC voltage. Let's consider an AC waveform consisting of the alternate reversal of a DC supply (battery). The battery and capacitor with a reversal switch is shown at **Fig. 5**. The battery is connected to the common contacts on a DPDT (Double Pole Double Throw) switch. The capacitor leads are connected to the contacts that are made

**Fig. 1: The basic construction of a capacitor. Fig. 2: A selection of capacitors used in electronic circuits. Fig. 3: Symbols used for capacitors. Fig. 4: Simple circuit showing how charge builds on the capacitor. Fig. 5: As Fig. 3 but with a switch to allow the direction of current flow to be reversed. Fig. 6: Using analogue meters to observe current flow in a capacitor. Fig. 7: The effect of applying a sinewave voltage across a capacitor.**


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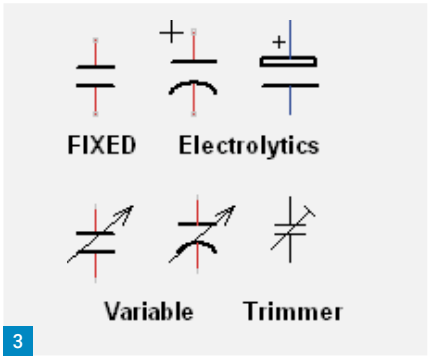

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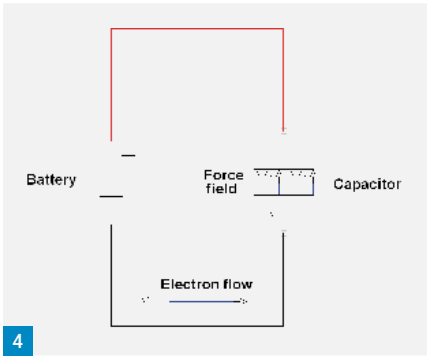

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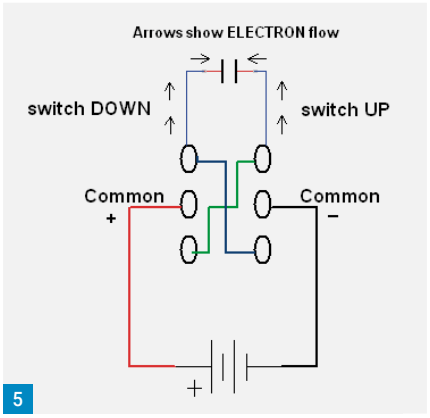

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when the switch is 'thrown' (placed) in the up position, which puts the battery positive on the left-hand plate of the capacitor with the negative from the battery on the right-hand plate of the capacitor. When the switch is placed in the down position it reverses the polarities of the battery on the capacitor. The capacitor first charges up with the electrons flowing from the negative terminal of the battery to the right-hand plate and stops when the voltage across the capacitor is equal to the battery voltage. If the switch is reversed the electrons now travel from the negative terminal of the battery to the left-hand plate of the capacitor. When the power supply is removed, it will show the voltage across the capacitor plates. The capacitor is now charged and will remain until discharged. However, there is no perfect insulator and the capacitor will discharge over time because of leakage in the dielectric (insulator).

## See the Current Peak

The effect can also be seen with an ammeter placed in series with the battery lead and the capacitor plate. As soon as the battery voltage is applied, the pointer on the ammeter peaks then goes back to zero showing that current (very fast) was sent from the battery negative lead to the capacitor plate. Using two AVOs, **Fig. 6**, or any analogue multimeter or ammeter set to DC100mA (0.1A) and the battery (DC power supply) to 12V (or 13.8V) placed in series with both capacitor leads, when the power supply is switched on or battery connected, the pointers on both of the meters will indicate a sharp increase in current then return to zero.

The power supply positive lead is connected to the one AVO DC+ terminal and the positive lead on the electrolytic capacitor is connected to the negative DC– terminal of the same AVO. The power supply negative lead is connected to the DC– terminal on the second AVO and the DC+ terminal connected to the negative lead on the capacitor. This indicates that although current does not pass through the capacitor, it flows through anything in its path. In this case the two AVOs. But once the capacitor is charged no more current flows and the capacitor stays at the voltage it has reached. The AVOs shows the surge of current and if a scope were connected across the capacitor (the earth lead of the scope connected to the negative terminal of the battery) with DC selected on the scope and the probe connected to the positive side of the capacitor, with the power supply removed the scope will display the voltage held in the capacitor.

## Sinewave

If we apply a sinewave (such as our UK mains, which is at 50Hz, or frequencies within the audio spectrum), the current will reduce as the capacitor charges up while the voltage on the capacitor plates will increase. When the voltage is at maximum, the current will have reached minimum. This is effectively a pair of sinewaves (one voltage, one current), 90° out of phase alternating minimum and maximum. The current first as it charges the capacitor then it is followed by the voltage as the current flow to the plate of the capacitor reduces.

## Push Pull

Or perhaps that should 'push push'. The voltage increases quickly and the electric (force) field strength in the dielectric of the capacitor is changing quickly. As the field gets stronger, it pushes more electrons out of the positive plate (due to increasing electric force on them created by the field). A capacitor is an open circuit and current does not flow through a capacitor but to or from one plate or the other. This causes an electric field to build in the dielectric, which affects the free electrons on the other plate via electric force. The capacitor plates are of conductive metal, so lots of free electrons exist in them. The voltage difference between plates, generated by the sinewave source, will push free electrons from the negative side of the source onto the plate it is connected to. This builds an electric field within the dielectric of the capacitor such that electrons are pushed by the

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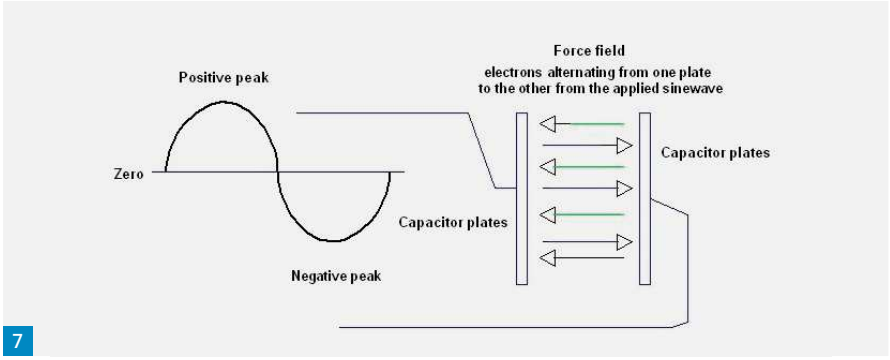

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electric force out of the opposite plate. The circuit carries them back to the positive leg of the source supply.

The force field acts like a flexible barrier, **Fig. 7**. The direction of the lines of force shown in the dielectric in the diagram shows electrons being repelled from one plate making it positive. This results in storage of charge. The electric field distorts the molecular structure so that the dielectric is no longer neutral but is stressed by the electric field force. This results in a charge in the dielectric. When the phase of the sinewave changes, the lines of force are reversed, the dielectric is once again distorted and a charge is held but in the opposite polarity. This alternation of the field force and distortion of the dielectric pushes out the electrons from the opposite plates and gives the impression that current flows through the capacitor.

## Elastic Barrier

To reiterate, the electrons on the negative capacitor plate try to cross to the other plate connected to the battery positive terminal and fill in the gaps left by the depletion of electrons (they were attracted to the positive terminal of the battery) and as they try to get across, a force field is created that is like an elastic barrier as it bulges out to reach the other plate. They cannot get there because of the insulation but in doing so they 'push' out more electrons from the positive plate. As more and more charge is pushed into the negative plate, the field grows stronger and more electrons are pushed off the other plate. However, since the rate of change of voltage is slowing as we reach maximum voltage (at 90°), our field strength is still increasing, but more slowly all the time. For that reason, fewer and fewer electrons are pushed off the positive plates so the current flow is getting smaller. At the point of maximum voltage, the rate of voltage change is zero, so there are zero more electrons being pushed off that positive plate. At that point the voltage begins to fall, and the field weakens. This allows some of the pushed-out electrons from the positive plate to come back into it. As the voltage rate of change accelerates and the voltage falls back toward zero, the rate at which electrons return to the positive plate accelerates (current rises). When the voltage is at zero, it's changing at its maximum rate, so you have maximum current flow in the circuit (electrons are coming back to the plate as fast as they ever will for this circuit). The other half of the waveform (negative lobe of the voltage sinusoid) is the same, but switches the plates from negative to positive.

(To be continued in part 2)

# Radio Round-up

**ANOTHER CANCELLED RALLY:** Following the Government's new guidelines for social distancing and events, the Rochdale and District Amateur Radio Society rally re-scheduled for Saturday November 28th 2020 will not now be able to take place.

**FCC FEE PROPOSAL:** The ARRL (American national society) is urging members to strongly oppose the proposal by the FCC (regulator) to introduce fees for amateur licences.
In a special edition of the ARRL Letter issued October 27th the League is urging its members to oppose the FCC proposal to charge a fee for licence applications, renewals and upgrades.
The ARRL says: "ARRL will file comments in firm opposition to an FCC proposal to impose a $50 fee on amateur radio licence and application fees. With the November 16th comment deadline fast approaching, ARRL urges members to add their voices to ARRL's by filing opposition comments of their own".
Under the proposal, amateur radio licensees would pay a $50 fee for each amateur radio application for new licences, licence renewals, upgrades to existing licences, and vanity callsign requests. The FCC has also proposed a $50 fee to obtain a printed copy of a licence. Excluded are applications for administrative updates, such as changes of address, and annual regulatory fees. Amateur Service licensees have been exempt from application fees for several years.
www.arrl.org/arrlletter

**AMSAT SYMPOSIUM SATELLITE TALKS ON YOUTUBE:** The video of the 38th AMSAT Space Symposium and Annual General Meeting, held on October 17th 2020, is now available to view on YouTube. You can join the AMSAT News Service Mailing List at:
www.amsat.org/mailman/listinfo/ans

**NEW MODES IN WSJT:** WSJT-X 2.3.0 is a program upgrade offering two new modes designed especially for use on the LF and MF bands. FST4 is for two-way QSOs, and FST4W is for WSPR-like transmissions.
Both modes offer a range of options for T/R sequence lengths and threshold decoding sensitivities extending well into the –40 dB range. Early tests have shown these modes frequently spanning intercontinental distances on the 2200m and 630m bands.
Further details and operating hints can be found in the Quick-Start Guide to FST4 and FST4W, posted on the WSJT website:
https://tinyurl.com/yyr8yaeb
Download WSJT from:
https://tinyurl.com/ozca2ss

# Listening on Headphones

**Harry Leeming G3LLL** starts with headphones, which takes him to hearing aids, on to starting a shop and ending with diodes!

