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New Hockley D-Star Repeater GB7SS! Rx 439.8625 Tx 433.2625

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2m 65Watts FM
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List Price: £179.95

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Exclusive - get FREE IC-7000kbd with matching lead for instant RTTY/PSK31

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Icom have produced a realistically priced transceiver based on the IC-7800 technology. Dual DSP units form the heart of the design. The rx. front end has a preselector and boasts 40dBm i.p. that equals the IC-7800 at twice the price! The 7" colour LCD panel is truly amazing in clarity. The spectrum scope allows close signal and band monitoring. Includes built-in PSK31 and RTTY and FREE IC-7000kbd keyboard - no PC needed! Other features: IF notch, professional grade 6m rx, digital voice recorder, dual USB ports, auto atu etc.

£Phone!

Waters & Stanton First with VX-8

YAESU

Waters & Stanton were given a sneak preview of this new radio by Yaesu's top designer Mr Fujiki. We will have the first UK stocks and it should be ***available September.*** This will be the first truly portable APRS radio, and with Blue Tooth, could easily function as a mobile.

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FT-897D+

The FT-897D+ is exclusive to W&S and comes with dual DC leads making it the ideal base portable radio.

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Log on to GB7SS repeater at Hockley

ICOM

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This dual band mobile offers D-Star facillities with digital speech as well as normal FM at 50W

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Fitted with D-Star
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Also get voice recorder and announcer!

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**TX: 160-10m, 6m, 2m, 70cm*
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Deal: bhi DSP fitted **£449**

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KENWOOD

EchoLink Memories & NODE Terminal
50W on 2m & 70cms!

W&S £249 D

FTM-10R/E NEW

YAESU

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HF - 70cms 100W transceiver plus SP-21 spkr and SM-20 mic **£1169 D**

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Includes antenna, and charger.

A fully fledged digital radio using D- Star aswell as traditional dualband.

W&S £Phone C

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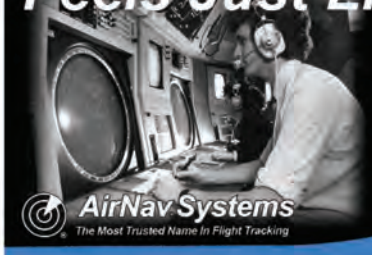

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NOISE OFFSET POWER SUPPLY — NEW

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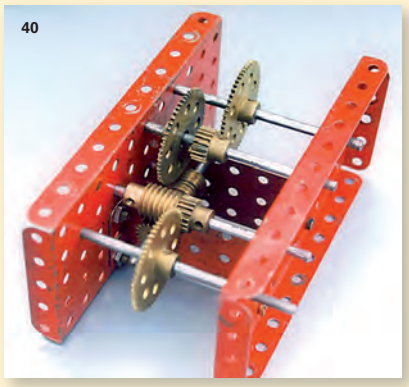
Practical Wireless October 2008

contents

Volume 84. Number 10. Issue 1218. On sale 11 September 2008

52

54



40

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Rob Mannion's

keylines

Rob discusses the British Amateur TV Club's video streaming, a 70MHz activity afternoon and the support he's received from readers.

Occasionally in the wider Amateur Radio hobby, someone has a really good idea that can benefit a large number of people and encourage others into our multi-faceted pastime. Such an idea has recently materialised – after a great deal of hard work – from the **British Amateur Television Club** (BATC).

At one stroke (or should that be 'switch'?) the BATC have created a video streaming service – via **www.batc.tv**/ – that provides a truly superb medium for Radio Amateurs to watch and enjoy many aspects of our hobby in action.

The BATC's streaming service is free and isn't just for the ATV hobbyist. Indeed, I sat at my computer work desk at home and watched the very last antenna modelling lecture given by the late **Dud Charman G6CJ**. I was never fortunate enough to attend one of Dud's talks, but being able to watch it at home via my computer was a wonderful experience and it's now available 24 hours a day!

There are many other things to watch on the BATC website. I found it truly fascinating to watch the video test cards and activities from TV repeaters around the country. I've also enjoyed watching ATV QSOs and feel privileged to be taking part, albeit through the magnificent efforts of others!

I think that the BATC's new service (it really is for the whole hobby) is a truly excellent initiative. I'm sure that there will soon be many casual visitors who find that their appetite has been truly whetted, perhaps enough to join Amateur Radio.

However, in order not to put newcomers off, I shall resist the suggestion – hopefully made as a lighthearted joke – that one of my own *PW* club visits be recorded for use on the site! In fact, I cringed with embarassment at the idea, especially after seeing G6CJ's professional but relaxed and informed lecture, along with those from the other recorded talks. The BATC's new service is a step forward for our hobby and I wouldn't want it to trip on the way! Well done BATC – thank you for the idea – we need more like it!

In Vision Author Retires

Grahan Hankins G8EMX has given many years devoted service to both ATV and *PW*. Unfortunately, Graham has announced in his column that he's planning to retire from writing his *In Vision* bi-monthly column. Everyone here at *PW* – together with his readers – will be very sorry to lose him as an author and colleague and we wish him well in future. Good luck my friend!

Writing a regular column in *PW* is always a great commitment, even though the ATV colum is a bi-monthly article. However, despite that fact that *In Vision* only appears every-other-month I consider it to be an important part of *PW* and would very much wish it to continue. So, I invite anyone who is prepared to be as dedicated as Graham G8EMX has demonstrated, to contact me at the *PW* offices. A new author would be considered to be very much part of the team and treated as such as we work together to produce what our readers say they need in *PW*.

Four Metre Saturday

Although I had fewer replies than expected to my suggestion that we should arrange another *PW* 70MHz activity afternoon, there's enough interest to arrange for a session on **Saturday September 27th**. I'm planning to be active on both s.s.b. and f.m. from Povington Hill, near the Dorset coast. Anyone interested in taking part is asked to contact me at the office so I can get a rough idea of what modes are likely to be used. It's not a contest – it's just an opportunity for us to have a friendly and enjoyable time on 70MHz.

September Topical Talk

I have been pleasantly surprised – and encouraged – by the support shown to me after my comments regarding airport security in September's *Topical Talk*. It appears – from the feedback I've received – that my comments and attitude make sense to other Amateurs. Let's hope that the authorities take note!

Rob Mannion G3XFD/EI5IW

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We have a selection of back issues, covering the past three years of PW. If you are looking for an article or review that you missed first time around, we can help. If we don't have the whole issue we can always supply a photocopy of the article. See the Book Store page for details.

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Orders for back numbers, binders and items from our Book Store should be sent to: PW Publishing Ltd., Post Sales Department, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW, with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders must be drawn on a London Clearing Bank and in Sterling. Credit card orders (Access, Mastercard, Eurocard, AMEX or Visa) are also welcome by telephone to Broadstone 0845 803 1979. An answering machine will accept your order out of office hours and during busy periods in the office. You can also FAX an order, giving full details to Broadstone 01202 659950.
The E-mail address is bookstore@pwpublishing.ltd.uk

Technical Help
We regret that due to Editorial time scales, replies to technical queries cannot be given over the telephone. Any technical queries by E-mail are very unlikely to receive immediate attention either. So, if you require help with problems relating to topics covered by PW, then please write to the Editorial Offices, we will do our best to help and reply by mail.

Practical Wireless

readers' letters

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

The Increasing Threat To Reception

Dear Editor,
Local QRN is becoming an increasing threat to reception over the whole of the short wave spectrum and for many Amateurs and short wave listeners, is fast becoming an impossibility. There's a conflict between the desire to link up all sorts of gadgets in the home and the ability to listen to low level signals. One fast growing threat is the use of domestic mains electricity wiring to distribute data signals around the home. This technology uses devices known as Power Line adapters (PLA).

I personally see this in the context of a number of onslaughts on short wave operation these include, cheap unfiltered computer power supplies that carry the CE mark and are now flooding the UK, badly filtered switch mode power supplies in TVs and set-top boxes, ditto running modems, chargers, light dimmers, etc. The issue of Power Line Adapters really is a wake-up call, unless we push for improved standards and best practice we will lose the short waves - they will be sunk under an ever increasing tide of QRM.

Whilst the RSGB does a good job of representing licensed Amateurs on EMC issues at national and international levels it is not mandated to represent other non-professional users of the short wave bands. Up to now there has been no representation that embraces the concerns of short wave listeners as well as Radio Amateurs. Enter UKQRM – a new group formed to campaign on the issue of PLA QRM. The group, which has over 300 members, is open to anyone concerned with these issues and can be found at **http://tech.groups.yahoo.com/group/UKQRM/**
Regards,
Charles Ivermee
Member UKQRM
Peartree Green
Southampton
Hampshire

Editor's comment: *Thank you Charles. I invite readers to join me on the Topical Talk page for further discussion on the problems highlighted in the letter from Charles.* ***Rob G3XFD****.*

Star Letter

When, When, When 70MHz?

Dear Rob,
As my heading introduction asks, just when are one of the 'Big Three' – that is Icom, Kenwood and Vertex/Yaesu, going to get their act together and produce a multi-mode rig for the 4m band?
I'm posing the question because there are an increasing number of countries now being granted access to 70MHz.

If I look about there's not much choice to get onto 4m. I can use either an ex-PMR rig, an AKD 4001, an FT-847 or a transverter. An ex-PMR rig or an AKD is okay for f.m. work but how about s.s.b. operations? The only option is an FT-847 or a transverter. The FT-847 is a bit expensive just for 4m, and using a transverter, there's only one company in the UK making them as kits or ready-assembled.

So please Icom, Kenwood and Vertex please think about a 4m only multi-mode transceiver. I'm sure I'm not alone in this as I've heard other Amateurs say the same thing – When?
Andy Dunham G6OHM
Chatteris
Cambridgeshire

Editor's reply: *I think it's unlikely that the 'Big Three' Japanese manufacturers will produce equipment specifically for the 4m band until the band is available in the USA or Japan itself. In the past, I 've written to various Japanese manufacturers on the subject. The only one to reply was Alinco and this company's reply echoed my own opinion. However, I'm building and can recommend the PW Poundbury 70MHz s.s.b. transceiver project, designed for PW by* ***Tony Nailer G4CFY****. The kit is available from his commercial company Spectrum Communications.* ***Rob G3XFD****.*

Serendipity & GB75PW

Dear Rob,
'Serendipity: the faculty of making happy and unexpected discoveries by accident' (*Concise Oxford English Dictionary*). Well, would you believe it – here's a case of serendipity! On 21st July 2007 you and I, Rob, had a GB75PW QSO on 40 metres. Keen to receive the special GB75PW QSL card from Poole, I straight away dispatched a self-addressed envelope with a 50p stamp attached, along with a QSL card for you, featuring my beloved Lynton & Barnstaple Railway.

Thirty-five days then elapsed. Nothing in the post so, towards the end of August I contacted you by E-mail and asked if, perhaps, my GB75PW QSL card was on the way. Your response (prompt, as always) was – how shall I put it? – decidedly firm, friendly and to the point. You suggested that a little more patience on my part would be helpful, as you were writing out the cards as and when time allowed, the production of *Practical Wireless* being the top priority.

Fair enough, I thought that's put

me in my place! I resolved to bide my time. I went out and bought my 2008 diary early and, under 'July 21st 2008' I wrote: 'GB75PW QSO – first anniversary'.

And that was that – until July 21st 2008! "Dear Rob – a year ago today, etc., etc..... are the QSL cards still being written?"

I'm so pleased that I made that entry in my diary. Yes, my latest E-mail elicited yet another of your speedy replies – and the card arrived next day (for which, many thanks). I tend to agree with you that my first posting must have gone off the rails somewhere, so to speak; and what a shame that was! (This story has a little way yet to run .....)

I know you love railways (as well as Amateur Radio) as you have mentioned it from time to time in the pages of *PW*, so I reminded you of the Lynton & Barnstaple Railway when I wrote to you on the 'first anniversary'. I wasn't aware that you already had an encyclopaedic knowledge of it!

As soon as it dawned on you that lucky-old-me lives just a five-minute walk from Pilton Yard (the former headquarters of the L & B), your enthusiasm was really fired up, and we spent the next twenty-four hours delightedly swapping anecdotes about our love of the old line (and to think, this could all have started twelve months ago!).

I was fascinated by your historic family connections with the Southern Railway, Devon and the Lynton & Barnstaple and I think you liked my tales of hacking through 73 years of undergrowth to get photos of a stretch of old trackbed.

What I find so gratifying is that, through devotion to one particular hobby (and, in this case, an obstinate determination to get hold of a special QSL card!) it's possible to make such happy discoveries of other mutually loved pursuits. I mean: radio and railways – they do go well together, don't they? But why is this so and are there any other intriguing combinations to be unearthed?

Finally, I'll be holding you to your proposal that we go on safari up the L&B line one day. I know a very nice little 'comfort-stop' in Lynton; and another one in Parracombe (right next to the L&B!) and, come to think of it, a couple here in Barnstaple too! Best wishes.

Stuart Davies M1FWD.
Pilton
Barnstaple
North Devon

Editor's reply: *We'd better not continue our chats about narrow gauge railways on this page Stuart, although I know you've got your GB75PW card now! Please join me on the Topical Talk page for updates on the GB75PW QSL card situation and other points raised by my friend in Pilton Yard.* ***Rob G3XFD.***

Florida Lightning Strike!

Dear Rob,
I was interested to read the letter about the lightning strike in the August

copy of *PW* from **Peter Leybourne MM5PSL**. That was a very close call! I also had a close call on an antenna system when I was living in Maryland, USA in 2006, where lightning is a daily occurrence in the summer as it is where I live now, in Florida.