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I always found that trying to decipher signals buried in noise was much easier if I used headphones, and for many years this was my preferred mode of operation. There is a danger when wearing headphones, however, in that you tend to be less conscious as to how loud the signals are, as you are isolated from room noise, and hence have no reference level. In my case I am paying the penalty of all that listening on noisy channels, as I have become deaf and have to wear hearing aids. Learn from my mistake and when wearing phones use the lowest possible volume setting.

## And Talking About Hearing Aids

The age-old problem, with any kind of portable electronic device, has always been the difficulties in storing enough electricity, and of reducing size. I can still remember as a child an elderly gentleman (well he was probably younger than I am now!) who had an earpiece plus a heavy box hanging around his neck at church. This often emitted whistling noises during services, much to my amusement. Later, as technology progressed, slightly smaller aids were developed, still full of valves, and some of these early devices, ended up being sold off on the surplus market. Radio magazines such as *PW* then published DIY articles showing how to convert them into portable radios.

Move on to this century and due perhaps to the large number of young people who have spent a great deal of time listening to loud music, increased numbers are become deaf at an earlier age, and hearing aids are becoming even more important.

Having for many years experimented with making speech clearer on amateur radio equipment, I was pleasantly surprised at the care that was taken to match the response of the NHS hearing aids I was supplied with some years ago by the Lancaster and Morecambe Audiology department to the response of my hearing. Modern hearing aids are a marvel of miniature solid-state electronics and Audiology has become a very worthwhile career to anyone interested in sound and electronics, and who likes helping people.

Storing electricity is still a problem, however, and recently I was having trouble with my aid's batteries, **Fig. 1**, having only a very short life. I started trying to test one that had apparently failed, with my digital meter. It should have read about 1.4V but only registered around 1V. I was just going to throw it in the bin when I noticed an odd effect. The voltage was gradually rising, and after about five minutes was showing a full 1.4V. I refitted it to my aid and it then functioned perfectly for a few more days. What on earth was going on?


I had a search on Google and ended up on Rayovac Hearing Aid Batteries' website, which had a most interesting article:

https://tinyurl.com/y8kx5lg2

The latest batteries for hearing aids use 'Zinc/Air' technology. They arrive in a packet and on the top of each battery is a red label. It is not just for decoration, as removing it exposes some very fine holes in the battery's case. Normal batteries use the reaction between metal, carbon and other chemicals to generate their output, but Zinc/Air batteries use only zinc, which reacts with the oxygen in the air once the red label has been removed.

In my case it would seem that the hot weather had caused me to sweat (or perhaps I had forgotten to wash behind my ears!) and that this had either blocked up the very fine ventilation holes in the batteries or those in the aid's case, **Fig. 2**. I can't help wondering as to how many perfectly good batteries are thrown away just because the holes have got blocked. I have now noticed that if my batteries fail when I am away from home, and have not got a spare, if I wipe the them with a hanky and blow into the holes, I get a few hours extra use from them – worth knowing!

Zinc/Air batteries and rechargeable power cells seem to be popping up in all sorts of places, such as being used to store the output of wind farms, and are even proposed for use in electric cars, so it is worth keeping your eye on developments.

## Thinking of Opening a Radio Shop?

If your hobby is radio, computers, or even gardening, it can be quite tempting to make it into a business, but first of all you have to ask yourself if you have the ability to organise a business, and as to what the competition is like? Can you offer repairs and anything special that the nearest competitors can't match, and have you plenty of contacts in local clubs who are likely to patronise you?

Also, are you or your partner good at record keeping? The tax and VAT inspectors require a complete trail showing all your takings and expenses, where they originated, and where they go to. They are inherently suspicious of cash, and I can remember being grilled and having to show proof that the

**Fig. 1: Harry's hearing aid with batteries.**
**Fig. 2: The small breather holes.**

cash I had taken had ended up in the bank, and not my pocket. Fortunately, my wife Brenda is gifted in keeping clear tidy paperwork, and took charge of keeping the records, or I should have been lost.

VAT can be a real headache. This is levied on all shops with an annual turnover of over £85,000 and if you get your paperwork wrong, it can cost you a lot of money. When VAT started I was told that everything I sold, that was my property, was liable for VAT, which was then levied at 10% and which was added to the final purchase price. When I purchased new equipment from a registered supplier this was no problem. VAT was added to the price I paid, and I was given a VAT invoice with their registered number on it, with the VAT I had already paid clearly shown. When Brenda submitted the 'VAT Returns' to the VAT office she was able to deduct the VAT that we had paid to the supplier, and we only paid VAT on our profit.

The real problem started with second-hand equipment obtained from private customers.

Yes, VAT was then only 10% but it still meant that if I part-exchanged or purchased a rig from a private non-VAT registered customer for £300, serviced it and sold it for £330, I had to pay £30 VAT. Hence this wiped out my profit and the payment for my work, even more so when the level of VAT was increased. I stopped selling any second-hand equipment that was my property, and arranged to sell it on a 'commission sale' basis, but this involved extra paperwork.

VAT is much higher nowadays so this could have killed the second-hand business, but fortunately there is now a somewhat simpler way of accounting for VAT on second-hand goods. However, there are still traps for the unwary who don't get their paperwork or computer records correct and you may need to pay an accountant to help you setup a legally watertight system.

I heard of one trader who got himself into


2

dead trouble. Over a length of time a VAT inspector had kept a record of the second-hand equipment that had been in his window, and had disappeared, presumably sold. At the next VAT inspection the trader was challenged to account for the several thousand pounds VAT that would have been chargeable on these goods. *"Oh, they were not mine so I only declared VAT on my profit"* was his defence. *"Where then is the paperwork, with the names and addresses and signatures of the owners, proving they owned them, and not you, at the time you sold them?"* He could not produce these, so it cost him a lot of money.

There are many other things that you must think of before starting a shop, but that is enough for this time

## Switching Diodes

The contacts on relays, band-change and other switches in electronic equipment do tend to give trouble, and replacing or cleaning these on amateur radio and hi-fi equipment was 'a nice little earner' when we had the shop. Modern rigs have replaced most of these with 'reliable' switching diodes, so this source of trouble is disappearing, only to be replaced with more mysterious faults.

Have you started to hear your own voice in the speaker as you are transmitting, had your rig burst into oscillation, found that the receiver has become very noisy, or come across other odd effects? These are quite possibly caused by a leaky switching diode.

The switching on most modern rigs is carried out by placing a positive voltage on either the transmit (TX) or receive (RX) line. These will be marked on the circuit diagram something like 'TX 8V' or 'RX 8V' (or whatever voltage is used).This voltage will be applied to the various amplifying stages and relevant switching diodes, to turn them on and off in the TX or RX modes as applicable. If you check the voltage on these lines, only one should carry a positive voltage when in the appropriate TX or RX mode, and there should be no positive voltage, and sometimes a slight negative voltage, on the other. If there is a slight positive voltage on the line that should not be active, there is probably a leaky switching diode. The most likely diodes to fail are those nearest to the antenna, and tracing these will involve removing circuit board connector plugs, and a little unsoldering using trial and error to track down where the voltage is coming from.

Schottky barrier diodes are normally recommended as the most efficient type for RF switching, but some of these seem very susceptible to being damaged by voltage spikes. I had quite a bit of trouble with the switching diodes located near to the antenna input of the FT-757, and in the end started replacing them with normal IN4148 ones. These had a much higher voltage rating, and while they were not intended for RF use, I could detect no difference in performance.

Even when using these I did have the odd repair which 'bounced' back with the replacement TX/RX switching diode having failed. I could find no reason for the failure, and in desperation I replaced the failed diode with a much larger 1500V 2A mains rectifier diode. Once more I could detect no difference in performance and the rigs did not fail again. I did warn the customers, however, to advise any future repairer as to the reason why the large diode had been fitted, as otherwise he would have been tempted to replace it with the 'correct' one.

**Geoff Theasby G8BMI**
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# The G8BMI Tripod

Not a kit as such, but **Geoff Theasby G8BMI** repurposes a camera tripod.

I received a camera tripod for my birthday, and it was while I was contemplating this that I realised that with a 2m whip antenna or a small beam attached, it could be useful for going portable, for example in contests such as the *PW* Low Power and the RSGB Backpackers as well as in SOTA events. Collapsible poles are good, but need guying, and the *PW* Tenna-Tourer is very good if you can drive to the transmitting point, but I was looking for something that would pack down very small, and would be quick and easy to erect. I then thought that the legs of the tripod, if connected up as the ground plane of a vertical, would complete the ensemble. The reason being that a horizontal ground plane exhibits a low impedance at the base of the antenna, of about 25Ω. Drooping the radials at 45° increases this impedance to about 50Ω.

Idly thinking about tripods in the all-too-brief period between waking and setting off to work, I conceived the idea of using a magnetic mount antenna, such as I have for my car. If a small sheet of steel had a central hole, tapped to match the screw on the tripod, then radials could be attached to this plate in the manner of a ground plane, and the mag-mount would sit on this. Of course, if the steel sheet were tapped in the middle, then protrusion of the tripod screw would interfere with the mag-mount. Therefore, if a matching nut were to be brazed or glued to the steel sheet, the mag-mount would be free to attach. Furthermore, to stop the waving of the whip antenna stressing the brazed or glued joint, if a ring, approximating to the dimensions of the top plate of the tripod, could be fitted, or perhaps four more nuts were similarly attached, the strain on the mounting nut would be reduced, **Fig. 1**.

A mag-mount antenna would also be pre-matched to a horizontal ground plane, as when attached to a car, so the tripod legs need not be used as radials, nor the radials drooped. What is more, the concept of attaching a nut to the steel sheet could be carried further. A small beam, HB9CV or a little larger, could be similarly prepared, with three nuts in a line, placed at the centre of gravity of the beam. The pan and tilt head of the tripod would allow for rotation and, if need be, polarisation change. (Although the metal tripod legs would interfere with the radiation pattern of the antenna when set for vertical polarisation) Rather than solder the radials direct to the steel sheet, if small sockets were to be attached to the corners, or every 90° around a circular plate, then the radials would be easily removable for transport. The result is more or less the finished article, **Fig. 2**.

## Construction

I cut a 150mm square sheet of steel 0.5mm thick, from a piece I found in a scrap yard. Wrappers from cookers, fridges or office equipment, or even car body panels can be used for this, the only requirement being that it is flat, stiff enough to resist the bending effect of the antenna, yet thin enough to cut easily, and magnetic. I obtained a piece for nothing from the scrapyard, after I explained my requirements. I was given a hard hat and told to look *"over there"*. Please be aware that, although aluminium alloy sheet, when cut, is reasonably easy to deal with, steel sheet when cut with tinsnips or a nibbler, is razor sharp, and will draw blood easily. Run down the edges with a file or grinding wheel, and keep the Elastoplast handy!

Five nuts were Araldited to the centre of the plate in a diamond formation. To prepare the plate, remove all paint and rust from the steel, and degrease the nuts, especially if they are new. I washed the nuts in white spirit. They need to be ¼in BSW thread, which is fairly standard for tripods. If you do not remove the paint, you are dependent on the strength of the bond between the paint and the steel. With the paint removed, the bond is much better, **Fig. 3**.

The precise spacing depends on the size of your tripod's camera mounting surface. Many tripods have a quick release at the tip, **Fig. 4**.

Then, solder four 4mm wander sockets to the corners. Use a large bit in the soldering iron, because there is quite a lot of metal to heat up, but clean steel solders well.

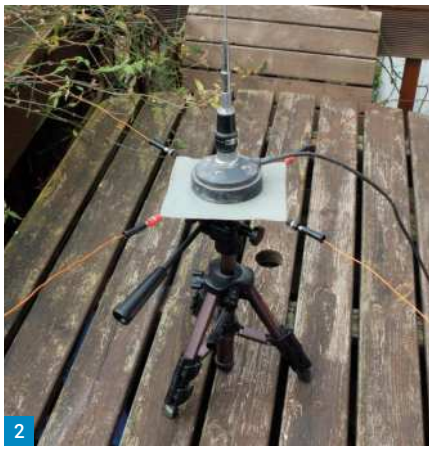
To make the radials (Do this while the glue on the nuts is setting) cut four pieces of stiff copper wire. I used 16gauge hard-drawn enamelled copper wire offcuts from a 40m antenna project. Cut them to 550mm long, assuming they are for the 2m band. This is to allow for trimming to frequency later. Radials should be one quarter wavelength at the frequency in use. Solder each one to a 4mm wander plug. That is more or less it!

**Fig. 1: The components. Fig. 2: Assembled. Fig. 3: Nuts glued to base. Fig. 4: Tripod QR top.**

## In Use

The square plate screws to the tripod, the whip antenna (I used a 5/8-wave whip) mag-mount sticks to that and the radials plug in to the corners. If you are using a beam, attach that to the tripod instead of the steel sheet, and you don't need radials. Extend the tripod legs to their fullest extent, wind up the centre column if there is one, and bingo! A vertical or small beam ready for action. What is more, the antenna is more than a half wave above ground on 2m or above, which is recommended. If you use a camping chair, or one which is quite low, you will not distort the radiation pattern of the antenna too much, as you will be 'below' the ground plane and the antenna will not 'see' you. My 5/8-wave whip used in this configuration returned an SWR of 1.2:1 when mounted on the car roof. (Which is a perfect ground plane, being a continuous steel sheet) On the tripod, which extends to a height of 5ft, it gave an SWR of 2:1.

Trimming the radials down by a couple of centimetres reduced this to 1.7:1, but trimming more off this length had no noticeable effect. During construction I found that the radials I used were too short and I had to lengthen them. This may be seen



in the photographs. I tried a smaller tripod, which extends to 3ft high. This also resulted in an SWR of 2:1. I tried connecting the legs electrically as drooping radials, using short lengths of flexible wire and crocodile clips and no radials. This made the SWR 4:1, and with the radials reconnected 2:1. This suggests that there is no advantage to connecting up the legs as radials. The HB9CV gave an SWR of 2.2:1 when mounted on the large tripod, which is acceptable, and suggests that the whips are reasonably matched. Tripods of the type described can be found from about £20 in photography shops, or the CPC Catalogue: www.cpc.co.uk

Going equipped for remote portable operations requires some thought, and taking directional antennas more so. This option provides an opportunity to take lightweight, directional or omnidirectional antennas quite some way off the beaten track for very little effort.

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

# Part 1: Eating Humble Pie

**Richard White G6NFE**
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**Richard White G6NFE** enjoys building the Ivel receiver from Walford Electronics.

1

I hadn't built anything in kit form for about 38 years, but after a long lapse in amateur radio and renewing my licence in 2015 after discovering I could now use the HF bands with my 1982 'Class B' licence, it was time to try my hand at building and testing again. At the back of my mind was the memory of the embarrassing letter I received in the post 38 years ago after complaining to the manufacturer that their kit 'didn't work', only to have my poor construction skills pulled apart and my glaring errors highlighted and corrected (for a small fee)!

Could I build a modern radio in kit form? Did I have the requisite soldering skills? Could I remember the resistor colour codes? As it turned out I needn't have worried, the instructions with the Walford Electronics kits are excellent as I will explain later.

## An Idea Comes to Fruition

The idea to try kit building again had probably been forming in my mind for some time. In 2019 I purchased some used RF test equipment, checked it, and satisfied it all worked, neatly stacked it away determined to find a use for it. Originally, I intended to refurbish some old Yaesu hybrid HF transceivers, but in a small house with four family members and a lively Greyhound, finding the space to tear them apart proved impossible.

Then came the chaos and fallout from Covid-19. No more shopping, cinema, coffee shops, restaurants, socialising, etc. What to do? How much TV can you consume before enough is enough? How many times have you tried a new author only to find the new book isn't doing it for you? Hmmm. I needed to find something I could dive into, think carefully about what I was doing and start remembering things long forgotten.

Most importantly, I had to be able to walk away from it when I wanted and then pick it up where I left off. Then the penny dropped. I had vague recollections of an article about the *Halse and Hatch* HF radio kits from Walford Electronics.

Finding the Walford Electronics website completely convinced me. After drooling through the various pages, I somehow and rather foolishly, convinced myself I could build the most complex kits and I would have them working perfectly in shiny enclosures beautifully hand crafted by myself. The power of dreams. Oh dear.

## The Kit Arrives

The *Halse and Hatch* duly arrived along with the frequency counter kit and the power amplifier kit. Inside was a polite note from **Tim Walford** advising me to take it slow. Hmmm. Does he know something I don't? The answer is undoubtedly yes, he does. I think what he was trying to tell me was *"take it easy, these kits require real care, preparation, consideration, manual dexterity, test equipment and lots of patience"*. Not to mention the use of skills that in my case I hadn't practiced for many years, such as soldering and desoldering....

The reality hit me like a brick. I'd taken on too much, too soon. My ambitions and imagination were writing cheques my kit building abilities couldn't cash. Without admitting my over ambition to my wife, I quietly put the kit parts to one side and had a re-think. About a month passed and then one day I just happened to be on the Walford Electronics site again. I'd found the answer. I would start out with something simpler, much simpler. And so, the logic went as follows: I ordered the *Ivel* HF receiver classified as a 'simple' kit, and also the *Ilton* HF transmitter, classified as an 'intermediate' kit. If, and it was a big if, I could get these working then, and only then, would I attempt the *Halse and Hatch* with the frequency counter and power amplifier.

## Credit Card Time

Out came the credit card again. Here goes. Better get it right this time! As before, the *Ivel* and *Ilton* arrived in good time and very well packaged. Tim is very good at letting you know how things are progressing with the order as well as replying to any technical questions that may arise.

After obtaining the required authorisation from my wife I reserved an area of kitchen worktop with a promise it would all be cleared away well before dinner in the evening. Woe betide the

**Photo 1: First stage of build.**
**Photo 2: First check of the audio section.**
**Photo 3: Final alignment for centring the frequency and peaking up signal level.**

amateur radio kit builder who holds up dinner and leaves a mess on the kitchen worktop!

Thinking about what I needed I reasoned on: (a) biscuit tin with lid, (b) soldering iron, (c) DMM, (d) some basic tools such as cutters, pliers, tweezers, and also (e) a power supply of some description. The frequency counter and signal generator could wait until further down track; I didn't need them now.

## Getting Started

Each kit comes in its own clear plastic bag with very clear instructions and colour photographs to help you understand the layout of the board. At this stage I recommend the builder puts the kits still inside their bags into a biscuit tin with a tight-fitting lid. This will reduce the chances of the accidental escape and potential loss of extremely small parts.

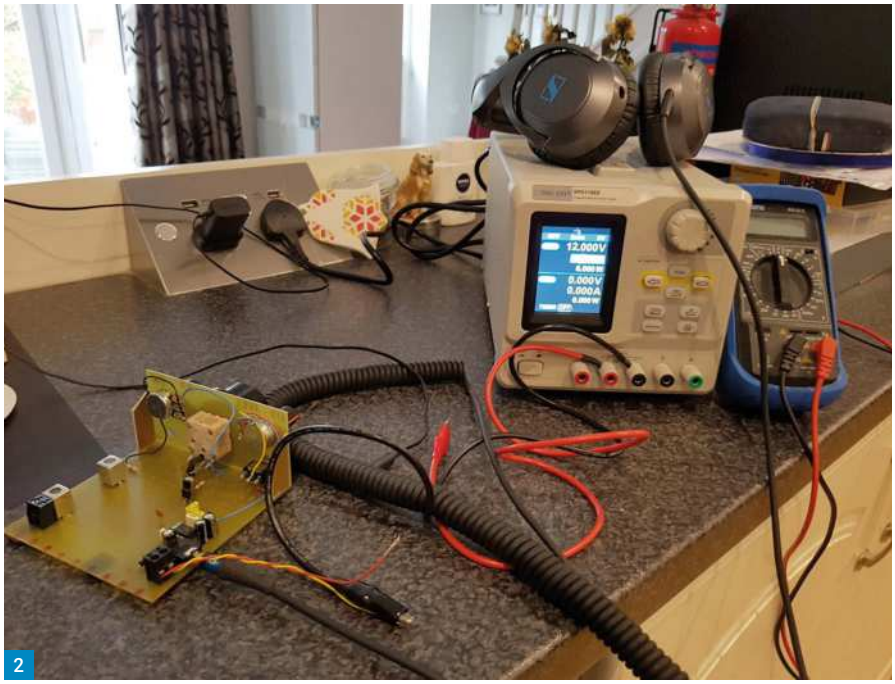
On examining the *Ivel* it is immediately apparent just how much thought has gone into developing the radio. The components appeared to be of the best quality and the instructions are clear once read and re-read a number of times.