In Maryland I ran a full size G5RV with a switch box, lightning arrester and a comprehensive earth system to protect against any lightning strikes and the resulting damage they can do. I was glad I did!

My antenna system took a hit – but not a direct one. An overhead cloud-to-cloud strike right over the antennas put enough potential on the antenna system for it to arc over to a fence along which the 200ft of RG213 coaxial cable ran to a supporting mast. The charge found a weak spot in the sealing tape cover on the connector going into my Ameritron external switch and flashed over to the supporting mast.

The result was amazing! Apart from hearing the system arc as a huge cracking sound the arc also blew a hole right through the PL259 cover (See the photo). It melted, yes

Heart Warming & Encouraging!

Dear Rob,
I have to say that I think **Joel Fergusson's** Star Letter (August *PW*), was both heart warming and very very encouraging! At 13 few teenagers today have such enthusiasm or respect and regard for a hobby and its history, Joel is a young man who delights in building and exploring circuits. Taking things apart, and rebuilding or re-using them.

This is of course how things used to be in our great hobby, but is seldom embraced with such passion. Joel does not need to thank the members of **Leicester Radio Society** (LRS), it is in fact they who should thank him. Any club would be proud to count Joel as a member, in fact give us five more like him and we would have the best club in the land!

One day Joel who wants one day to work for NASA will do so, probably after a few years as chairman of our club. Our hobby is a great way to get youngsters back into the fields of engineering, electronics, science and manufacturing or technology, lets grasp these young people and keep them firmly in our midst. Thank you Joel, thank you Rob and thank you to *PW*!

Kevin Argyle G1GEV
Leicester
Leicestershire

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E-mail: pwletters@pwpublishing.ltd.uk

melted, the outer of the connector and you can see how the metal ran for a moment like solder before cooling! It also blew holes in the insulation of the coaxial cable for several feet.

The interesting part is none of this charge got into the house and absolutely nothing was damaged except the coaxial cable and connector. Why? Well, the antenna system had an in-line gas discharge tube arrestor that arcs over at 70 Volts, a good earth system tied to the house earth to balance the potential across both earths and lastly, the Ameritron remote isolation switch which, when the antennas are not in use earths all the inputs.

The moral to this story? Never run the coaxial cable from your antenna system directly into the house! Take it via an arrestor system and if possible use a remote earth switch. It's a given that everything must be earthed outside the house at the point of entry. I use two metre long ground rods driven into the ground with 10mm or so left above the ground. I attach a thick earth strap to tie all the parts of the antenna entry point together (switch, gas tube, and coaxial cable outer).

Where lightning is concerned, if it's not done right, there is little or no forgiveness! Safety is number one. Take a look at the connector picture and keep in mind this is an overhead cloud-to-cloud strike and not even a cloud-to-ground strike!

Keep up the great work on *PW*. I always look forward to seeing it in my mailbox each month. Best regards.
Kevin Jackson G4NEJ/AA3XV
Orlando
Florida
USA

***Editor's comment**: Wise advice Kevin! Please join me on the Topical Talk pages for further comment. **Rob G3XFD**.*

Cornwall & Clocks

Dear Rob,
As there haven't been many more feedback letters on the new 60kHz service from Anthorn in Cumbria, I thought it would be a good idea to give you an up-date from my corner of Kernow. Like many others, as soon as the new service started there were problems with the radio-controlled clocks in my home. No matter where I tried to put the clocks – they wouldn't lock on to the new service. However, **Ron Harris GW8DUP**'s article *Bring Back Rugby* in the July issue of *PW* was very interesting. It was then I realised that the problem was almost certainly due to the weaker 60kHz signal, as Ron reported the field strength from Anthorn was lower than that from Rugby and it was suffering from interference.

As a keen listener, I've got a Roberts Radio of the type that you reviewed in *PW* some years ago Rob and even though it won't tune down to the 60kHz transmissions, it does tune down to the lower end of the long wave broadcast band. Listening to the various transmissions I was surprised and disappointed to realise that stations that were once heard clearly – had almost disappeared under electrical noise.

I then went round the house to ensure that any switch-mode power supplies, that weren't being used, were unplugged. In my search I found that we had three three plugged in and switched on, although the equipment they were powering was switched off.

To say that I was surprised at the reduction of background noise on long waves would be an understatement! I then set about looking out various 'wall wart' plug in power supply units I've collected over the years, no doubt like any other radio enthusiast I've ended up with quite a few of them!

I soon found several plug-in power supplies that used transformers and even though I was concerned that there might have been problems due to the heavy current demands from digital equipment – even our set top Freeview box runs quite happily from a mains to 12V 2A plug-in power supply. In fact, I found that the transformer supply ran cooler than with the original switched-mode unit.

A friend of mine also suggested that I investigated the noise level coming from the set top Freeview converter. He's is a keen cricket fan who listens to the BBC Radio 4 commentaries on 198kHz and found that his early model set top box (in a plastic case) caused much interference throughout the house, making long wave reception difficult. However, once the set top box was replaced by one in a metal case the interference on long wave dropped dramatically and he was able to enjoy his cricket again! My own set top Freeview converter turned out to be okay in this respect and in fact, there was much more interference coming from the TV set itself!

After a few days I had managed to replace most of the switch-mode power supplies around with transformer units wherever possible. Next, as our mains supply is fed to the house via overhead cables, I looked for somewhere to hang our main radio controlled clock where it would be as far away from our TV set and the overhead mains cables as possible.

Since I moved the clock and reduced local electrical noise as much as possible, the lower signal levels from the Anthorn transmitter seem to have been overcome. Indeed, I've noticed that the main clock has only re-set itself automatically once in the last month or so.

So, it seems as though we can – with care – overcome the problems associated with the lower power transmissions from Anthorn! Best wishes to you and the team Rob!
Brian Tresize
Penzance
Cornwall

*Editor's comment: Well done Brian – I've done the same at home and my clocks all seem okay, despite the weaker signals. **Rob G3XFD**.*

A great deal of correspondence intended for 'letters' now arrives via E-mail, and although there's no problem in general, many correspondents are forgetting to provide their postal address. I have to remind readers that although we will not publish a full postal address (unless we are asked to do so), we require it if the letter is to be considered. So, please include your full postal address and callsign with your E-Mail. All letters intended for publication must be clearly marked 'For Publication'. **Editor**

news & products

A comprehensive round-up of what's happening in our hobby.

Wirral Schools' Buildathon

The first **Wirral Schools' Amateur Radio Club** (**GX8WSR**) Buildathon took place during the week of July 28th. Inspired by an article on a **Buildathon** by **Steve Hartley G0FUW** in the G QRP Club's journal *Sprat*, the organiser, **Neil Jones M0NBJ** secured a Community Initiative grant from the New Brighton and Wallasey Ward forum of Wirral, to enable a collaborative project between children and older citizens (licenced Radio Amateurs). So, 20 of **Tim Walford G3PCJ's** *Knapp* receiver kits were purchased together with assorted bits and pieces – including soldering stations – for the children to use.

Although there was a disappointing response to the requests for Radio Amateurs in the area to assist, it was decided to start the Wirral Buildathon with **Neil Jones M0NBJ**, **Alec Wood G8WHR** and **Bill Cross G0ELZ**. Nine children were signed up and each was tutored through the soldering and construction techniques to successfully produce a working receiver! An led torch kit from **Kitronik** was used to start the soldering skills instruction session. Another 11 children will be continuing the Buildathon in the Autumn term.
The children were pleased to have acquired a new skill and made something themselves which worked. They will be able to to come to the GX8WSR club in future to compare listening notes! Anyone interersted in helping during the Autumn term is welcome to contact **Neil Jones** via **jonesrnli@googlemail.com**

On The Air GB1CODY
Celebrating The First Powered Flight in England

The **GB1CODY** Special Event Station will be on the air and operating from the Aldershot Military Museum in Farnborough, Hampshire. It's being operated to celebrate the very first powered flight in England by the famous American cirtizen **Mr. Samuel Franklin Cody** (internationally famous for his "daring exploits"!) on October 16th 1908.

More information on Cody's life (He's often mistaken for 'Buffalo Bill Cody, especially as both men were involved in 'Wild West' shows!) can be seen on the **Wikipedia** page **http://en.wikipedia.org/wiki/Samuel_Cody**

The station will be operated by the **Farnborough & District Amateur Radio Society** on a daily basis from October 13th until October 19th as follows: 0900Z to 1200Z using l.s.b. on 7.050MHz, and 1200Z to 1600Z using u.s.b. on 14.250MHz. (There will be extended hours on October 16th). We will acknowledge all QSOs (via the RSGB QSL Bureau), with a Special QSL Card and would emphasise – and are very grateful for – the unusual 'granting' of this unusual four letter suffix callsign for this Very Special Anniversary Event'. Further details can be found at **www.QRZ.com** and **http://www.fdrs.org.uk/** and we can be contacted via **mail@fdrs.org.uk** **John Powell** and **Derek Stanners G3HEJ** (**Cody Anniversary Station Manager**).

Shack Supplies & Isopole

Adrian Lane M3TVF contacted the *PW* Newsdesk to announce that, "I'm a partner in a company called Shack Supplies, we operate online at **www.shacksupplies.co.uk** and we've have just been appointed sole UK Distributors for Spectral, the manufacturer of the IsoPole. So, we'd like to inform your readers that this wonderful antenna will be available once again in the UK. It's bound to be a winner!"
Adrian Lane (Partner)
Shack Supplies
29 High Nash, Coleford,
Gloucestershire GL16 8HN.
Tel: (**02921**) **252536**
Mobile: **07902 989344**
Skype : **shacksupplies**
E-mail: **sales@shacksupplies.co.uk**
Website: **www.shacksupplies.co.uk**

Jersey Radio Society Shack Refurbishment Completed

Rob Luscombe 2J0RZD reports that **The Jersey Amateur Radio Society** (**GJ3DVC**) have recently completed their club radio shack refurbishment and re-fitting. The full story can be followed in words and pictures on the new club website at **www.radioclubs.net/gj3dvc** where progress has been recorded almost as it happened. The sum result of all of this is that the shack – which was admittedly looking rather tired – has now been brought right up-to-date. There are one or two further refinements to make the shack even more 'operator friendly' and probably even more desirable as a venue for visiting DX-Expeditions to the Channel Islands. Full details can be obtained by emailing the club at **gj3dvc@gj3dvc.org.je** Thank you to all the club members (and others) who provided their time, resources and materials for this project.

The Jersey Amateur Radio Society meets every Friday at 7.30pm at **The German Signal Station, Rue Baal, La Moye, St. Brelade, Jersey JE3 8HQ**, also on a Wednesday evening during the summer months to maintain, alter and improve the shack, antennas etc. Plentiful coffee and car parking visitors are always welcome, shack rental available. See our website for further information.

Rob Luscombe 2J0RZD/MJ3RZD
Tel: Jersey **07797 923916**
Visit my website at
www.etribes.com/robl
The Jersey Amateur Radio Society at
http://www.radioclubs.net/gj3dvc/

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Leicester Show Special Offer Entry Prices

Geoff Dover G4AFJ from the **Leicester Amateur Radio Show** organising committee contacted the *PW* Newsdesk to announce some special offers for entry tickets to the 2008 show, which takes place on **Friday** and **Saturday October 24th/25th** 2008. Geoff announces that the special prices – on tickets booked **before September 30th** will be £3 for a one-day ticket, Concessions (OAPs and under 16s) £2.50. A two-day ticket will cost £5 with the concession tickets costing £4. Advance party bookings (12 people minimum per party) will cost £2, with two-day party tickets costing £4 each. Under 12s are admitted free when accompanied by an adult.

To take advantage of the special LARS offers please send a cheque – payable to LARS – with a stamped addressed envelope to: **Special Tickets Offer**, **LARS**, **31 Newbold Road**, **Kirkby Mallory**, **Leicestershire LE9 7QG**.

Further information from
Geoff Dover G4AFJ,
Tel (**01455**) **823344**,
mobile **0779 6492146**,
FAX (**01455**) 828273),
or via E-mail **geoffg4afj@aol.com**

Amateur Satellite Beginner's Session At The Leicester Show

Dave Johnson G4DPZ of **AMSAT-UK** and the **RSGB's** Amateur Radio Manager **Carlos Eavis G0AKI** will be presenting "Amateur Satellite Operation for Beginners" as part of the lecture stream at the **Leicester Amateur Radio Show** at the Donnington Park Exhibition Centre on Saturday October 25th at 1200. They will explain how to get started in the fascinating world of Amateur Radio Satellite communications and that even Foundation holders can work through the satellites.

The pair will demonstrate that – with some satellites – you can communicate using little more than a standard dual-band f.m. hand-held transceiver. Other satellites allow the use of c.w. (Morse) or s.s.b. and permit intercontinental DX communications using the v.h.f./u.h.f. bands.

Most of the Astronauts onboard the International Space Station are licenced Radio Amateurs and operate on 144MHz f.m. when they're off duty. Dave and Carlos say that there's "a real thrill in talking direct to an Astronaut in space."

In addition to the presentation there will also be practical demonstrations of satellite operations throughout the day as orbit passes permit. The **AMSAT-UK** organisation publish a newsletter *OSCAR News,* which is full of Amateur Satellite information.
For further details contact **Jim Heck G3WGM** via E-mail at
g3wgm@amsat.org
Readers can join AMSAT-UK online at
https://secure.amsat.org.uk/subscription/
and their website is
http://www.uk.amsat.org/

Adur Imports Unadilla

West Sussex-based **Adur Communications** are now importing the American-made Unadilla specilaised baluns and antenna traps. **Phil Godbold G4UDU/AG4ML/VK6AAM** contacted the *PW* Newsdesk to provide the latest up-date.