This is also a good time to print off a resistor colour code chart if like me, you last looked at these 38 years ago! That said, the instructions do give you the colour codes and also explain what numbers to look for on other components such as capacitors, ICs and so on.

The instructions recommend building and testing the *Ivel* in stages and this is what I did. To minimise any build issues, I ticked each individual component off as I populated the board. The instructions recommend the soldering of the front panel to the main PCB before adding the pots and switches, but I wasn't sure I wanted to do this because of my lofty (read expensive) ambitions to mount the whole project in a metal enclosure.

So, after some thought, I applied a few dabs of super glue and prayed it would work. It did. Enough to hold it together, but not so much I'd damage the board when disassembling it later. A word of caution here: The instructions do not recommend this procedure. It was a personal choice. You have been warned!

Mechanical assembly was easy with all the parts fitting without issues and the colour photos were really useful as a



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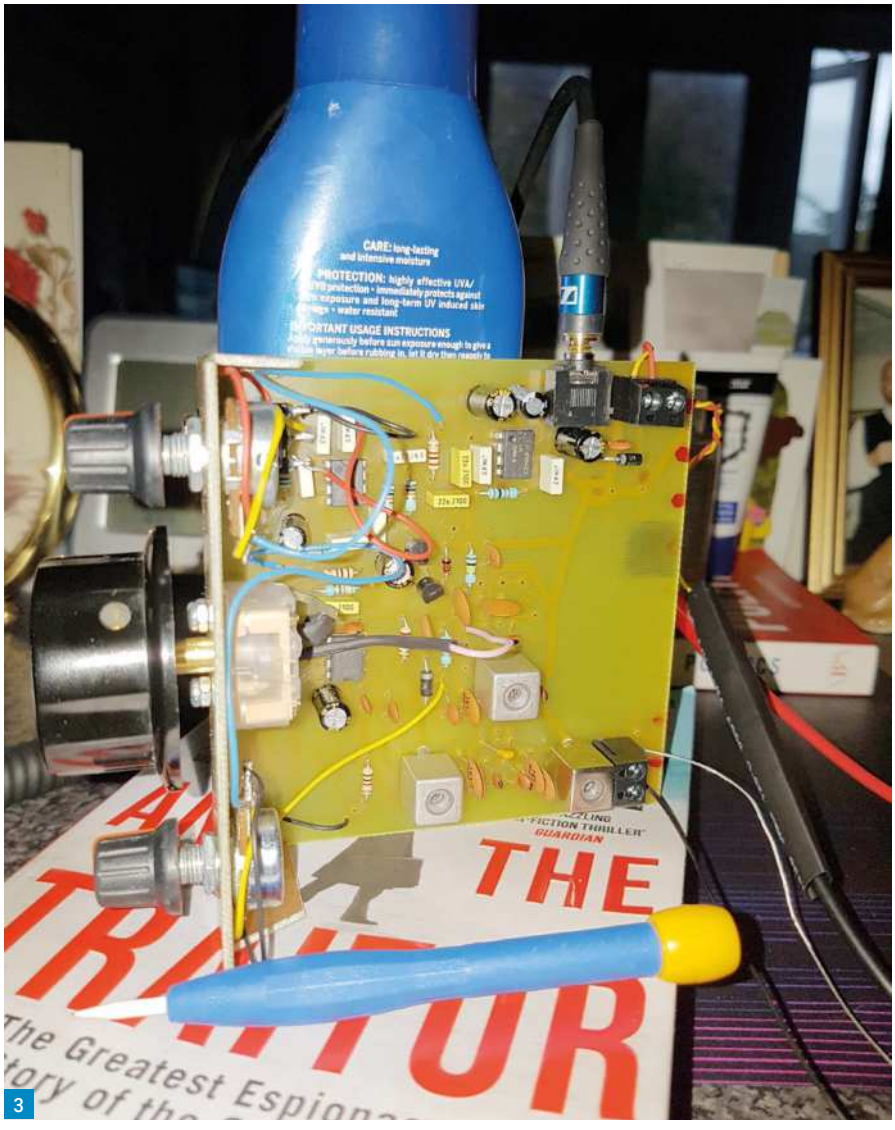

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**Photo 4: Final testing with signal generator attached.**

reference. The value of the photographs becomes even more apparent as the build progresses.

Next came the electrical assembly. This started off easily enough; certainly, the two screw connector blocks, the stereo jack and the metal canned inductors are easy to locate and fit.

Moving to the smaller components raised the first challenge. My 58 year-old eyes are not quite as sharp as they used to be. I installed a resistor only to realise later that I had managed to confuse red with orange. Lessons learned; make sure you have very good lighting and, if required, a small magnifying glass to hand. One thing I did discover was the true 'Swiss Army Knife' ability of the modern smartphone. Using the camera with the built-in LED flash switched on, I magnified the image on the screen.

The results were outstanding and the impossible to read digits on the tiny Polyester capacitors were crystal clear. Oh, one other thing, use a good quality DMM if you have any doubts about the value of the resistor you are about to fit.

I carefully worked my way to the end of stage 1 and connected the wires on the 'fine' pot to the main board as described. The power supply was connected with the lowest power output I could select and the time had come. Power was applied. No smoke, no supply trip, no horrible smells. Measuring the voltage on point 8 showed 7.94 volts. Near enough to 8 volts. Phew!

## Working through the Build

Working through the subsequent stages was not difficult. All you have to do is follow the instructions step-by-step and if text is in **bold** print there is a good reason for it! I made a note of all test voltage readings I got and ticked each stage off line by line. The only voltage that caused me concern was at the end of stage 4 where I measured 5.62 volts. A quick e-mail to Tim Walford confirmed it was near enough to the 6 volts required. Result.

Stage 6 is the stage you need to be decisive about. Choose your band and stick to it as the specific band is defined by the inductors and capacitors you choose at this stage. Something to point out here is the 20 metre band. As supplied, the kit covers the 30, 40 and 80 metre bands. If you want to use 20 metres, you need to flag this up when you order the kit. I chose the 40 metre band.

This final stage is where all the concentration and diligence comes together. Applying power, antenna and headphones, I could hear RTTY and CW. Obviously, it needed final alignment but it worked. Yes! The embarrassment of 1982 melted away. I could build a kit and, more importantly, it worked as the designer intended.

## Testing, Testing

After this I decided it was time to break out the 2019 designer collection of RF test equipment. Hooking up my budget (extremely cheap) Chinese frequency counter to a divide-by-10 probe and a 150pF capacitor in series was not successful. The frequency wandered from 2.8MHz to 8MHz. Clearly it wasn't up to the job and demonstrated the value of good quality test equipment.

Thinking about it later it's entirely possible the counter was not at fault as I didn't install any vero pins in the test points on the main board. I recommend you do this because it could save a lot of frustration.

Lastly, I hooked up my signal generator to the antenna port on the board and extremely cautiously applied a test signal of −120dBm at 2kHz and 70% modulation on 7.150MHz AM. Astute readers will now realise why I couldn't hear the test signal on the *Ivel* receiver. Another quick e-mail to Tim Walford and he pointed out the error of my thinking. How on earth did I expect to hear a test signal at −120dBm? As he said, S9 is considered to be −75dBm. I would have to come up a very long way....

Moving swiftly on from this 'schoolboy error' I could hear the test signal clearly. I aligned the receiver to be centred around 7.150MHz and this worked for me as I prefer the SSB segment of the band. Finally, I peaked up L2 and L3 for maximum signal strength and that was it. Job done.

## Conclusion:

The *Ivel* is a good place to start if, like me, you haven't touched a kit or seriously played with components for a long time. The instructions are completely logical and very clear. It is entirely possible to build and test it with only a digital multimeter and another HF receiver to monitor the *Ivel's* VFO. You certainly don't need a frequency counter or signal generator. As I said earlier, the value of the colour photos becomes more evident as you move through the build, allowing you to sanity check the placement of components before you solder them in place. Technical support from **Tim Walford** is available if required, but to be honest the instructions are good enough that you rarely need it. A good quality receiver and highly recommended.

# Practical Wireless 2020 Index

**Article Name and Author** — **Month & Page**

## Feature Articles



## Projects & Practical



## Reviews



## Regulars



## Carrying on the Practical Way



**Continued on page 63**

# Designing a 2m All Mode Transceiver

**Joe Chester M1MWD**
m1mwd@gmx.com

**Joe Chester M1MWD** wonders why there is no replacement for the single-band VHF multimodes of old.

Would you like to have a 2m/70cm all mode transceiver? When I say all mode, what I really mean is FM and SSB – I don't think AM is really important (tell me I'm wrong). Of course, the answer is to buy a multi-mode HF radio, one which covers 2m and maybe 70cm also. You will get a good transceiver, maybe 100W on 160-6m, and a bit less on VHF. However, it won't quite be a mobile or portable rig. Not quite bicycle friendly. Is such a transceiver possible? Let me rewrite the specification. VHF/UHF, FM and SSB, in a lightweight portable format, maybe 5-10W max output. Think of all the uses – 2m contesting out /P, or the SSB satellites. As there will be FM on board, it could be used as a mobile FM rig. As a backpacking radio, for SOTA work maybe.

## The FT-290

I once had an FT-290. It was a lovely little radio for the time. FM and SSB, a few watts output, but it was fun to operate. I put it in my car and operated mobile on my daily commute, which was a 150km round trip at the time (I butchered a coat hanger to make a quarter-wave to mount on a wing of the car!). I also used it for /P 2m SSB operations during contests, with an HB9CV gifted to me by my original amateur radio teacher. My best performance was into the south of France from a hilltop in the centre of Ireland. Today, mobile operation, unless the car is parked, has been made more difficult by the huge increase in road traffic volumes, although many operators do work mobile. And /P operation, with a big HF transceiver, is also a more difficult operation than it was back then with the FT-290, sometimes even requiring a generator. As a footnote, I found myself looking longingly at a refurbished FT-290 at a hamfest recently – not huge money, but beyond the current budget limit. Perhaps that would be the answer?

## Why no Replacement?

But wait a minute. Why is it that a transceiver with this specification is not on the market today? I've asked around, and the universal answer is that there is no market for such a radio. Really? I can guarantee at least three customers, from a single chat about this on an 80m net recently. At hamfests over recent years I've spoken with suppliers and manufacturers' representatives. They all universally sing the same tune. No one wants such a radio. The development costs are huge, and without the certainty of worldwide sales there is no business interest in such a radio.

Now I'm not a marketing expert. But I can't see why there would be no interest in such a lightweight radio. Lots of amateur operators do portable work, and the annual 2m and 70cm contests are well supported. These are essentially SSB activities. So, my case is that there would be a demand, if such a radio was available. As it's not, there really is only one choice. No, I'm not talking about the second-hand or refurbished market. I guess I'll just have to design and build one.

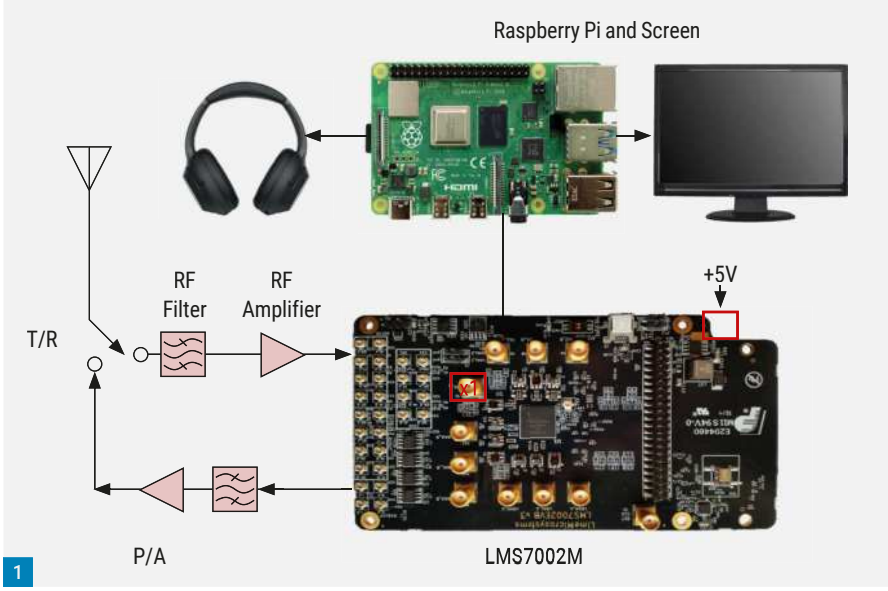


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**Fig. 1: Concept for a 2m SSB rig (https://tinyurl.com/y4nwycq6 (modified))**

## Some Thoughts

Daft! Mad! But that's not what happened when I told this to a few fellow operators. Rather the reverse. Suggestions poured in, and I began to lose the thread of the very technical conversation that followed. One clever chap even suggested doing an internet campaign to raise money for the development. He was cut off sharply when we discovered his real ambition was to be away with the funds to Saint Lucia! But I digress. So back to the challenge.

This is very much what **A. Einstein** used to call a thought experiment. For now anyway. There are lots and lots of component suppliers, and even of sub-systems suppliers out there. So, my plan is to sit down with a good book about designing radios and start from first principles. I'm also going to cheat a little, by looking at block diagrams of various radios. For, of course, the thing that makes this project viable is SDR technology, and the SDR chip sets are readily available. But I've leaped ahead.

Trivially, what I will need is a front end to capture VHF/UHF signals, which of course are analogue AC currents. I will then need a bit of filtering, and then convert these to digital form, and present these to a processor which will do all the demodulation. Take the output from this to

an audio processor, and finally an amplifier, and I'm done. Any questions? Stay awake at the back, as questions will be asked. Because here's the first question. Is this a good start for my design?

Well, yes, and no. As a concept block diagram, it will probably do for now. But more research will be needed. I can see one weakness already. This concept will need a computer to run the software.

And I don't want to lug a laptop with me when I am backpacking up Mount Snowdon. Then another surprise. Because there are very, very small computers available quite readily, which could be programmed to do what is needed. I've been told the CPU chips are available from you know where for £1 a dozen, or even cheaper.

But I don't think I want to design the computer processor for this. What about a Pi, or an Arduino, or similar. Now we're getting somewhere. Might have to learn Python, but so what.

A day later, and it's not as mad an idea as it sounded originally. But then, surely someone somewhere must have tried this already? Well, no; all I found were HF transceivers, with 2m boards in them. Even the new rigs like the Xiegu, the Ailunce or Q900 (other possibilities exist as well). So, it's back to the design stage.

Now the search turned to the question of the SDR chip, or system, if you prefer. *"Use a Lime SDR (small) or Pluto SDR (even smaller)"*, one correspondent said. Both those SDRs can receive and transmit anywhere from HF to a couple of gig, so would easily cover all the VHF and UHF bands. I spent a bit of time looking at what are in fact chipsets intended for the mobile phone industry. Many of these, like the LimeSDR and the Hermes Lite, are actually full specification transceivers, even if the output is only a few milliwatts. I settled on the LimeSDR for my design, because of a conversation with another radio amateur who had already used it for an Oscar 100 station, which seems to be a popular use for this chipset currently.

## Coming Together

The supplier says that the LimeSDR is an open source SDR transceiver, covering 10MHz up to 3GHz, in full duplex. I was warned by another operator that the lower frequency limit on some of the boards may be higher than the quoted specification, but that's for another day. Checking the Lime webpages was an interesting afternoon. It seems the Lime design philosophy is to put as many of the building blocks on the same chip as possible to make it easier and cheaper for developers. Therefore, I won't need to assemble so many individual sub-systems to get this done. This is what I now have, **Fig. 1**.

With this done, I really don't know where to go next. Any help would be appreciated. OK, I know that the Lime is expensive for what I want it to do so what would other people suggest?

And I'm not a welder – last time I tried I nearly burned a hole in the kitchen table putting solder on an audio plug. But I am convinced that my 'thought experiment' has, with help, achieved the first stage of an achievable design.

Based on this I believe that it would be possible to design and build an SSB 2m transceiver, lightweight and very portable. Anyone like to give it a go?

# Practical Wireless 2020 Index (Continued from page 61)

# Practical Wireless Christmas Quiz

The answers to our Christmas Quiz on page 45

## Part One: Radio People

**A1.** He is an actor: VU2AMY is world famous 'Bollywood' film star **Amitabh Bachchan,** pictured in **Fig. 5. (1 point)**
**A2. Steve Franke K9AN**. **(1 point)**
**A3. Joe Walsh**, the guitarist and singer formerly in The Eagles rock group (**Fig. 6**). **(1 point)**
**A4.**Senator **Barry Goldwater K7UGA**, **Fig. 7** (he lost to **President Lyndon B Johnson** in 1964). **(1 point)**
**A5.** With **Guglielmo Marconi**, in 1909. They were awarded the prize jointly *"for their contributions to the development of wireless telegraphy"* (yet who has ever heard of poor old Braun?) **(1 point)**
**A6. Sir Hiram Maxim's** son was **Hiram Percy Maxim** who co-founded the American Radio Relay League (ARRL) in 1914. (Sir Hiram was American-born but emigrated to Great Britain and became a naturalised British citizen.) **(1 point)**
**A7. Alexander Graham Bell**, **Fig. 8**, inventor of the telephone. **(1 point)**
**A8.** Frequency hopping or spread spectrum radio. During WWII **Hedy Lamarr** and **George Antheil** together developed a frequency-hopping spread spectrum technique designed to prevent jamming of radio-controlled torpedoes. The frequency-hopping 'Secret Communication System' was patented by them in 1941. **(1 point)**
**A9. Feargal Sharkey, OBE**, lead singer of The Undertones and solo performer of 1985 hit *A Good Heart*. **(1 point)**
**A10.** SWL **Geoff Watts**. **(1 point)**

## Part Two: General

**A11**. MGY. **(1 point)**
**A12.** (a) Collins: the 30L-1 was a 1kW input linear amplifier and the KWM-2 a transceiver. (b) KW Electronics: the Vanguard was an AM / CW transmitter and the Viceroy an SSB / CW transmitter. (c) Drake (R L Drake Company): The T-4XC and R-4C, were a top of the range transmitter and receiver respectively and could be operated together as if a transceiver. (d) Heathkit: the DX-100 was a 100+ watt AM / CW transmitter and the HW-101 an SSB / CW transceiver. (e) Codar: the AT5 was a 10W 160 / 80m AM / CW transmitter and the T28 a matching receiver (they were often used for 160m mobile operating in the UK in the 1960s and early '70s). **(5 points)**


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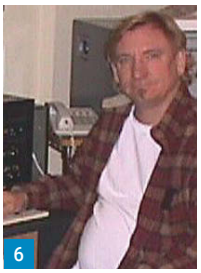
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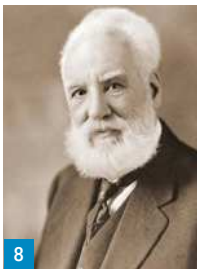
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**Fig. 5: Amitabh Bachchan (Studio Harcourt, Wikipedia, CB by 3.0) Fig. 6: Joe Walsh WB6ACU (LuckyLouie, Wikipedia) Fig. 7: Senator Barry Goldwater K7UGA. Fig. 8: Alexander Graham Bell.**

**A13.** (a) Australia, (b) Bosnia-Herzegovina, (c) Switzerland, (d) Belgium, (e) Brazil. **(5 points)**
**A14.** They're all used by the NCDXF / IARU International Beacon Project. **(1 point)**
**A15.** Automatic Packet Reporting System (and not Automatic Position Reporting System). **(1 point)**
**A16.** Astonishingly, the answer is (e) 680 million (if you don't yet use it, take a look at **https://clublog.org**) **(1 point)**
**A17**. They are all in their country's second call district (VK2, W2, OH2, VE2, SM2, ZL2, UA2). **(1 point)**
**A18.** (a) August. (b) April. (c) October. (d) July. (e) October. **(5 points)**
**A19.** (a) 60 – 90km, (b) 90 – 150km, (c) 150 – 500km (any figure within these limits count for points). **(3 points)**
**A20.** (a) MM7XYZ, (b) SM0XYZ, (c) W2XYZ (despite still having 'call districts', US amateurs do not change their callsign when moving from one district to another. W2XYZ may sign W2XYZ/6 from California, but this is not mandatory.) **(3 points)**
**Maximum possible: 36 points.**

# Radio Round-up

**JUST IN FROM ICOM:** The AL-705 is a new, versatile portable magnetic loop antenna from Alpha Antenna. As part of a special agreement with Icom, the AL-705 is now an official partner product for Icom's new IC-705.
The AL-705 operates on the 10 to 40m bands. The antenna's compact design allows it to be stored in the lower section of the LC-192 backpack for easy storage and transportation. Once deployed, the antenna's maximum diameter of 26.5in or just over 67.3cm, means it is easy to manipulate and mount conveniently wherever needed.
Maximum power handling is 20W SSB, 10W CW & Digital. The AL-705 comes with 15ft/4.57m of feedline, with BNC and PL-259 connectors. The AL-705 will be available for sale from authorised Icom amateur radio dealers from November.