"For many years the standard of the industry, W2AU baluns are built to last! The W2AU is the preferred Balun of Amateurs worldwide. The W2AUs operate at 1.1:1 or less v..s.w.r. from 1.8 to 40MHz, and handle powers up to 2kW p.e.p. (at s.w.r. levels of less than 3:1). The W2AU Baluns are transformer designs with ferrite cores to provide 95% minimum coupling efficiency. Each has a built-in lightning arrester, hang-up hook, and 270kg (600lbs) of pull-apart strength in a weather-proofed, rugged package using only stainless steel hardware and quality materials. Two models are available. The 1:1 matches 50 (75)Ω unbalanced coaxial cable to 50 (75)Ω balanced dipoles. The 4:1 matches 50 (75)Ω unbalanced coaxial cable to 200(300)Ω folded dipoles.
W2AU 1:1 50Ω-50Ω or 75Ω-75Ω (Transformer Type 1.8 - 40MHz)
W2AU 4:1 200Ω-50Ω or 300Ω-75Ω (Transformer Type 1.8 - 40MHz)
W2AU 4:1 LL Ladder line/Coaxial cable Transition 4:1 Balun.

Unadilla Multi-band Traps

"We're also importing the Unadilla range of multi-band traps. Using these you can avoid switching wire antennas to work different bands. Use Unadilla's W2VS high performance traps to convert your single dipole into a tuned, multi-band wire antenna. You can also use these traps to design h.f. vertical multi-band antennas using either wire or aluminium tubing.

Traps for different bands can be combined onto one dipole to create a single antenna tuned for maximum gain on all your favourite bands, from 160 to 10 metres. The W2VS traps are available for in two versions for 80 metres and up. Rated for 2kW PEP. Built from stainless steel and aluminium hardware to resist corrosion, these rugged traps have a pull strength of over 270kg (600lbs). Trap coils are waterproofed and condensers are epoxy-sealed.

For further information on the Unadilla range contact **Phil Godbold G4UDU**, at **Adur Communications**, **Upper Beeding**, **West Sussex BN44 3WH**.
Tel: (**01903**) **879526**, E-mail **pgodbold@adurcomms.co.uk**, website **www.adurcomms.co.uk**

CQ - CQ - Calling All Radio Amateurs!

Details of this year's **British Wireless for the Blind Fund's** (BWBF) annual fund raising event for Radio Amateurs have been revealed. The 48-hour on-air **Transmission 2008** weekend is set to kick off on September 20th with a brand new category for the under-18s. The competition invites Radio Amateurs to make as many sponsored contacts as possible with other Amateurs across the globe.

Money raised will help the BWBF, a national charity, which provides specially adapted radio equipment for blind and partially sighted people in need.

The BWBF fundraiser, **Fiona Fountain** contacted the *PW* Newsdesk saying, "We are really keen to hear from Amateur Radio clubs and individuals interested in taking part in the event. This year we're launching a new category – a young person's prize for special achievement, aimed at the under 18s. The award will go to the young person who has made an outstanding contribution to the Transmission event, for example, in fundraising, helping others, or making a high number of contacts."

The BWBF has just launched its latest state-of-the-art radio CD cassette player – the *Concerto* – which is designed to the charity's specification. "The specially-adapted sets are a blessing for people who are unable to see", added Fiona. "They are designed to be easy to use and to help give blind people greater independence. The BWBF, launched by **Winston Churchill** in 1929, issues specially adapted sets through a network of more than 300 voluntary agencies across the UK. The charity is celebrating its 80th anniversary year and recently relocated to a brand new headquarters in Maidstone, in Kent."

For more information visit: **www.blind.org.uk** or call: (**01622**) **754757**.
E-mail **info@blind.org.uk**

Or you can write to: **10 Albion Place**, **Maidstone**, **Kent NE14 5DZ**.

A Tribute to Brian Dance

Although he wasn't a Radio Amateur, Brian wrote for *PW* for many years on modern electronics, especially semiconductor technology. An enigmatic and very private man, Brian was a prolific writer, journalist and chemical engineer. Indeed, his home in the West Midlands appears to have been so badly affected by chemicals used in semiconductor technology and nuclear research that specialist de-contamination companies are involved in removing material from his lifetime's work – involving much expense and causing quite a headache for his Executors! Even though Brian and I had developed a working friendship over the years, I knew little about him and his private life was just that – very private! I had been talking to him on the telephone a few days before he was struck by a car on his way home. He died very shortly afterwards in hospital. Brian was unmarried and left no close relatives and I'm grateful to Richard Mayall for the news of Brian's death and the personal tribute to his relative. I feel extremely privileged to have known Brian and will miss his regular – sometimes hectoring – telephone calls. He was a great character and a dedicated writer, ever anxious to spread technical and scientific knowledge. **Rob Mannion G3XFD.**

Richard Mayal writes: Brian Dance was born on September 4th, 1931 in Handsworth , Birmingham, the only son of Frederick and Vera Dance. His secondary education was completed at Alcester Grammar School in the 1940s before attending Birmingham University, where he achieved a first class honours degree in physics. Brian's national service years were spent at Harwell Research Laboratories, from where he entered and taught at a number of Further and Higher Educational Institutions. At the same time, he was making a number of contributions to a variety of scientific publications. In 1967, he published his first book *Radioisotope Experiments in Physics*. Other books followed. He retired from lecturing in 1982 in order to concentrate on his writing career. Brian's last published work was co-authored with **I.C.E. Turcu** and entitled X-Rays from Laser Plasmas. He was still writing for several journals at the time of his death, the result of a road traffic accident. Brian was unmarried and had no close relatives, although his legacy to the world of electronics must certainly be his prolific amount of published work.

The GB2VET Veterans Weekend East Park Hull 2008

Bernard Atkinson G0SWO reports on an interesting weekend! "Preparation for the 4th Veterans weekend held in East Park Hull started of on Friday August 1st and went quite well – with good weather – enabling the team to erect the 10m high, five section portable guyed mast securely, contrary to last year's problems of gale force winds and rain that wrecked the tent!

The portable mast was the centre point of **Ken G4KCF's** home-made full size G5RV, which was fed entirely with twin open wire feeders and did an excellent job on the 3.5, 7 and 14MHz bands. Specific thanks go to Ken G4KCF of Pocklington, **Terry G0KOE** of Malton and **Don G4UBY** who spent two extra days helping to erect my portable mast plus Ken's home-made antenna, prior to the event to make sure we had no problems at GB2VET weekend.

The centre portable mast also held the Diamond 300 vertical v.h.f./u.h.f. antenna. The final gem was a pulley and rope to hoist the **Royal Air Force Amateur Radio Society** (RAFARS) Flag! **Bob Clayton G0DAM** and **John Williams G8LGC** came with the RAFARS road show vehicle bringing display boards, with photos of past events and Veteran information. They had to be moved to a new site location because of the strong winds that developed – the new site also gave GB2VET station more protection from the weather!

The Hull Town Crier visited the h.f. station and we were also interviewed on BBC Radio Humberside – a nice plug for RAFARS!

The total number of QSOs on h.f. was 105. We worked quite a few G stations on 3.5MHz, including **GB2IWM** at Duxford Museum and most of Europe being worked on 7MHz. The best QSL on 14MHz was with **George W1ZT**, in Boston USA – a nice c.w. contact. We also had total of 61 QSOs worked on v.h.f. over the weekend at East Park. Thanks everyone!

Further details from Bernard G0SWO g0swo@165.karoo.co.uk

New Rochdale At Ripponden!

Rob Mannion G3XFD writes: Following the retirement of the **Rev. George Dobbs G3RJV**, from his St. Aidan's parish in Sudden, Rochdale, the long-established GQRP Club Convention is moving to a new venue, just over the Penines to Ripponden, West Yorkshire. The new venue will be at the **Rishworth School**, on the A672 (Ripponden) road, off Junction 22 on the M6 on **Saturday October 18th**. The post code for SatNav users is **HX6 4QA**.

For many years *PW* has supported what has become one of the most important events of the year for traditional 'home-brewing' and truly 'practical' Amateur Radio enthusiasts. This year **Tex Swann G1TEX** and myself will be making the journey north to Ripponden. We're looking forward to meeting friends old and new at the attractive new venue. So, make sure you mark October 18th in your diary to come and meet us at the new Ripponden venue! **G3XFD**.

Contest University UK Sponsored by Icom UK

Do you want to learn about Contesting? Have you ever wanted to brush up on your contesting skills? Are you new to Amateur Radio and want to get involved with the exciting and fast paced action of contesting? If the answer is yes to any of these questions, then welcome to **Contest University UK**! To be held at the **Radio Society of Great Brtiain** (RSGB) **HF Convention** at the Wyboston Lakes Centre in Bedfordshire, on Saturday October 11th 2008, Contest University UK is the place where you will learn all the skills and secrets to start your journey in becoming a Contester!

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"Contest University proved a success at Dayton last year," said **Ian Lockyer** Marketing Manager of Icom UK Ltd. He added, "I know that its UK counterpart will be just as successful."

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Feature

Using Surface Mount Components In Home-Brewing

In Part 1, Barry GM4TOE says "Lose you fear of surface mount devices and build a useful filter!"

I'm an avid home-brewer and have been since my early introduction to electronics in the late 1950s. This will tell you that my natural hair colour is grey, my skin is starting to look like a contour map and that I am rather myopic. Indeed, my wife says I'm "blind as a bat"!

I have survived the era of restoration of ex-military valved equipment, studied at a time when the transistor was new, worked professionally in electronics through the nascent years of the 'microchip'. I've also watched (in horror) as electronics became ever smaller and the boards more densely packed.

Home-Brewing Popular

Home-brewing is having a resurgence in popularity and, while conventional devices are still relatively easy to come by, the home-brewer is finding it increasingly difficult to take advantage of recent innovation in component design.

The modern Amateur is increasingly unable to contemplate servicing the commercial equipment that probably now comprises his station because of their fear about tackling fault finding and the replacement of surface mount devices (SMDs). The latest integrated circuits (i.c.s) now perform functions formerly requiring many individual 'chips'.

Additionally, there's a continuing shift to lower-power requirements, smaller size and use of components at higher operating frequencies. This has resulted in an increasing number of new products available only in surface-mount packages.

Fear not though! It's possible to home-brew and still take advantage of modern devices and it just needs a change in approach to the design and bread-boarding of the circuits under construction.

Since I built my first project using SMDs several years ago, I've built many circuits. My skill levels have increased tremendously with practice, and I now routinely tackle projects I never thought possible!

So, based on my personal experience, I know that home-brewers can work with SMDs. I'm sure that other constructors will soon be able to start building their own projects with SMDs devices and the result will be more truly state-of-the-art projects in *PW*.

Surface Mount Advantages?

Readers may ask, "What are the advantages of surface mount devices?" In replying I must mention that my first exposure to the technology was when building pre-amplifiers for 430MHz (70cm). The state of the art Gallensuin Arsesenide field effect transistors (GaAs. f.e.t.s for the project were only available in a capstan style stripline package and for de-coupling there were some really small leadless capacitors. The advantages of low inductance de-coupling and very low noise devices with high gain revolutionised my approach to ultra high frequency (u.h.f.) amplifier design.

The advantages of building with surface mount devices include smaller sized projects and SMDs out-perform their dual in-line equivalents with lower operating voltages and lower quiescent currents.

Barry Horning GM4TOE says we can use surface mount devices (SMDs) even if we use glasses, have grey hair and beards!

KITS & MODULES

NEW PRODUCT

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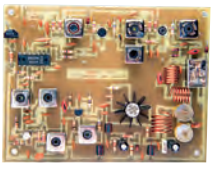

POUNDBURY 70MHz FRONT END as featured in July 2007 PW. Receive preamp and mixer, transmit mixer and three stage amplifier. Receive sensitivity 100nV, transmit output power 250mW minimum. **PCB and parts kit with potentiometers £44.00.** Works in conjunction with the POUNDBURY 9MHz SSB IF UNIT, the PORTLAND VFO, the MIXER-VFO, and the TA4S4 amplifier to create a tuneable 70MHz 25W SSB Transceiver.

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MASTHEAD PREAMPS 400W rated, for 2 or 4 or 6metres. RF switched. DC fed via a separate wire. 20dB gain 1dB NF. Heavy duty waterproof masthead box with SO239 connector. **RP2SH, RP4SH, RP6SH. PCB & hardware kit £40.00, Ready Built £62.00**. **Masthead fitting kit £6.00**.

TWO TONE OSCILLATOR as featured in *PW* March 2005. A vital piece of test equipment used together with an oscilloscope for setting up AM, DSB, & SSB transmitters. **PCB & bits £10.00. PCB assembled £20. PCB & hardware kit £25. Ready Built £52.50**.

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PORTLAND VFO as featured in March 2006 PW. 7-7.2MHz as local oscillator for a 40m direct conversion receiver or transceiver. Otherwise as 7.9-8.4MHz to use in conjunction with a mixer-vfo system as local oscillator for a 4 metre receiver/transmitter with a 9MHz or 10.7MHz IF. Available with Buffer 2 for high drive output or with Buffer 1 suitable for the Poundbury project transceiver. **VFO PCB with Buffer 1 or Buffer 2 PCB and parts kit with potentiometer £14.50. PCB and parts kit with drilled box £24.00**. **Ready built £47.50**.