**KING OF THAILAND LICENSED:** The call sign HS10A was granted on September 24th to Thailand's King Vajiralongkorn. National telecoms regulator NBTC and RAST, the national amateur radio society, presented the Advanced-class license and amateur radio equipment, including HF and VHF/UHF transceivers, antennas, and peripherals.

**SPECTRE SPEECH INVERTER:** Ron G4GXO reports, "I have finally got around to creating a GitHub account and have posted the schematics, PCB layouts and source code for the Spectre speech inverter, (described in PW January 2019). The files are found here": **https://github.com/G4GXO/Spectre**

**ATTENDED PROPAGATION BEACON:** Geoff M1EDF reports that his new Propagation Beacon is complete and tested. The message is M1EDF space UK repeating every 10 seconds at a power of 25W daily, and attended in accordance with the rules.
Transmission will be spasmodic but as a guide, the times of transmission and frequencies will be as follows: Monday and Tuesday 3.545kHz from 7am until 11am, Wed and Thursday 7.035kHz from 7am until 1100am, Friday and Sat 10.129kHz from 7am until 11am.
Note that the beacon will check that the frequency is clear before operating.

# Specialist Dealers

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### Morse is Dead?

**Dear Don,**
I was quite saddened to read **Edward Martin's** letter *'Morse is Dead'* published in the November 2020 edition of *PW*. Rather than lament the loss of 'real Morse' sent by 'real operators' using only straight keys, I prefer to look at things a bit differently.

I see amateur radio as the last happy refuge of Morse code communication. Were it not for what still must be a significant proportion of the amateur community, Morse really would have died several years ago when it ceased to be used commercially. However, I'm extremely happy to report that Morse on the HF bands is alive and doing quite well.

As things stand, there are very few occasions when I fail to find someone to have a CW QSO with on one of the amateur bands if I want one. I often meet people just starting out using CW and am always more than happy to drop my speed and offer as much encouragement as I can.

I'm certain that nearly every other more experienced amateur does the same. Does it really matter what type of Morse key a person uses as long as they use one? Well-sent Morse on a paddle key can still be a pleasure to listen to, just as poorly sent Morse on a straight key can be horrible.

I've heard it all before, multiple times. Back in the day, some AM operators were of the opinion that SSB would kill amateur radio. The change from a written RAE to multiple-choice exams certainly heralded the end. The internet was definitely going to do it and if it didn't, the loss of the Morse test would for sure. And the introduction of a Novice licence was like poison for the hobby.

I believe that Morse will always be an integral part of amateur radio for many operators and (paraphrasing **Mark Twain**) reports of its impending death are greatly exaggerated.

**Mark Godden G0ACQ**
**Portland**

**Dear Don,**
I cannot help but feel **Edward Martin's** letter *'Morse is dead'* was penned a little tongue-in-cheek, knowing fine well the can of worms such a missive would open.

He is correct to point out machine Morse is soulless, and that such a mode is not necessarily progress.

Where the point goes awry however is firstly that straight key Morse is better somehow than a paddle. It is indeed a skill, but I have heard some lousy Morse sent by fist pumpers. There is a tendency for instance for straight keyers to extend the da, and just as some paddle users do, insist on rolling letters together, CQ for instance becoming one long string of characters, joined together without a gap between them.

I would not send Morse without my trusty paddle keyer. That way I can improve the characters I send for the recipient to decode more easily. Equally I will not use a keyboard and screen.

In addition, we know a carrier wave can get places a microphone cannot. This is another reason for the mode to persist.

To lump paddles in with keyboards and screens is disingenuous. The recipient using the paddle still has to decode the incoming message. Receiving and decoding the signal is a skill in itself, probably a greater skill than sending.

As for using hacksaw blades on a piece of wood, well, that's just cheating surely. Let's just use two bits of wire, presumably sent on a cat's whisker.

I would get out more, but this COVID thing has me glued to the radio.

Thanks for a great magazine.

**Richard Baker G0AIH**
**Darlington**

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**Dear Don,**
I read with interest the letter by M5UF and to a point I totally agree, However, in the early 60s I met G3JRE in Malta who had designed a keyer using micro-logic ICs with auto character spacing. I built one and used it for several years, and was glad I did so because in 1974 while serving on *HMS Hermes* the Turks invaded Cyprus, ex-pats wanted relatives to know they were safe so telegrams were sent by myself and the late G3JFF direct to Portishead Radio (over 1,000 between us). I never did meet the guys on the other end (No wrist ache either).

I have never used a straight key since, apart from my test at Portishead, and don't intend to, but I have respect for those who do.

**'Mac' McPheat G4OEC**
**Holford, Somerset**

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### Entry to the Hobby

**Dear Don,**
You ask about barriers to entry to amateur radio but, as someone who has been studying since 1978 (not full time!) I may be able to shed a light on some of the issues.

OK, there is an exam. If you don't want to do an exam, you can always get a CB. I think the exam does give a civilised nature to enthusiasts. Your point about jargon, though, is agreed. Arguably this is contra to the licence conditions!

The main issue I have had over the years is booking the exams – online invigilation has sorted this – hopefully! Before, you had to fit into someone else's schedule, which rarely fit mine.

Then there is the practical – forcing people to spend two days with others is not my cup of tea.

But then there is the syllabus – with a handheld on the front of the Foundation Licence Manual. But the training does not give any indication of an ideal first setup. So, I got a handheld, and in the first day had one contact. I am convinced I need a better antenna but have you tried finding a 2m antenna? Ideally, I want to listen but the barrier is crazy.

So, what about listening – I may as well not go there. The receivers cost as much as the transceivers.

Do I go handheld, 144/430MHz, or full base. So, the pricing is £29 to £2,900 plus.

It is more than the syllabus – you really have to know a lot or know someone to get into this hobby.

**Ross McManus**
**Derby**

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**Dear Don,**

I must agree with your conclusions regarding the Foundation Licence in October's issue. I am an Intermediate Licence holder who passed the exam in the first round of the new syllabus of November last year. I would really like to progress to the Full but I know my limitations as regards the technical aspects of the exam so will not be able to progress any further.

Maybe there is a case for a Full Operators Licence whereby you can use your modern equipment. I have no intention or desire to take the lid off a radio, I just want to communicate with other like-minded amateurs around the world and not delve into the innards of the equipment. Today's radios (mine is an Icom IC-7300) will be sent back to manufacturers for repairs. This is 2020 after all.

**Adam Wake 2E0NVL**
**Wareham, Dorset**

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**Dear Don,**

Re *Keylines, Foundation Licence PW*, October 2020. Rarely am I prompted to put pen to paper, but I felt some of your remarks in the above required comments.

Questioning your need for the Foundation Licence to require only the most basic knowledge of certain technical facts and comparing the activity to that of driving a car without knowing how a car works. A driver would quickly learn, perhaps painfully, the consequences of driving anywhere on the road he chose, or at any speed. Whereas, an amateur radio operator transmitting on any frequency or power of his choice could, without being aware, seriously endanger life. An example being that some of the early cheap Far Eastern handhelds transmitted spurious signals on civil Air Traffic Control frequencies near an airport. With no requirements for technical expertise, the Foundation operators had no idea that was happening until the authorities identified it.

From experience, I challenge the remarks about railway modelling costs, which can be even more costly than simple amateur radio equipment. Also, the railway modeller is unlikely to cause any interference to public systems outside his model installation. Therefore, why would he require any licence to operate in the same way as a radio amateur? There is no comparison in the two hobbies for this reason.

Your comment that a pass of 19 out of 26 questions should warrant a Distinguished Pass. Having taken many professional and recreational examinations over the years, I have yet to see a Distinction Pass awarded for a 73% pass! That is normally reserved for a 98-100% pass. Distinction is defined as being of 'special honour, recognition, achievement or fame'. Another example of how our world now accepts declining standards, perhaps?

All due respect for a 10 year-old passing the Foundation Licence examination, but our hobby is not simply buying a transceiver and just operating it. That can be done without examination on CB Radio. A 10 year-old simply hasn't been on this planet long enough to acquire much in-depth experience or knowledge of the many facets of amateur radio operating or technicalities in our 'self training of the operator'.

**John Lockwood G3XLL**
**Norfolk**

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**Dear Don,**

I've tried holding back on the Foundation exam debate, but can't any longer.

My daughter passed her Foundation exam three years ago on the second attempt, aged eleven. What made the difference for the successful attempt was the ability of the instructors at the Dragon ARC, North Wales, themselves to make the taught material much more easily understood.

For example, the 'inverse square law' was made infinitely less intimidating by an instructor asking, as he walked away, making a humming noise, whether he was getting louder or quieter. That kind of thing sticks much more easily in all our minds, let alone a youngster's. But even though the lesson material can be made more accessible, the exam wording continues to be criticised as needlessly stuffy by many.