MIXER-VFO for 4metres as described in DiBD PW May 2006. A crystal oscillator and mixer and amplifier producing 61-61.5MHz or 59.3-59.8MHz local oscillator signal when used in conjunction with the Portland VFO. **PCB & parts kit £23.30. Ready built and tested £34.00**.

3N201 MOSFET equiv. 40673 £2.25 each, P&P £1.00 any quantity.

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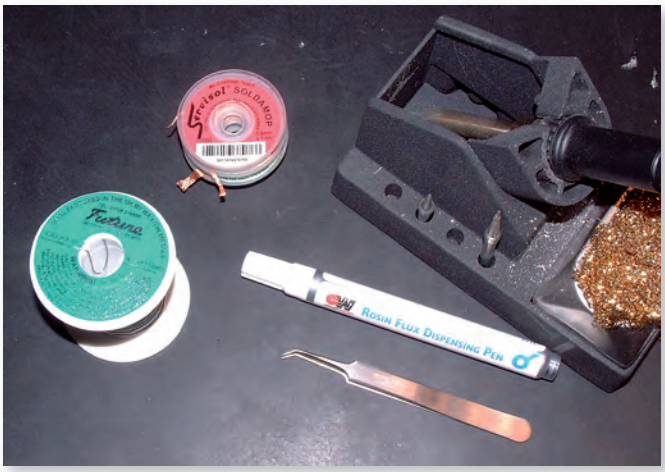


Fig. 1: Barry Horning's list of 'must have' tools for working with SM components.

Short signal leads make the devices better suited for high frequency applications, enabling the component to be placed very close to the ideal location for its intended purpose (de-coupling)

Printed circuit board (p.c.b.) designs can be easier as we don't need to have holes for the leads. However, there are some disadvantages! The components **can be very small**, so seeing and handling them requires changes in the construction techniques we use.

It's not possible to prototype circuits easily as the proverbial 'rat's nest'. Despite this there are techniques for producing a quick and 'dirty p.c.b.' Although we have to assume that **every** semiconductor is static sensitive and the appropriate precautions have to be taken.

Some things can't be reduced to micro-miniature proportions, so we may need to design accordingly. And, just to give two examples, our fingers are a fixed size so controls need to be sized accordingly and low frequency alternating current (a.c.) components still require a lot of iron in their construction.

Essential Equipment & Tools

Enough waffle – let's get down to the basics and look at what equipment is required to use SMD components. So, here's my list of 'must have' tools (some are shown in **Fig. 1**).

The first essential – of course – is some sort of magnifier. Those of you who, like me, are **very** short-sighted know that it's possible to remove your spectacles and work on circuits in the range between your near point and far point of vision. In my case this is between 50 and 100mm from the end of my nose!

There is a distinct advantage in this but also a great disadvantage – would you really want to operate a soldering iron at about 350°C within two inches of your nose? So, like me you should invest in one of those binocular magnifiers that strap onto your head or buy an illuminated magnifier on a stand. Both items are readily available from well-known suppliers or the ubiquitous Ebay.

A temperature controlled soldering iron with a small tip is a necessity. I use the Xytronic LF-1000 (from Rapid Electronics) with a selection of bits. I find that the chisel tip shape is easier to use than the pointed tips.

Whatever iron you decide to use, make sure that the tip is earthed because many SMD components are static sensitive. Provide yourself with a means of quick tip cleaning – the iron I use has a brass wool cleaning system but a wet sponge works just as well

Thin gauge flux cored solder (26s.w.g.) is essential. My preference is for conventional lead/tin solder with a small quantity of silver added as I find this wets the tracks better and forms a more reliable bond than regular lead/tin solder. Personally, I hate lead free solder as it produces absolutely rubbish joints when hand soldering!!!

A flux pen for adding that little extra flux where it's needed. The alternative is to use solder flux jelly in a syringe but this can put too much flux at the joint.

De-soldering braid (solder wick) is absolutely essential for removing excess solder and for when the inevitable solder bridge happens. I use two sizes for SMDs: 0.8 and 1.5mm widths.

Stainless steel tweezers are used to pick up and place components. I use whatever tip shape suits but those with angled pointed tips seem to work for me. The self-grip type are absolutely useless for this type of work – unless you want to fire components all over the room and spend the evening searching the floor for the component you projected so effectively into orbit.

Wooden cocktail sticks, combined with a tiny piece of Blu-Tac, make very effective 'hold downs' for components while soldering SMDs.

Finally, as I've already briefly mentioned it's essential to have some sort of static protection. Cheap conductive mats and antistatic wristbands are available from many suppliers including Maplin and will provide peace of mind when working with static sensitive components. The added advantage is that the rubber mat protects the (perhaps the dining room?) table from the ravages of your construction efforts.

Typical SMD Components

So, what components are available in SMD format? The simple answer is that any conventional component usually has its SMD equivalent, although I have not yet come across a surface mount valve!

The home-brew constructor is usually going to limit their components to the more common items including resistors, capacitors, transistors, diodes, integrated circuits, trimmer resistors and capacitors, chokes and possibly switches. In addition the v.h.f./u.h.f. home-brewer may also use mixers and helical filters.

During my home-brewing I've found a limit to the size of component that is easily manipulated by hand, but this does not mean that this restricts everyone to my self-imposed size limit. The photograph, **Fig. 2**, illustrates the size of typical components in surface mount form compared to equivalent through hole components.

In practice I usually limit my resistors and ceramic capacitors (when power dissipation is not a concern) to the 0805 size. The code refers to the chip footprint dimensions 0.08 inch x 0.05inch – the USA still rules on electronic component dimensions!– and the 1206 formats and i.c.s to the 'SO format (Small Outline – where the body of an 8-pin i.c. is 5 x 4mm). Transistors, diodes and other passive components are easily handled in their standard surface mount formats.

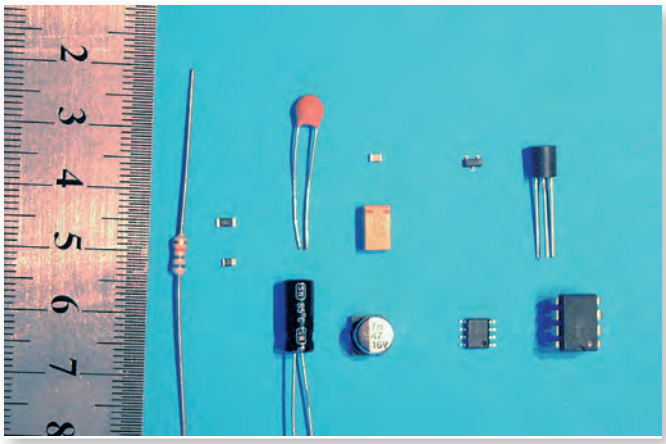


Fig. 2: Typical surface mount components alongside standard components.

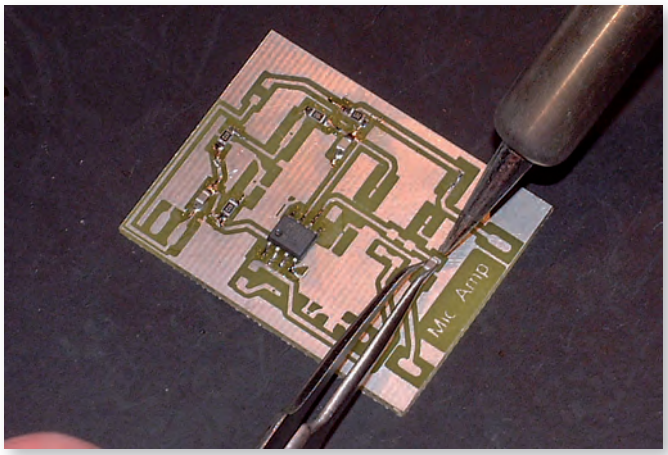


Fig 3:Installing passive SMD components.

Soldering SMD components

When I'm home-brewing a p.c.b., the final stage before assembly is to thoroughly clean the board using an abrasive rubber. I then degrease it using any one of the numerous toxic chemicals available for the job (I use cellulose thinners, which is both toxic and noxious as it contains Toluene).

Next, I tin-plate the p.c.b. using a solution available from the usual component vendors (Rapid p/n 34-0775 for example). This helps prevent further tarnishing and greatly aids the installation of these small components.

To install a passive component (as shown in my testing session **Fig. 3**) I lightly tin one pad using the minimum of solder. The trick is to add just enough solder so that when I reheat the track the solder flows towards the component end

With my tweezers I then hold the part in place and flow the solder towards the part. Other constructors may find it may be easier to hold the part down with a cocktail stick while soldering. There are no hard and fast rules, it's whatever technique that you can work with. Then solder the remaining pads and, if necessary, rework the original connection.

Remember that it doesn't take a lot of solder to properly attach a surface mount component. You'll realise whether or not you've completed the soldering satisfactorily. A correctly installed part will be flush against the board and have a small fillet of solder at the end caps. (Use Solder wick to remove excess solder if necessary).

If the part is to be installed on one earth plane pad and one ungrounded pad, it's easiest to solder it to the ungrounded pad first. This is because the ground plane copper will need more heat to ensure a proper joint.

Active Components

Let's now look at soldering active components. To install an i.c. (again in a testing session **Fig. 4**) – remembering to take appropriate anti-static precautions before working with active components. Study the layout of components on the p.c.b. and ensure that the integrated circuit is correctly aligned.

However, a word of caution about the orientation of surface mount integrated circuits! The method of indicating the package orientation varies between manufacturers. Some use a spot or dimple to indicate pin 1, a few use a notch at the end as with conventional dual in line (d.i.l.) i.c.s, and some use their logo to indicate pin 1. Finally, some have a different slope on the package along the long side where pin 1 lies – this one is **very confusing** – so double check!

The technique I use to install an i.c. is to solder two diagonal corner legs in place immediately and then solder the remaining legs. To do this, I tin one of the corner pads as described and then tin the diagonally opposite pad as well. Next, I place the i.c. onto the board checking its orientation ensuring the pins are centred on the pads

While holding the i.c. in place I flow the solder to the first pin to make the joint. Next, while still holding the i.c. in place I flow the solder to the diagonally opposite pin. Then I check the alignment of the i.c. to its pads.

If it's not centred I then gently reheat the trace and manoeuvre the i.c. so it's correctly aligned. Once I'm happy with the alignment, I solder the remaining pins – using the absolute minimum of solder.

Note: If a solder bridge appears (and it happens sometimes!), I use solder wick to gently remove the excess. Finally, I then rework the joints taking great care not to overheat the tracks or the i.c.

The legs of the i.c. must lie flat to the board although the legs will bend very easily – so don't press down too hard. I check each joint with my ohmmeter, one probe lead to the track and one probe lead to the leg of the i.c. close to the body. It's easier to rework at this stage than once other components are fitted. If more solder is required at a joint tin the trace some distance from the component and then slide the iron and the molten solder towards the component; this helps to prevent bridging.

Removing Components

I think it's pointless trying to save surface mount devices by removing them, their unit cost is low, but the p.c.b. may be irreplaceable. However, I have two techniques for removing a duff component: for resistors and capacitors I place the tip of a scalpel blade under the component near one end, twisting it very gently and apply my soldering iron to the joint.

Usually, the component will lift at one end and then it's simply a case of grasping the component with tweezers and unsoldering the other end. Sometimes though, the component gets so hot that it will actually fly off the board

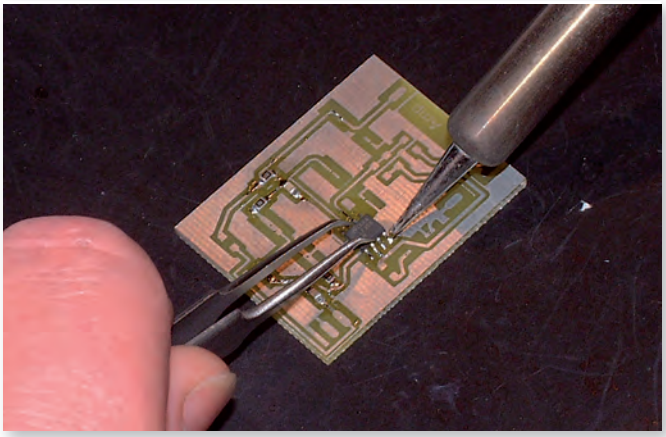


Fig. 4: Installing an SMD i.c. Anti-static precautions are essential.

and this will guarantee it landing in your conveniently placed cup of tea or somewhere in the carpet!

So, when removing multi-legged device it's simpler to cut the device away with cutters and then remove each lead individually. I then clean up the traces with solder wick before installing a new component.

First Project

To illustrate – and encourage – the use of SMDs, I have devised a project that makes use of some advanced i.c.s to produce a useful audio filtering circuit. The circuit comprises a tuneable low pass filter and a tuneable notch filter followed by an active high pass filter and audio amplifier, in a compact format suitable for installing in a small box or integrated into a home-brewed receiver.

The accompanying circuit provides a tuneable filter and audio output stage, which can form the 'back-end' of a receiver (direct conversion or superhet) or be used as an accessory. The circuit makes use of switched-capacitor filter i.c.s to provide a tuneable low pass filter and a tuneable notch filter that can be switched into circuit when necessary. The circuit is shown in **Fig. 5**.

The pre-amplifier is based upon an field effect transistor (f.e.t.) operational amplifier with the overall alternating current (a.c.) gain determined by the ratio between R6 and 4. Overall gain is defined at some frequency (not d.c.) by the ratio R6/4, because R4 is grounded through capacitor C3 at d.c. the value of R4 is, for all practical purposes, infinite – so the gain is zero.