Very few of us build a transceiver from the ground up these days, not always because we couldn't do it, but because there is no real need to do so. It's no longer the 1930s where you scavenged bits and bobs and made a radio out of them. We mustn't hold the future ransom to nostalgia. Almost all of us now simply buy a radio and use it. Of course, people who want to build radios can and will, and absolutely deserve every encouragement.

The distance learning course I took was very well presented, but it was the most boring thing I'd ever studied, and many say the same thing about courses today. All I wanted to do was speak to other people, far away. If my radio broke I would, then as now, take it to someone who knew what they were doing.

There was never any point in me pretending that working as a microbiologist would make me somehow equally skilled at fixing radios as someone who did that particular job all day, every day.

Amateur radio is not a professional career. But it has often traditionally been a blend of what people or their fathers did 'in the war', or 'in their day job', and what they did in their spare time. That's why there was quite a bit of snobbishness in the hobby, and why people who had passed a full C&G exam on radio theory were nevertheless blocked from using the HF bands, simply because they had not also passed a CW course. It was a flagrant attempt to keep things 'the way they had always been', and a way to preserve the bands for those who considered themselves a cut above the new intake. That attitude did amateur radio a huge amount of entirely avoidable damage up until it was changed due to external forces as the 20th century closed.

It strikes me that we need to get our priorities straight. Above all, we need more people to join, regardless of age or aims in the radio hobby. If they fall out of the equation, there is no point arguing about exam content or what people can and can't do with radios – nobody will be there to take any interest! We need to make exams a lot friendlier,

accepting that the hobby has, for a long time now, ceased to be the natural hobby progression for people who were often professional electronics and communications workers. Very few of us are 'GCHQ families' (G8PMA in *Letters*, November 2020), so that path to radio, where the subject is always somewhere in the background already, is not really there any more.

For my money, a good Beginners' Licence should focus, above all, on considerate operating, with almost all the electrical theory held back until the Intermediate and Full courses and exams. In support of that argument, just turn on your rig and see how long it is before someone with a Full licence and years of experience operates contrary to law or convention. A few minutes is all it will take...

**John Rowlands MW1CFN**
**Anglesey**

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**Dear Don,**
I wish to give my opinion to your nice piece in *Keylines* about the Foundation Licence. You are totally right. I agree 100% with your arguments even though I am 70 years old, as probably 80% of your readers are. Even I have known the difficult times most of us, elderly now, had in the last 50 years to get a licence and nice rigs/accessories. I think we should forget those times immediately after the war, where we indeed had to make by ourselves and experiment with mistakes and success some mysterious propagation and material. If somebody feels he likes radio, whether HF, VHF or UHF, let him experiment in a club or on his own, and give the girl or guy the licence after six months experimenting, after a short exam in front of experienced amateur radio operators on how to handle material, rig, antenna and connexions. Most of them usually came from CB and will know. Give them a licence with 100W (as most rigs offer 100W) and let them go and make our frequencies alive again because nowadays 70% of transmissions are digital.

**Etienne Vrebos OS8D/ON8DN**
**Belgium**

*(**Editor's comment:** I certainly seem to have stirred up plenty of emotion as a result of that particular editorial, both for and against. I imagine most readers will stick with whatever opinion they held at the outset so I suggest we now give this one a rest!)*

## An Error Corrected

**Dear Don,**
I have just been reading October's *PW* and can see an error in **Tony Jones'** explanation of the operation in Fig. 3. He states that C1 starts to charge via R2. This should read as R3. This could be confusing to a newcomer to electronics. Also, in Fig. 6 the capacitor mentioned in the text as C1 is not marked, going to pin 2 of the LM324 circuit. This is in no way a criticism to Mr Jones as it was an excellent article.

**David Pentin G1ZEW**
**Merseyside**

*(**Editor's comment**: Well spotted, David. Tony agrees that this slipped through the net and I am happy to carry your correction.)*

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## Weather Watching

**Dear Don,**
The feature on *Weather Watching and Radio* by **Georg Wiessela** in the October issue contained so much useful information most of us will be working on it for months to come. Checking out the links alone will keep me busy for many a rainy day.

However, there was one minor glitch in the text when he referred to Volmet as being a 'portfolio' word. What he meant was 'portmanteau' word (first referred to as such by **Lewis Carroll** in *Through the Looking Glass* when explaining 'mimsy' and 'slithy').

**Colin Hall GM4JPZ**
**Dundee**

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## Mains Supplies

**Dear Don,**
Referring to *Letters* of November 2020.

I believe the American mains feed to a USA house is a 230V volt Bi-phase (centre tapped) supply to provide two115V supplies to the home from the transformer on the pole in the street.

Cookers, water heaters and other appliances that take a lot of current are wired across the 230 volts supply.

I think that information came from a *Television* magazine item years ago.

I did like your story about the HR joint on the pole. Which reminded me of another story in the *Television* magazine about a TV repair man who replaced the timer clock in his VCR, which had the clock motor winding burnt out. The replacement clock that he fitted had a similar fate. One night going to the bathroom and turning the light on, the light was super bright! Being a television repair man, he measured the mains voltage as Very High! The reason being that the neutral connection at the substation transformer had become disconnected and the three phases were floating.

During the day the phases were loaded equally, balanced, so the voltage to his home was OK. During the night (less load on his supply) the phases were not balanced. The voltage to his home was high enough to overload the clock winding.

**John Ashmore G8GXF**
**Wolverhampton**

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## QSLing

**Dear Don,**
I just had to write. I was licensed in 1981 and operated HF/VHF until I left the hobby in 1986 (abandoning my equipment and records, including QSL cards, many of which I would be proud to display now). I was persuaded by a long-term friend, G4VHL, to return to the hobby in mid-2017 and what a shock was in store for me. The technical advances and superb equipment on the market just overwhelmed me. A lot of new good friends rallied around and got me up and running again. Fortunately, I was able to resurrect my original callsign and without a fee.

Another big shock, apart from the apparent relaxing of rules and regulations, was the deterioration in operating skills and general good manners on the air, which left a lot to be desired (in my mind anyway). I was military trained and am, I expect, rather over-critical and no doubt I will be told that by your readers.

I wondered whatever happened to the 'ultimate courtesy', the good old QSL card? LoTW and eQSL seem to have taken over and the question must be whether or not you will get the same satisfaction from these electronic facilities, as you will when you are holding that precious paper QSL? I have heard the comment *"we don't bother any more – too expensive and time consuming"*. Not so, say I. Joining your national society and availing yourself of the QSL bureau does not cost the earth – probably less than you would spend on a night out or two with the boys (or girls). QSL card printing these days will not break the bank and if you have a logging programme that will print out contact details on adhesive slips, it is not going to

tax your energy that much. From my SWL days to the date I gave up the hobby, QSL cards were the most important thing to drop through my letterbox and still are.
**Stephen Reading G4LZD**
**Dartmouth**

## Resistors

**Dear Don,**
Reading **GW8LJJ's** article *Resistors and Resistance* inspires me to write some comments.

The first statement to attract my attention was the suggestion that the rating of a resistor is that below the point it burns up. Not so. Long before that point, it will become unreliable, its value changing, usually increasing, to the point where it will impair or prevent operation of the equipment in which it is fitted. For some resistors, to further illustrate the point, makers state two ratings: for normal operation or precision operation. A case from a catalogue being 0.25W or 0.125W.

An explanation of the way values are chosen was needed, as they may well seem odd to the uninitiated. They are chosen so the high end of one value's tolerance range does not overlap the lower end of the value above.

For example, a 10Ω 20% resistor can be between 8Ω and 12Ω. Therefore, in the E6 series, there is no 8.2Ω, as it would overlap the 10Ω, as the range is 6.56Ω to 9.84Ω. As the tolerance is reduced, there are more values.

It may have been clear, but was not stated that the E values are the number between decades. Some values in the higher ranges are not the same as in the lower. For example, 6.8Ω becomes 6.81Ω, though you may think this is rather pedantic.

The E series applies to capacitors too, but as it is harder to make them to close tolerance, most values are not generally available. Electrolytic caps vary so much with time, applied voltage and aging that trying to have close-tolerance would, in any case, be futile.

It further needs to be understood that these values are what the maker guarantees were true at the time of manufacture, not what they may be by the time they get to you. They will drift with storage, and when soldered, and then with further time and with dissipation. Normally you can forget all of this, but not in precision applications. The maker's datasheet will have all this information, but we rarely bother, or even think about these things when using them.

There are those who when 'renovating' equipment fail to understand the above: and change lots of resistors even if they are in tolerance, because they seem to think what they measure should be what is on the markings. The late **Chas Miller** of *Radiophile* fame labelled this 'CCCD' – Compulsive Component Changing Disorder. You need to understand tolerance, and what is important in a circuit, which will normally work fine with components well outside their initial tolerance, but some are more important.

The article states always replace like with like. This is not necessarily true. Often you may find a resistor that ran very hot, not because of a fault, but because the maker used too low a wattage for economy. With modern resistors it is often the PCB that suffers, the resistor still being within tolerance.

The answer here is to use either a higher rated component or to stand it off the PCB, by either kinking its legs, or putting loops in them, or both.
**Philip Moss**

## Corrosion in Antennas

**Dear Don,**
I was given a 50 MHz dipole last year and a few months ago 6m was open to Spain and Portugal at fantastic signal strengths. I called six stations but couldn't make contact. Something wrong here I thought, even with my 5W they should hear me.

The coax looked fine and not much can go wrong with a dipole, maybe corrosion at the gamma match. The SWR was good at first then increased a little after a short time. A simple RF meter showed RF present at the dipole.

I removed the SO239 socket to find corrosion underneath it, which I cleaned off, nothing wrong at the gamma match. After re-assembling it I checked with the RF meter and was pleased to see more RF coming off the dipole as indicated on the meter.

I wonder if this was why I had been given the dipole? Its performance on transmit had gone down and couldn't be explained. If you feel your antennas are not working like they used to, check everything for corrosion.

I've yet to work any distant stations but am confident it's working much better now.
**Bill Kitchen G4GHB.**
**Ashton under Lyne**

## More from Bob

**Dear Don,**
(Thought I knew all the contests but this one below I've only just discovered from 2017.)

RaDAR (Rapid Deployment of Amateur Radio) Originally called SIAS (Shack in a sack), this radiosport combines speed, a portable station and efficient communications. The operator picks a four-hour timeframe within which to operate and deploys his portable station as quickly as possible. Once deployed, the operator makes a maximum of five contacts, exchanging name, signal report and exact (8 digit or more) Maidenhead location digits. Once five contacts have been made, the operator packs up the station and moves it at least 1km on foot or 6km by car.