Similarly, at a very high frequency, R6 is bypassed by C4 which also results in zero gain. The gain at 1kHz is about 30dB, the low frequency -6dB point is about 40Hz and the h.f. 6dB point about 16kHz. These roll-off points can be adjusted by changing the values of C1, 3 and 4.

Simulating the circuit in *5Spice* I've found the best values for an l.f. roll off (3dB) of 300Hz and an h.f. roll off of 3kHz are C1=22nF, C3= 1μF and C4=1800pF. Adjustment of R6 will alter the overall gain but will affect the h.f. roll-off frequency too.

The pre-amplifier is designed to follow straight on from a product detector, so the gain of this stage may be too great if it follows audio pre-amplification in the receiver but this is easily adjusted. (Note that there is a practical limit to the gain variation games that can be played with operational amplifier filters).

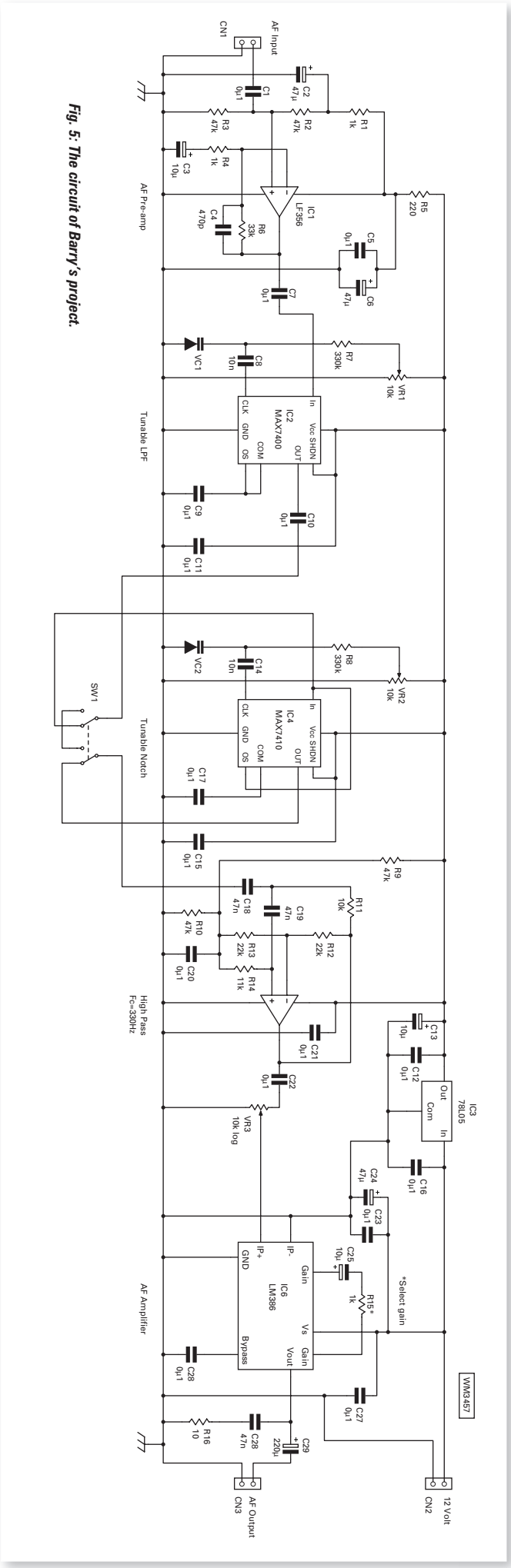
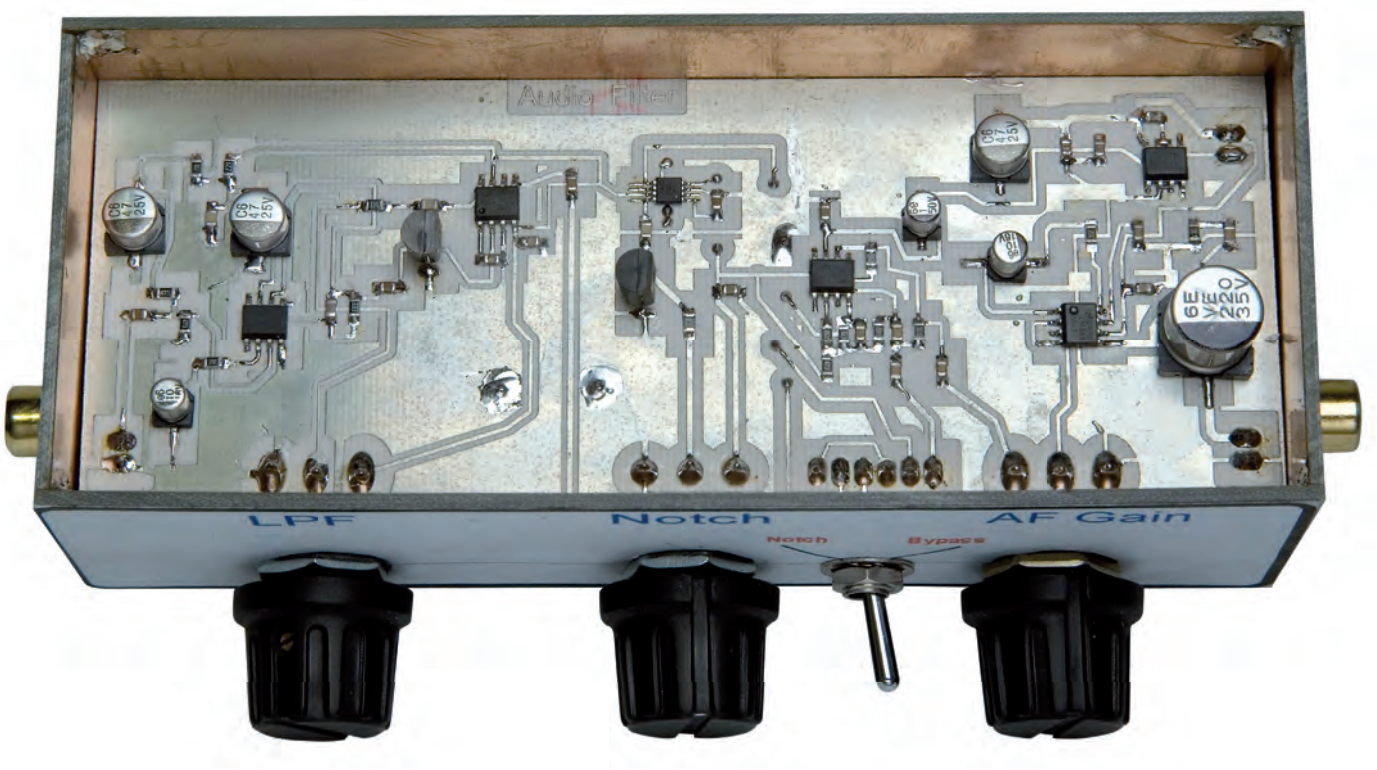


Fig. 5: The circuit of Barry's project.



Reduce the gain of this stage below about 15dB and the high frequency attenuation disappears turning this circuit into a high-pass filter! Unity gain can be achieved by omitting C4 and replacing R6 with a short circuit; the resulting pass-band has an l.f. cut-off, -6dB, at 180Hz and unity gain to 50kHz or more with C1 = 22nF and C3=1μF).

The filtered signal then feeds directly into the tuneable low-pass filter, which utilises a Maxim MAX7400 switched capacitor filter configured as an 8th Order Elliptic. This filter configuration can provide over 80dB of stop-band rejection and a transition ratio of 1.5. (The ratio between the cut-off frequency and the ultimate stop band attenuation frequency, so if the transition is at 1kHz the filter attenuation will be -80dB at 1.5kHz).

The frequency of the internal clock of the filter is determined by the capacitor on the CLK pin and by substituting a varicap diode for the fixed capacitor the knee of the filter (which occurs at clock frequency/100) can be adjusted using a variable voltage from the panel mount potentiometer. The filter has a gain of one with its low-pass cut-off variable from about 650Hz to 4.5kHz (depending on the capacitance swing of the varicap diode).

The output of the tuneable low pass filter is passed via the front panel switch to a high-pass filter with a cut-off frequency of about 330Hz implemented using a f.e.t. operational amplifier type LF356 (see parts list for options). The filter values are determined using the equations in Ref. 6. The output of this filter, which determines the l.f. point of the overall audio filter, then feeds a conventional LM386 a.f. amplifier i.c. but implemented in SM technology (SMT).

The optional notch filter is constructed using a Maxim MAX7410, a fifth-order Butterworth response filter. This is a very tiny package (8-pin uMax, roughly half the size of the SO8 package used for the other i.c.s) but I've used it to show that it's perfectly feasible to build a circuit using the smallest dual in-line SMD components (the other packages which utilise even smaller footprints are exceedingly difficult to use on the home workbench).

The circuit uses a feature of all the switched capacitor filters in that the output has an accurate 180° phase shift of the input signal at the cut-off frequency (actually $0.85f_c$) with unity gain.

The filter is configured as a low-pass filter cutting off (in theory at least) all frequencies above the required notch frequency. Then the filtered signal combines in the output stage of the filter (configured as a summing node) with the input signal where phase shifted frequencies cancel each other (see the data sheet for a more detailed explanation).

The project provides a notch of about -50db relative to the pass-band amplitude. The clock of this i.c. is again determined by the varactor on the CLK pin and is tuned by the front panel mounted potentiometer.

Finally, the 12V d.c. supply used for the output stage is reduced to 5V for the other stages using an L78L05 series regulator in a SM package. However, one thing to note is that the board size is determined by the controls used, not the components! Also, the varactors are conventional through-hole components because I was unable to locate a SMD varactor with adequate capacitance swing.

Next month, in Part 2, Barry explains the construction stage.

Shopping & Components Listing

To obtain a full part list please send an E-mail to **tex@pwpublishing.ltd.uk** with the text 'SMD filter Parts List' in the E-mail's subject box. Thank you. **Tex Swann G1TEX.**

Note: Barry's reference list will appear in part 2. **Editor.**

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Tony Nailer's

technical for the terrified

This month in Technical for the Terrified Tony Nailer G4CFY aims to remove the fear from h.f. transceiver circuitry.

Welcome to the article that's designed to remove the fear of theory and technical matters! It's where – in this series and DiBD – I've discussed and produced variable frequency oscillators (v.f.o.s), crystal oscillators, and digital synthesisers.

I also produced a board I called a mixer-v.f.o., which really was a crystal oscillator and mixer, to be used in conjunction with a v.f.o., to build a high frequency (h.f.) or very high frequency (v.h.f.) local oscillator (l.o.).

Since the last article in this series, in August 2008 *PW*, it has been suggested I consider working out the details for a tuneable intermediate frequency (i.f.) unit, for use in conjunction with receive converters or transverters, or as a 28MHz (10 metre band) unit in its own right.

This series discusses the theoretical side of radio – but **it's not** a design course. So, I will look at the problems that dictate choices of i.f.s and local oscillators for the various h.f. Amateur bands.

The Tuneable IF

The tuneable i.f. was traditionally (very often) a unit covering the range 28 to 30MHz, to provide all of 10 metres, as well as an i.f. with the whole 2MHz swing required for converters to and from 50MHz (6 metres), 70MHz (4 metres) and 144MHz (2 metres).

Having recently looked at the **Radio Society of Great Britain** (RSGB) bandplans for 28, 50, 70 and 144MHz it was interesting to see how various groups have been allocated areas of the bands for their own specialised use and interests. As a rough approximation, we can use Morse (c.w.) and single sideband (s.s.b.) from 28 – 29MHz, 50 – 50.250, 70 – 70.300, and 144 – 144.490MHz.

Above the frequencies mentioned there are allocations referred to as 'All Mode', but frankly speaking, there are so many spot frequencies for specific users that we could undoubtedly upset someone if we tried working any other mode in those regions!

From 29 to 29.7MHz the band is generally channelised in 10kHz steps and allocated principally for amplitude modulation (a.m.) and frequency modulation (f.m.). For those frequencies a dedicated a.m./f.m./ radio using 10kHz step synthesiser would be more useful.

On 6 metres, the section 50.5 – 52MHz appears to be channelised also in 10kHz steps, and could carry a.m. or f.m. in that region.

On 4 metres, the frequencies of 70.25 – 70.30 and referred to as 'All Mode' appears to be channelised in 10kHz steps and is no doubt the best place for a.m. operation. The frequencies 70.3 – 70.5MHz are channelised on a 12.5kHz step for use of digital modes and f.m. There's probably no place on 2 metres that would be acceptable for a.m. operation and 145 –145.8MHz is arranged on a 12.5kHz step channelisation and is principally f.m.

The band plan dictates two types of tunable i.f.s. on 28MHz. The first should be v.f.o. controlled in the region 28 to 29MHz and be for c.w. and s.s.b. only. The other i.f. range, for a.m. and f.m., should be digitally synthesised with 10kHz or 2.5kHz steps and would be in the range 29 – 30MHz.

Transceiver Fundamentals

All transceiver designs can be broken into as many as five distinct modules. These are shown in **Fig. 1** and are explained as follows;-

1: The Main Board, which generates the transmit signal at an intermediate frequency, and acts as the main signal processing part of the receiver. The Poundbury SSB Generator is a module of this type.

2: The local oscillator. Originally this was a v.f.o., with or without crystals and a mixer for multi-band use. These days in almost all commercial rigs

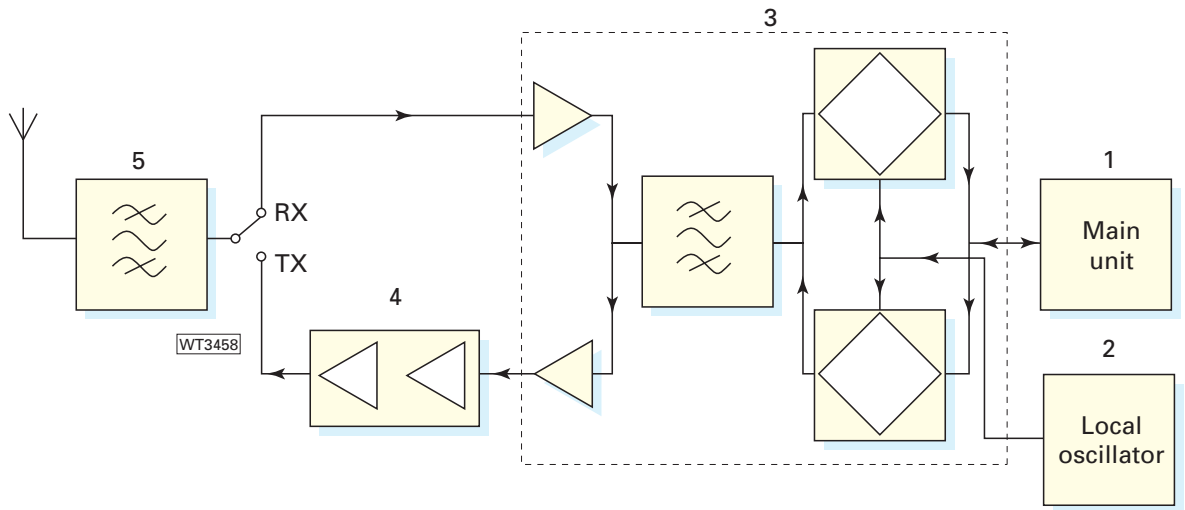

Fig. 1.

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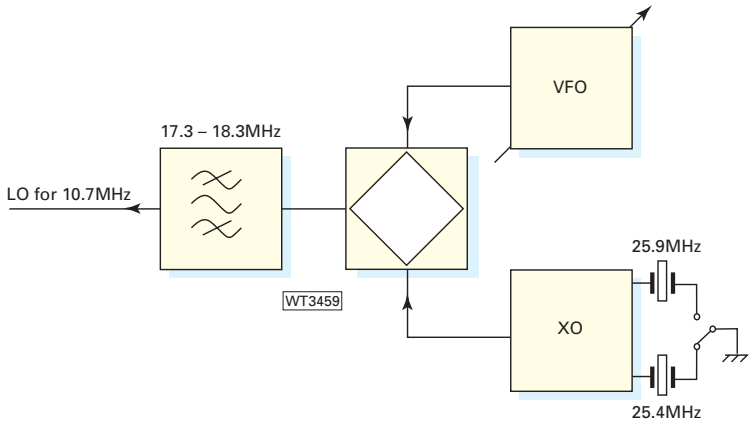

Fig. 2.

it's a digital synthesiser, with all the complexity and noise that goes with it.

3: Front End Unit. This mixes the signal to-and-from the main board with the signal from the local oscillator. It also does all the filtering and amplification at low level on receive and transmit. The Poundbury Front End is a module of this type.

4: Transmit main amplifier. Does what it says! Normally at 50Ω input and output impedance, generates lots of heat and is usually kept as far away from the other parts as possible.

5: Front end filters. Usually cascaded low-pass and high-pass filters, specifically to band-limit on receive, and to reduce harmonic output on transmit.

Ten Metre SSB Transceiver

I'll now explain how this scheme can be applied to a single band transceiver for c.w./s.s.b. for 28 – 29MHz and initially I'll consider the Main Unit with an i.f. of 10.7MHz. To determine the local oscillator frequency, simply subtract the i.f. from the input signal range (28 to 29)MHz – 10.7MHz gives 17.3 to 18.3MHz.

The most obvious **first approach** is to have a v.f.o. running at 17.3 – 18.3MHz. The second harmonic of the v.f.o. would sweep the range 34.6 – 36.6 MHz, which is well above the range 28 – 30MHz. On transmit the second harmonic of the i.f. is 21.4MHz and the third harmonic is 32.1MHz. There are no obvious problems with simple harmonics although the drawback of this approach is achieving the required stability of the v.f.o. at that frequency.

The **second approach** is to run the v.f.o. at a lower frequency, where it's likely to be more stable, and mix its output with that of a crystal oscillator up to the required range. In choosing the operating frequency, we have to avoid harmonics of the v.f.o. and the crystal appearing in the i.f., the l.o. range, or the r.f. range. This is approach is referred to as **partial synthesis**.

Let's now try a v.f.o. running at 6.5 – 7.5MHz. The second harmonic is 13 – 15MHz, and is acceptable. The third harmonic is 19.5 – 22.5MHz and is also acceptable. The fourth harmonic is 26 – 30MHz, sweeping right through the wanted band and is unacceptable.

Try now using a v.f.o. running at 7.6 – 8.6MHz. The second harmonic is 15.2 – 17.2MHz, which is too close to the 17.3MHz, and is unacceptable. Other v.f.o. frequencies with swings of 1MHz cause equal problems.

The **third approach** is to use a 500kHz range for the v.f.o and have a choice of two crystals to mix with it. With one crystal the range is 17.3 – 17.8MHz and with the other 17.8 - 18.3MHz. For this I will try 7.6 – 8.1MHz for the v.f.o. The second harmonic is 15.2 – 16.2 MHz, which is acceptable. The third harmonic is 22.8 – 24.3MHz, which is acceptable. The fourth harmonic is 30.4 – 32.4MHz, which is also acceptable.

A value of crystal frequency to mix with the 7.6 – 8.1 MHz v.f.o. to produce 17.3 – 17.8 MHz would be 9.7MHz. That to produce 17.8 – 18.3 MHz would be 10.2MHz. This is a little close to the i.f., could produce unwanted

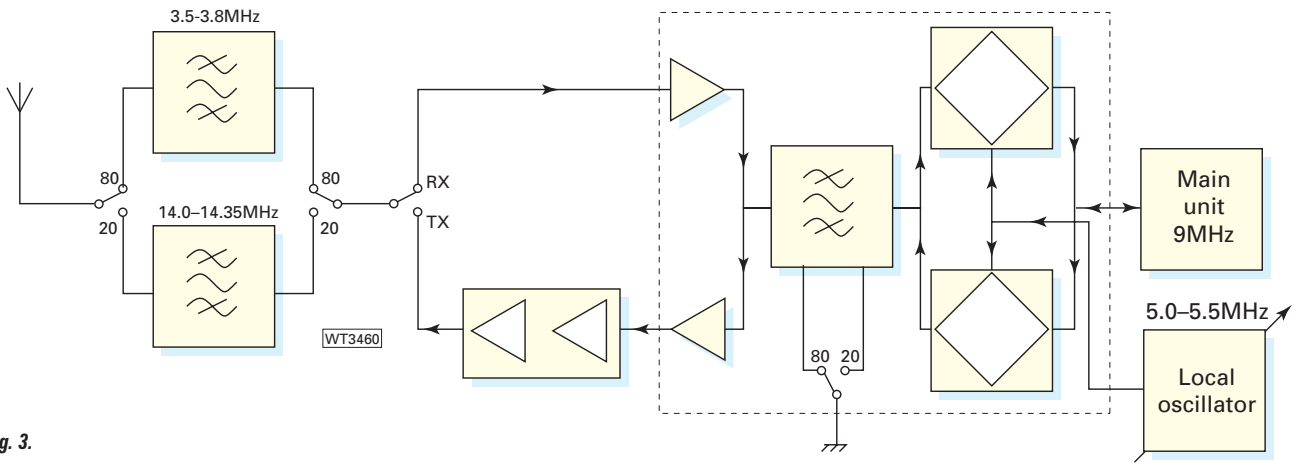

Fig. 3.

heterodyne signals on transmit and get into the main board on receive.

The alternative is to use a high side crystal, so that the l.o. signal is the difference between the v.f.o. and the crystal. This will require crystals on 25.4, and 25.9 MHz. A bandpass filter is then needed to pass 17.3 –18.3MHz whilst rejecting the second and third harmonics of the v.f.o. on 15.2 – 16.2, and 22.8 – 24.3MHz. A workable solution and shown in **Fig. 2**.

A 9MHz IF Version

A similar procedure can be used for a 9MHz first i.f. This will give local oscillator ranges of 19 –19.5 and 19.5 – 20.0MHz. Use the same frequency v.f.o. 7.6 – 8.1MHz, with crystal frequencies of 11.4 and 11.9MHz. This is also a workable solution.

A 21MHz SSB Transceiver

Next, I'll look at a 21MHz (15m) s.s.b. transceiver. This has a signal frequency range of 21 – 21.45MHz. An i.f. of 10.7MHz would not work for this transceiver, because the second harmonic of the i.f. is at 21.4MHz which is within the r.f. range. Maybe, in this case a 9MHz i.f. would work together with a 12 – 12.5MHz l.o. range.

If the v.f.o. range is also 7.6 – 8.1MHz, then the mixer crystal is 4.4MHz for low side and 20.1MHz for high side. The second and third harmonics of the v.f.o are clear of the input range. The harmonics of the crystal are 8.8, 13.2, 17.6 and 22MHz, which are all outside the r.f. and l.o. and i.f. ranges. The high side crystal at 20.1MHz is not preferred as it's a bit close to 21.0MHz.

Classic 3.5 & 14MHz Transceiver

For the classic 3.5 and 14MHz transceiver the simplest solution for dual-band use is to use a 9MHz i.f. with a v.f.o. running 5 –5.5MHz. The i.f. minus the v.f.o. gives 3.5 – 4MHz tuning in reverse. The i.f. plus the v.f.o. gives 14 –14.5MHz tuning forward. The block diagram for such a rig is shown in **Fig. 3**.

Harmonics of the v.f.o are 10 – 11MHz, which precludes the use of a 10.7MHz i.f., and 15 – 16.5MHz which is well clear of the r.f range. Furthermore, the third harmonic of 3.5666MHz on transmit also happens to work out as 10.7MHz.

Table 1: Narrow-bands radio frequencies, with 10.7MHz first i.f., and v.f.o. running 5.5 – 5.7 MHz.

Band (m)	RF Range (MHz)	LO Range (MHz)	Xtal (MHz)
160	1.80 – 2.00	12.50 – 12.70	7.00
40	7.00 – 7.20	17.70 – 17.90	12.20
30	10.10 – 10.15	20.80 – 20.85	15.30
17	18.068 – 18.168	28.768 – 28.868	23.268
12	24.89 – 24.99	14.19 – 14.29	8.69

Table 2: Wide-bands radio frequencies, with 9MHz i.f. and switched v.f.o ranges.

Band (m)	RF Range (MHz)	LO Range (MHz)	VFO Range (MHz)	Xtal (MHz)
80	3.50 – 4.00	5.00 – 5.50	5.00 – 5.50	0
20	14.00 – 14.50	5.00 – 5.50	5.00 –5.50	0
15	21.00 – 21.50	12.00 – 12.50	7.60 – 8.10	4.40
10A	28.00 – 28.50	19.00 – 19.50	7.60 – 8.10	11.40
10B	28.50 – 29.00	19.50 – 20.00	7.60 – 8.10	11.90

Top Band Radio

On 1.8MHz (Top Band) the 9MHz i.f. is unsuitable for a transmitter because the fifth harmonic of 1.8 is 9MHz. In this case the 10.7MHz is better because the fifth harmonic of 1.8 – 2MHz is 9 – 10MHz, and the sixth harmonic is 10.8 – 12MHz. So, the v.f.o. could tune 8.7 – 8.9 MHz.

Another solution is to have the local oscillator above the i.f. at 12.5 – 12.7MHz. This allows a wide choice of frequencies for the v.f.o. to run at. As an example a v.f.o. range of 5.5 – 5.7MHz, has the second harmonic at 11.0 – 11.4MHz. The mix crystal would be 7MHz.

The alternative route would be to use a 455kHz i.f, with the v.f.o. running on the high side of the input frequency, tuning 2.255 – 2.455MHz. The thing to watch out for here is that the fourth harmonic of 455kHz is 1.82MHz. (This wouldn't be a problem if the main unit is well screened from the front end unit.

Multiband Radios

I have applied the method detailed here to all the h.f. Amateur bands to determine acceptable and unacceptable v.f.o. and first i.f. The result was that 10.7MHz is a suitable i.f. for the 1.8, 7, 10, 18 and 24MHz (160, 40, 30, 17 and 12 metres). Where 1.8 and 7MHz are 200kHz wide, 10MHz is 50kHz wide and the other two are 100kHz wide. Hence, a v.f.o tuning range of just 200kHz would be ideal for a special radio for narrower bands.

Conversely, 9MHz is acceptable for 3.5, 14, 21 and 28MHz (80, 20, 15, and 10m), all of which are much wider bandwidths. Here a v.f.o. tuning range of 500kHz would be ideal, for a special wide-bands radio.

In **Table 1** and **Table 2**, I have shown a high side local oscillator except on 24MHz where it is low side. This choice reduces the total local oscillator range by 6.8MHz making it possible to use one coil and switched capacitors to filter it. It also means the mixing crystal is fundamental instead of series third overtone. The 10MHz band is c.w. only, so may not need to be included.