Other modes of transport are also used, each with its own minimal distance. The operator then deploys his station at the new location, makes five more contacts, packs up and moves again, until the four hours are up. The operator with the highest contact count at the end of the day, for his chosen four-hour period of operation, wins. (Source: *Wikipedia*)

Here at Verulam ARC St Albans we now have so many Covid-19 inspired links that I've put them all on just one web page via link below.
g4pvb.eu5.net/morse.htm

Possibly the most useful and timeless subject for amateur radio study is propagation. Valves, transistors, integrated circuits all come and go but propagation lives forever. Not only is it useful to study but it can be relatively easy to have a conversation about propagation with civilians as, after all, it is primarily about the sun of which we all have some understanding. **Steve Nichols G0KYA** presents his recent (April 2020) *Understanding HF Propagation* via the link below:
tinyurl.com/rjbkmsv

A big thank you to **David Seymour 2E0EYR** for **americanradiohistory.com** (*Letters,* June 2020). As I browsed the content it occurred to me that civilian internet has been available for some 26 years. We all know that websites come and go but maybe we don't all know about WayBack Machine Internet Archive. Websites as old as 21 years with text and GIF images are likely saved for... well, seemingly forever. So, if you're browsing past copies of *PW* and a web link is broken, then surf on over to the link below and search there:

https://archive.org

With the deepest respect to **Colin Redwood G6MXL** and his excellent article page 32 *PW* September 2020, I would be wary of using a car battery for hobby radio. Doing so could quickly ruin it beyond repair and your car won't start. Car batteries are designed for heavy starter motor discharge then immediate recharge.

Instead use a 20A gel-cell (no leakage) leisure deep-cycle battery as used by golfers for their carts. Many are changing to lighter lithium cells so ask politely at the pro shop and they will likely be delighted to offload free old batteries along with charger. I used to have one. It petered out at the 17th hole but after fitting a lower value fuse it was ideal for my previous humble Heathkit HW8 CW activity for a couple of years. Here are some leisure battery tips:

**tinyurl.com/leisure-batteries**

**Bob Houlston G4PVB**
**St Albans**

## Morse Sounders

**Dear Don,**

To prove that [a] I am not yet a silent key and [b] that old dogs do know tricks, I comment on **Tony G7ETW's** article (*Morse Practice Oscillators*) in the November Issue.

A long time ago, but 'After Marconi' I belonged to the Vange club. One evening they decided to hold a construction contest. The test was to produce a circuit that made a noise in the fastest time, and the junk box was open.

While lots were scrabbling for transistors and the like, I wired a relay through its own Normally Closed contacts and, lo, a buzzer.

Should Tony G7ETW have included this in his article?

**Alan Gordon G3XOI**
**Shoreham-by-Sea**

## Antenna Theory?

**Dear Don,**

Well done to you and those around you keeping *PW* rolling out. These last 6 months are an ongoing serious business and I missed a couple of issues as I bought my copies at the local newsagent. My daughter then bought me a subscription so I'm back on track. It is a hard balance. We want both the magazine and the local store to survive so I view this with quite mixed feelings.

Editorial is no doubt a pressure with fewer rallies, DXpeditions etc. to report on but it's good to have some 'practical' articles to read.

I think the newcomers and back to basics *What Next* pages are great for the many ops returning to the hobby. I have been back about 15 months now and there are many more ops listed as returning so refreshers are good.

A lot of us I think will have taken the opportunity of summer months to build and experiment with antennas. The lost cost NanoVNA devices giving even more opportunity if you really know how to use them. With this in mind I am writing to suggest or ask for articles on balun making and using an analyser such as the NanoVNA.

There are articles and webpages out there but most dive straight into R, X, L with complex formulae without any refresh or necessary preliminary explanation of these terms, what they mean (in antenna terms) and how to use them when making or tuning an antenna. This is before we hit Smith Charts! Is there any possibility you have a good lead out there that could run a series on this subject area in *PW* for us please?

Wishing you and *PW* team the best.

**Phil Cracknell G0KDT**
**Teignmouth**

*(**Editor's comment**: Thanks Phil for the kind comments. Yes, it would be nice to run one or more articles along the lines you suggest. I will do my best – any budding authors out there who fancy tackling this topic?)*

# ICOM

## HF/50/144/440MHz MULTIMODE PORTABLE TRANSCEIVER

# IC-705


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## specifications

### GENERAL

| | | |
|---|---|---|
| Frequency coverage*1 (Unit: MHz) | Receiver | 0.030–199.999*2, 400.000–470.000*2 |
| | Transmitter | 1.800–1.999 3.500–3.999 5.255–5.405*2<br>7.000–7.300 10.100–10.150 14.000–14.350<br>18.068–18.168 21.000–21.450 24.890–24.990<br>28.000–29.700 50.000–54.000 144.000–148.000<br>430.000–450.000 |
| Mode | | USB, LSB, CW, RTTY, AM, DV, FM, WFM (Rx only) |
| No. of memory channels | | 500 regular (100 groups), 25 scan edges,<br>4 call (2 ch × 2 bands) channels |
| Antenna connector | | BNC connector (50 Ω) |
| Power supply requirement | | 13.8 V DC ±15% (with external power supply)<br>7.4 V DC (with BP-272) |
| Operating temperature range | | –10°C to +60°C; +14°F to +140°F |
| Frequency stability | | Less than ± 0.5 ppm (–10°C to +60°C; 14°F to 140°F) |
| Frequency resolution | | 1 Hz |

| Current drain | 13.8 V DC | 7.4 V DC |
|---|---|---|
| TX (Max. power) | Less than 3 A (10 W) | Less than 2.5 A (5 W) |
| RX (Max. audio) | 0.5 A (typical) | 0.8 A (typical) |
| RX (Standby) | 0.3 A (typical) | 0.5 A (typical) |

| | |
|---|---|
| Dimensions (W×H×D, projections not included) | 200 × 83.5 × 82 mm; 7.9 × 3.3 × 3.2 in |
| Weight (approximate) | 1.1 kg; 2.4 lb (including BP-272 ) |

*1 Showing the USA version. Varies according to the version.
*2 Some frequency bands are not guaranteed.

### TRANSMITTER

| Output power | 13.8 V DC | 7.4 V DC |
|---|---|---|
| SSB/CW/RTTY/FM/DV | 0.1 – 10 W | 0.1 – 5 W |
| AM | 0.025 – 2.5 W | 0.025 – 1.25 W |

| | |
|---|---|
| Modulation system | SSB : Digital P.S.N. modulation, AM : Digital low power modulation<br>FM : Digital Reactance modulation, DV : Digital GMSK modulation |
| Spurious emissions | Less than –50 dB (HF), Less than –60 dB (50 MHz),<br>Less than –60 dB (144/430/440 MHz) |
| Carrier suppression | More than 50 dB |
| Unwanted sideband | More than 50 dB |

### RECEIVER

| Receiver system | | |
|---|---|---|
| 0.030–24.999 MHz | RF Direct Sampling | |
| 25 MHz and above | Down Conversion IF Sampling | |
| Intermediate frequencies | 25 MHz and above: 38.85 MHz±0.5 MHz | |

| Sensitivity (HF: Preamp-1 ON, 50 MHz: Preamp-2 ON, 144/430/440 MHz: Preamp ON) | 0.500–1.799 MHz | 1.800–29.999 MHz | 50 MHz | 144/430/440 MHz |
|---|---|---|---|---|
| SSB/CW (10 dB S/N) | – | 0.20 µV | 0.15 µV | 0.11 µV |
| AM (10 dB S/N) | 13.0 µV | 2.0 µV | 1.0 µV | 1.0 µV |
| FM (12 dB SINAD) | 0.5 µV (28.000–29.700 MHz) | | 0.25 µV | 0.18 µV |
| DV (1% BER)(PN9) | 1.0 µV (28.000–29.700 MHz) | | 0.63 µV | 0.35 µV |

| Selectivity (Filter: SHARP) | More than | Less than |
|---|---|---|
| SSB (BW=2.4 kHz) | 2.4 kHz/–6 dB | 3.4 kHz/–40 dB |
| CW (BW=500 Hz) | 500 Hz/–6 dB | 700 Hz/–40 dB |
| RTTY (BW=500 Hz) | 500 Hz/–6 dB | 800 Hz/–40 dB |
| AM (BW=6 kHz) | 6.0 kHz/–6 dB | 10 kHz/–40 dB |
| FM (BW=15 kHz) | 12.0 kHz/–6 dB | 22 kHz/–40 dB |
| DV (12.5 kHz spacing) | Less than –50 dB | |

| | | |
|---|---|---|
| Spurious and image rejection ratio (SSB/CW/AM/FM) | HF | More than 70 dB* (except for ADC aliasing) |
| | 50 MHz | More than 70 dB* |
| | 144 MHz | More than 65 dB |
| | 430 MHz | More than 54 dB |
| | * At Intermediate frequency in 25–30 MHz or 50–54 MHz: More than 50 dB | |
| Audio output power | Internal SP | More than 530 mW (12 Ω load at 10% distortion) |
| | External SP | More than 200 mW (8 Ω load at 10% distortion) |

All stated specifications are subject to change without notice or obligation.

## optional accessories

- mAT-705

- MP-705

- Prism 705 Cover


- BP-272 & BP-307

- LC-192

- MyDEL Tripod

- MyDEL QRAB Quick release antenna bracket

- VS-3

**Finance example:**
**Cost of IC-705: £1299.95**
**Deposit of £199.00** (card/cash/PayPal/Part-exchange)
**36 x repayments of £39.96***
**Total amount repayable: £1637.60**

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# FTDX101 TECHNICAL HIGHLIGHT - #5

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## ABI (Active Band Indicator)

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**Band Selector keys with Active Band Indicator (ABI) LED for both Main and Sub band selection are arranged in horizontal rows above the main VFO dial allowing instant identification of the current band and selection for a desired band change.**


HF/50MHz TRANSCEIVER
**FTDX101MP** 200W

HF/50MHz TRANSCEIVER
**FTDX101D** 100W

* Microphone M-1: Optional

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