Final Words

Having explored and tabulated suitable i.f.s. and local oscillators for h.f. rigs, I hope it will help readerswho try their hands at building superhet receivers and/or transmitters. It may also provide useful background data for me, in case in the future I produce a transceiver as a stand-alone article or as part of the *Doing it by Design* series. ●

If you wish to correspond regarding this article or previous ones, subscribe to the list **pw-g4cfy-on@pwpublishing.ltd.uk** by sending a blank E-mail with the word SUBSCRIBE in the subject box. When you receive confirmation from the server you can send an email to **pw-g4cfy@pwpublishing.ltd.uk** and your comments will be answered by the *PW* team or by myself. I will also respond to a private email directed to **tony@pwpublishing.ltd.uk**

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club news

Please remember to include full details of your club, E-mail and telephone contact details and the postcode of your meeting venue - it helps potential visitors to find you!

Send all your club info to

PW Publishing Ltd.,
Arrowsmith Court,
Station Approach,
Broadstone,
Dorset BH18 8PW
E-mail: newsdesk@pwpublishing.ltd.uk

BEDFORDSHIRE

Shefford &DARS
David Lloyd. Tel: (01234) 742757
www.sadars.org.uk
The Shefford and District Amateur Radio Society meets every Thursday at the Community Hall, Ampthill Road, Shefford, SG17 5BD (next to the Chip shop).
See web site for our full programme.

BERKSHIRE

Reading & DARC
Pete Milton. Tel: (01189) 695697
www.radarc.org
The Reading & District Amateur Radio Club meets on the second and fourth Thursday of the month at Woodley Pavilion, Woodford Park, Haddon Drive, Woodley, Berkshire RG5 4LY.

CHESHIRE

Chester & DRS
Graham. Tel: (07930) 655 121
E-mail: info@chesterdars.org.uk
www.chesterdars.org.uk
The Chester & District Radio Society meets on Tuesday evenings at the Burley Memorial Hall, Common Lane, Waverton, Chester CH3 7QT.

Halton RC
Sam. Tel: (01928) 714231
http://g7wfs.sytes.net/hrc/index.htm
The Halton Radio Club meets in The Play Centre, Norton Hill, Windmill Hill, Runcorne WA7 6LJ every Thursday from 7.30 to 9.30pm. There's plenty of parking and full disabled access.

Macclesfield & DRS
Ray King. Tel: (01260) 278431
www.gx4mws.com
The Macclesfield & District Radio Society meets every Monday at the Pack Horse Bowling Club, Westminster Road, Macclesfield SK10 3AT at 8pm.

Stockport RS
David Simcock. Tel: 0161 456 7832
www.stockportradiosociety.co.uk
The Stockport Radio Society meets on the first and third Tuesdays at the Bramhall Air Scouts HQ, Leewood Hall, Benja Fold off Ack Lane East, Bramhall, Stockport SK7 2BX.

Warrington Amateur Radio Club
Paul Carter. E-mail: g7odj@warc.org.uk
www.warc.org.uk
The Warrington Amateur Radio Club meets every Tuesday at 8pm at the Grappenhall Youth and Community Centre, Bellhouse Lane, Grappenhall, Warrington WA4 2SG.

CORNWALL

Cornish RAC
Ian Williams. Tel: (01872) 561058
E-mail: ianporsche964@aol.com
www.cornishradioamateurclub.org.uk
The Cornish Radio Amateur Club meets at the Church Hall, Church Road, Perranarworthal, Truro TR3 7QE on the first Wednesday of every month at 7.30pm. There is also a Computer Section that meets at the same venue and time on the second Monday of every month, except December.

Poldhu ARC
Keith Matthew. Tel: (01326) 574441
E-mail: g0wys@yahoo.co.uk
www.gb2gm.org
The Poldhu Amateur Radio Club meets at The Marconi Centre, Poldhu Cove, Nr Mullion, Cornwall TR12 7JB. Tel: 01326 241656.

COUNTY DOWN

Bangor and District ARS
Mike. Tel: 028 4277 2383
http://www.bdars.com
The Bangor and District Amateur Radio Society meets on the first Thursday of every month in 'The Boathouse', Harbour Car Park, Groomsport BT19 6JP at 8pm. Visitors and new members are most welcome.

COUNTY DURHAM

Bishop Auckland RAC
Mark Hill. Tel: (01388) 745353
http://barac.m0php.net/
The Bishop Auckland Radio Amateur Club meets every Thursday at 8pm in the Village Community Centre, Stanley Crook, Co. Durham DL15 9SN. Tuition for Foundation, Intermediate and Advanced licences is available. The club is registered as an RSGB exam centre.

Great Lumley AR&ES
David Barclay. Tel: 0191 3888113
E-mail: m0bpm@btinternet.com
The Great Lumley Amateur Radio & Electronics Society meets in the Community Centre, Front Street, Great Lumley, Chester-le-Street, Co. Durham DH3 4JD on Wednesday nights from 7 to 9pm.

DERBYSHIRE

South Normanton Alfreton and District ARC
A J Higton. Tel: (01773) 783658
E-mail: snadarc@linuxmail.org
www.snadarc.me.uk/
The South Normanton Alfreton and District Amateur Radio Club meets in the Village Hall, Community Centre, Market Street, South Normanton, Derbyshire DE55 2EJ.

DEVON

Exeter ARS
Paul Cheshire. Tel: 01392 660246
E-mail: pchesh-29@hotmail.co.uk
The Exeter Amateur Radio Society meets on the 2nd and the 4th Monday at 7.30pm in the Moose Centre, Spinning Path Lane, Blackboy Road, Exeter EX2 5RP. Tuition for Foundation, Intermediate and Advanced licence is available. The club is registered as an RSGB examination centre.

Torbay ARS
Dave Helliwell. E-mail: g6fsp@tars.org.uk
www.tars.org.uk
The Torbay Amateur Radio Society meets Fridays at 7.30pm in the Teignbridge District Scout Headquarters, Wolborough Street, Newton Abbot, Devon TQ12 1JR.

DORSET

Bournemouth RS
John. Tel: 07719 700 771
www.brswebsite.org.uk
The Bournemouth Radio Society meets on the first and third Friday of each month at the Kinson Community Centre, Pelhams Park, Millhams Road, Kinson, Bournemouth BH10 7LH. Meetings take place in Room 5 at 8pm and members assemble in the bar from 7.30pm. Visitors are always welcome.

Poole Radio Society G4PRS
'Tex' G1TEX Tel: 07966 460 552
www.g4prs.org.uk
Meetings are every Friday at 19:30 for 20:00 at the The Old Chapel Hall, Cabot Lane, Creekmoor, Poole BH17 7BX, the second friday meeting of each month is the formal evening, all others are basically shack and Natter nights. After successfully getting five new Advanced candidates through the exam, training for the Foundation and Intermediate licences starts again early September.

EAST SUSSEX

Brighton RC
Reg Moores. Tel: (01273) 503869
The Brighton Radio Club meets on the second and fourth Tuesdays of each month at the Vallance Community Centre, Conway Court, Sackville Road, Hove BN2 3WR at 7.30pm. Anyone wishing to know more are welcome to come along to a meeting, entrance is free.

Hastings E&RC
Gordon Sweet. Tel: (01424) 431909
E-mail: gordon@gsweet.fsnet.co.uk
www.herc.uk.net or http://g4cus.mysite.wanadoo-members.co.uk/
The Hastings Electronics & Radio Club meets on the third Wednesday at the Taplin Centre, Upper Maze Hill, St Leonards on Sea TN38 OLQ at 7pm.

ESSEX

Braintree & DARC
Keith. Tel: (01376) 329279
www.badars.org.uk
The Braintree & District Amateur Radio Society meets on the first and third Monday of the month in The Clubhouse, Braintree Hockey Club, Church Street, Bocking CM7 5LJ.

Colchester RA
David Chambers. Tel: 07766 543784
www.g3co.ccom.co.uk
The Colchester Radio Amateurs meets at 7.30pm on alternate Thursdays at St Helena School and The Colchester Institute, Sheepen Road, Colchester, Essex CO3 3LE. Members and non-members welcome.

Chelmsford ARS
Martyn Medcalf. Tel: (01245) 469008
E-mail: info2007@g0mwt.org.uk
www.g0mwt.org.uk
The Chelmsford Amateur Radio Society meets on the first Tuesday of each month in the Marconi Sports & Social Centre, Beehive Lane, Great Baddow, Chelmsford CM2 9RX at 7.30pm.

Loughton & Epping Forest ARS
Marc Litchman. Tel: 020 8502 1645
E-mail: info@lefars.org.uk
www.lefars.org.uk
The Loughton & Epping Forest ARS meet Friday fortnightly at All Saints House, Romford Road, Chigwell Row, Essex IG7 4QD between 7.45 and 10pm. All visitors will be made most welcome.

GLOUSCESTERSHIRE

Gloucester Amateur Radio and Electronics Society.
Anne 2E1GKY/M3GKY 01452 548478 (After 10am)
E-mail: hamreed@blueyonder.co.uk
www.g4aym.org.uk
Meet at Churchdown School, Winston Road, Glos. GL3 2RB EVERY MONDAY EVENING 7-30pm until 10pm except for Bank Holidays when we operate from a local escarpment. Monday 13th it's an Informal Meeting, on the 20th, Operating Club Equipment and on the 27th it's again an Informal Evening when we do Construction etc.

HAMPSHIRE

Fareham & District ARC
Ken Sapsed. Tel: 023 9279 7240
E-mail: secretary@fareham-darc.co.uk
www.fareham-darc.co.uk/
The Fareham & District Amateur Radio Club meets on Wednesdays evenings from 7.30pm in the Portchester Community Centre, Westlands Grove, Portchester, Fareham PO16 9AD.

Horndean & District ARC
Stuart Swain. Tel: (02392) 472846
E-mail: g0fyx@msn.com
www.hdarc.co.uk
The Horndean & District Amateur Radio Club meets on the first and fourth Tuesdays each month in the Lovedean Village Hall, 160 Lovedean Lane, Lovedean, Hants PO8 9SF at 7.30pm. Visitors are always very welcome.

Isle Of Wight Radio Society
Tony Pegg Tel: 01983 868 978
e-mail tony.pegg1@btinternet.com
www.g3sky
The IWRS meets every Friday evening 7.00pm-10.pm at Haylands Farm,Salters Rd. Ryde PO33 3HU. Visitors very welcome.The club runs courses for Foundation,Intermediate and advanced licenses. The club is registered as an RSGB exam centre

HERTFORSHIRE

Verulam Amateur Radio Club (St Albans)
Norman. Tel: 07773 628912
E-mail: g1bsz@aol.com (sec)
www.radioclubs.net/verulam
The club normally meets every 3rd Tuesday of the month 800pm at Aboyne Lodge School.Etna Road, St Albans, AL3 5NL. New members and visitors are always very welcome. Regular talks, events, Foundation, Intermediate courses exams are held. Club nets also take place every Sunday 12.00noon 40m (7.150MHz), then 14.00pm 2m (145.375) and on Tuesday 19.45pm 160m (1.975) then 20.00pm 2m (145.375). For further information about the club and events please see the website.

HUMBERSIDE

Hull & District ARS
Raymond Penny. Tel: (01482) 504618
E-mail: sirraymond@sirraymond.karoo.co.uk
The Hull & District Amateur Radio Society meets every Friday at the Walton Leisure Centre, Walton Street, off Anlaby Road, Hull HU3 6JB.

KENT

Bredhurst RATS
www.the-brats.co.uk
The Bredhurst Radio Amateur & Transmitting Society meets on Thursdays at the Parkwood Community Centre, Rainham, Gillingham, Kent ME8 9PN at 8.30pm. If you are interested in joining the club, write to: Membership, The BRATS c/o The Club Room, The Parkwood Community Centre, Long Catlis Road, Rainham, Gillingham, Kent, ME8 9PN.

Bromley & DARS
Graham
E-mail: bdars@grahamc.net
www.bdars.org
The Bromley & District Amateur Radio Society meets in The Victory Social Club, Kechill Gardens, Hayes, Kent BR2 7NH (off B265, Hayes Lane, Bromley) on the third Tuesday of the month at 7.30pm.

LANCASHIRE

Oldham RC
Christopher Cunliffe. Tel: 07749347142
E-mail: secretaryoarc@btinternet.com
www.oarc.org.uk
The Oldham Radio Club meets on Thursdays at Royton Air Training Corps, Hillside Avenue, Royton, Oldham OL2 6RF at 7:30pm.

Ellenroad RC
David. Tel: (01706) 358650
E-mail: info@ellenroadradioclub.org.uk
http://www.ellenroadradioclub.org.uk/info.htm
The Ellenroad Radio Club (ERC) meets every Monday evening from 7 to 9pm at the Ellenroad Steam Museum, Elizabethan Way, Newhey, Rochdale OL16 4LG. The museum houses the UK's only fully-working cotton mill engine, complete with its original steam raising plant and 220ft high chimney. Newcomers are always welcome and made to feel at home.

LINCOLNSHIRE

Spalding & DARS
Graham Boor. Tel: 07947764481
E-mail: secretary@sdars.org.uk
www.sdars.org.uk
The Spalding & District Amateur Radio Society meets at the Castle Sports Swimming Complex, Spalding PE11 1QF on Fridays at 7.30pm.

LONDON

Cray Valley Radio Society
Bob Treacher. Tel: 020 8265 7735
www.cvrs.org
The Cray Valley Radio Society meets on the first and

third Thursdays of the month at the Progress Hall, Admiral Seymour Road, Eltham, London SE9 1SL at 7.30pm for 8pm.

Southgate ARC
Donald F Berry. Tel: 020 8360 3614,
E-mail: dfberry@eggconnect.net
www.southgatearc.org
The Southgate Amateur Radio Club meets on the second Thursday of the month at Winchmore Hill Cricket Club, The Paulin Ground, Firs Lane, Winchmore Hill, London N21 3ER at 7.30pm.

Wimbledon and District ARS
Jim Bell. Tel: 020 8874 7456
E-Mail: james@jbell5.wanadoo.co.uk
www.gx3wim.org.uk
The Wimbledon & District Amateur Radio Society welcomes new comers to our meetings whether they are licensed or not. We hold our meetings at 8pm the second and last Friday of each month at Martin Way, Methodist Church, Buckleigh Avenue, Merton Park, London SW19 9JZ. The church is on the corner of Martin Way and Buckleigh Avenue.

THE LOTHIANS

Cockenzie & Port Seton ARC
Bob Glasgow. Tel: (01875) 811723
E-mail: gm4uyz@cpsarc.com
www.cpsarc.com/news.php
The Cockenzie & Port Seton Amateur Radio Club meets in the Thorntree Inn (Lounge Bar), High Street, Cockenzie, East Lothian EH32 0HP from 7pm till late. Organised talks are held in the Port Seton Community Centre, South Seton Park, Port Seton, East Lothian EH32 0EE. Timings 18:30 to 21:30hrs.

Lothians Radio Society
Tony Sigouin. Tel: 07739742367
E-mail: enquiries@lothiansradiosociety.com
www.lothiansradiosociety.com
The Lothians Radio Society meets on the second and fourth Mondays of the month in the Royal Ettrick Hotel, 13 Ettrick Road, Edinburgh EH10 5BJ from 7pm. Membership costs £12 per year and includes a free BBQ every June!

MERSEYSIDE

Wirral & District ARC
Tom. Tel: 07050 291850
E-mail: secretary@wadrac.com
www.wadarc.com
The Wirral & District Amateur Radio Club meets at the Irby Cricket Club, Mill Lane, Irby CH61 4XQ on the second and fourth Wednesdays of each month. Other Wednesdays are informal (D&W) meetings at a local hostelry.

NORFOLK

King's Lynn ARC Ray Dowsett, MBE.
Tel: (01553) 671307
E-mail: ray-g3rsv@supanet.com
http://www.klarc.org.uk
King's Lynn Amateur Radio Club meets every Thursday at the Scout HQ, Chequers Lane, West Winch, King's Lynn, PE33 0NY off the A10 at West Winch at 7.30pm.

Norfolk ARC
Mark Taylor. Tel: (01362) 691099
E-mail: narc@g0lgj.co.uk
www.norfolkamateurradio.org
The Norfolk Amateur Radio Club meets every Wednesday at the *Happy Landings, Norwich Aviation Centre, Norwich Airport NR6 6JA a 7.30pm.*

North Norfolk ARG
Tony Smith. Tel: (01263) 821936.
E-mail: g4fai@btinternet.com
www.radioclubs.net/nnarg/
The North Norfolk Amateur Radio Group meets in the Radio Hut at the Muckleburgh Collection Military Museum, Weybourne, North Norfolk NR25 7EG on Wednesdays and Thursdays from 10am to 4pm and some Sundays from 1 to 4pm. New members always welcome.1st October Fun Evening with Peter G3ASQ and Friends (Venue TBC), 8th October Informal (Venue TBC), 10-12th October RSGB HF Convention Trip Wyboston Lakes, 15th October Table Top Sale (Venue TBC) 18/19th October TDOTA Scouts 22nd October Members Forum (Venue TBC), 29th October Bright Sparks / Informal (Venue TBC)

NORTHAMPTONSHIRE

Kettering & District Radio Society Lorna Froggatt.
Tel: 0153 676 2523
E-mail: LornaSteveLorna@aol.com
The Kettering & District Radio Society meets each Tuesday from 7 to 9pm in the winter at The Lilacs Pub, Church Street, Isham, Northants NN14 1HD and in the summer at the Carpetbagger Aviation Museum, Sunnyvale Farm Nursery, Harrington NN6 9PF. Foundation, Intermediate and Advanced courses are held regularly.

SHROPSHIRE

Salop ARS
Richard Golding. Tel : 01743 356195
The Salop Amateur Radio Society meets in The Telepost Club, Railway Lane, Abbey Foregate, Shrewsbury SY26BT on Thursday between 8 and 10.30pm.

NOTINGHAMSHIRE

Worksop Amateur Radio Society (W.A.R.S.)
'Daz' Spence 01623 747314
Email- g3rcw@qsl.net
website- www.qsl.net/g3rcw/
Meets every Tuesday at 7:00 pm. Our cubhouse is located at 59 - 61west street, Worksop, Nottinghamshire. S80 1JP. Exams and courses run frequently for all licence levels. Construction nights due to start in the autumn, and we also put on various special events amongst which is the famous Sherwood Forest. Licensed bar & hot food available on club meet nights. Membership fee for the year is £10.

Telford & District ARS
Mike Street. Tel: (01952) 299677
E-mail: mjstreetg3jkx@blueyonder.co.uk
www.tdars.org
The Telford & District Amateur Radio Society meets on Wednesdays at the Little Wenlock Village Hall, Malthouse Bank, Little Wenlock. Telford TF6 5BG at 8pm. October 1st is Open House/On the air/ Committee, on the 8th their Hamfest debriefing / Brain-storm re new Society project. The 15th Hints & Tips. Members talk about their favourite ideas and methods., and on the 29th there's a video with food!

SOMERSET

North Bristol ARC
Dick Elford Tel:(01454) 218362
E-mail: g0xay@aol.com
www.nbarc.org.uk
North Bristol ARC meet Fridays at 7.30pm at SHE7, Braemar Crescent, Northville, Filton Bristol BS7 0TD. We carry out training for all the Radio Amateurs examoination, and our next training course is to be for Intermediate exams.

South Bristol ARC
Len Baker. Tel: (01275) 834282
E-mail: g4rzy@msn.com
www.sbarc.co.uk
The South Bristol Amateur Radio Club meets every Wednesday evening at the Whitchurch Folkhouse Association, Bridge Farm House, East Dundry Road, Whitchurch, Bristol BS14 0LN. October 1st there's a Technical Matters Forum run by Fred G7LPP, on the 8th their table-top sale, followed the next week by a computer network clicic. To finish of October, on the 29th there's an 'On the Air Evening' at the shack.

Yeovil ARC
Gary.
E-mail: g.swain@tesco.net
www.yeovil-arc.com/
The Yeovil Amateur Radio Club meets at the Red Cross Centre, Grove Avenue, Yeovil BA20 2BE (on the corner where Grove Avenue meets Preston Road). October 2nd, there's an RSGB talk given Dick G0XAY, on the 11th, it's an Elecraft evening hosted G3ICO & 2E0BFJ, on the 16th, there's Transistor Basics discussed by G6LLP and on October 23rd Transmission Lines is the subject. Finally on the 30th, it's 'Station on Air' evening.

SOUTH GLOUCESTERSHIRE

Thornbury and South Gloucestershire ARC
Tony. Tel: (01454) 417048
E-mail: tonytsgarc@beeb.net
http://jma-databases.co.uk/tsgarc/index.php/Thornbury_%26_South_Gloucestershire_Amateur_Radio_Club
The Thornbury and South Gloucestershire Amateur Radio Club meets in the United Reformed Church Hall, on the corner of Chapel Street and Rock Street, Thornbury BS35 2BA at 7.30 - 9.30pm.

SOUTH WALES

Barry ARS
Glyn Jones. Tel: (01446) 774522
E-mail: glyndxis@talktalk.net
www.bars.btik.com
The Barry Amateur Radio Society meets on Tuesdays from 7.30 to 10.30pm in the Sully Sports & Social Club, South Road, Sully CF64 9TG.

SOUTH YORKSHIRE

Axholme Radio Club
John Fennell. Tel: (01427) 872522
E-mail: g4hoy@tiscali.co.uk
The Axholme Radio Club meets at Hollytree Farm, Westend Road, Sandtoft, Epworth DN9 1LB on Wednesdays at 10amm to 4pm, Thursdays at 7 - 9pm and Saturdays from 10am - 4pm (other times by arrangement).

Sheffield ARC
Trevor Wood. Tel: 0114 2216947
E-mail: trevorwood6@yahoo.co.uk
www.sheffieldarc.org.uk
The Sheffield Amateur Radio Club meets at the SYPTE Social Club, Greenhill Main Road, Sheffield S8 7RH every Monday at 7.15pm. All three types of classes are held for the Foundation, Intermediate and Advance levels of licensing.

STAFFORDSHIRE

Tamworth Amateur Radio Society
Colin Marks. Tel: (01827) 700893
E-mail: colin.marks2@ntlworld.com
The Tamworth Amateur Radio Society meets every Thursday at 7.30pm at St Francis Church, Masefield Road, Leyfields, Tamworth B77 8JB.

SURREY

Sutton & Cheam RS
John Puttock. Tel: 020 8644 9945
E-mail: info@scrs.org.uk
www.scrs.org.uk
The Sutton & Cheam Radio Society meets on the third Thursday of the month at 7.30pm in Sutton United Football Club, The Borough Sports Ground, Gander Green Lane, Sutton, Surrey SM1 2EY. In addition to monthly meetings, licence training courses are held at regular intervals in Banstead Surrey.

TYNE & WEAR

Angel of the North RARC
Nancy Bone. Tel: 0191 477 0036
E-mail: nancybe2001@yahoo.co.uk
www.anarc.net
The Angel of the North Radio Amateur Radio Club meets every Monday 7 to 9pm at Whitehall Road Methodist Church Hall at the corner of Whitehall Road and Coatsworth Road, Bensham, Gateshead NE8 4LH. The entrance to radio club room is through door at the side of building next to the car park. The car park entrance is on Whitehall Road.

Tynemouth ARC
Tony Regnart. Tel: 0191 280 1981
E-mail: tony.regnart@gmail.com
www.gx0nwm.co.uk
The Tynemouth Amateur Radio Club meets each Friday from 7 to 9pm at St. Hilda's Church, Stanton Rd, North Shields, Tyne & Wear NE29 9QB. It's known locally as 'the church near the fire station'.

WEST MIDLANDS

Aldridge & Barr Beacon ARC
Roy Horton. Tel: (01922) 691646
E-mail: leslie137@btinternet.com
www.g0neq.co.uk
The Aldridge & Barr Beacon Amateur Radio Club is a daytime club and meets at the Aldridge Community Centre, Middlemore Lane, Aldridge, Walsall WS9 8AN on the first and third Monday of every month at 2pm to 4pm. They have a long wire and a 2 metre antenna for radio operation using the club callsign G0NEQ.

Midland AX25 Packet Radio Users Group
Miles. Tel: 01384 254199
www.maxpak.org.uk
The Midland AX25 Packet Radio Users Group, MaxPak, meets on the first Monday of the month at The Sir Robert Peel, 104 Bell Lane, Bloxwich, Walsall WS3 2JS.

Stourbridge and District ARS
John. Tel: (01562 700513)
www.g6oi.org.uk
The Stourbridge and District Amateur Radio Society meets on Monday evenings, except for Bank Holidays at The Radio Shack, Old Swinford Hospital School, Heath Lane, Stourbridge, West Midlands DY8 1QX at 8pm. We have Open Shack Nights - Tea/ Coffee always available, along with an opportunity to get on the air or just a natter with whoever attends

Sutton Coldfield RS
Andy Sherman. Tel: (01827) 875155
E-mail: peugeotnut@hotmai.com
www.hamradio.piczo.com
The Sutton Coldfield Radio Society Meets on the second and fourth Monday of the month at 7.30pm (no meeting on bank holiday Mondays) in the Sutton Coldfield Rugby Club, 160 Walmley Road, Sutton Coldfield, West Midlands B762QA.

Wythall Radio Club
Chris Pettitt. Tel: (07710) 412 819
E-mail: g0eyo@wythallradioclub.co.uk
www.wythallradioclub.co.uk
The Wythall Radio Club is based at Wythall House, Silver Street, Wythall, near Birmingham B47 6LZ. They meet every Tuesday at 8pm and meetings are informal and friendly.

WEST SUSSEX

Horsham ARC
Andrew Vine. Tel: (01483) 272456
http://www.harc.org.uk/
The Horsham Amateur Radio Club meets on the first Thursday of the month at The Guide Hall, Denne Road, Horsham, West Sussex.

Worthing & DARC
Roy or Joyce. Tel: (01903) 753893
www.wadarc.org.uk
The Worthing & District Amateur Radio Club meets every Wednesday at 8pm in the Lancing Parish Hall, South Street, Lancing, BN15 8AJ. There's a free car park at the rear and full disabled access. Visitors are always welcome.

WEST YORKSHIRE

Pontefract & District Radio Club
Colin. Tel: (01977) 677006
E-mail: info@pontefractradioclub.org
www.pdars.com
The Pontefract & District Radio Club meets every Tuesday from 7pm and Thursday from 8pm at the Carleton Centre, Carleton Grange, Carleton Road, Pontefract, West Yorkshire WF8 3RJ. A feature of their tuesday meetings is a series of 'Chinese Whispers run from 1900 – 1930 by Reg, G4KMW. Go along and find out what these are!

WILTSHIRE

Trowbridge & District ARC
Ian Carter. Tel: (01225) 864698
E-mail: ian.l.carter@btinternet.com
http://uk.geocities.com/tdarc@btinternet.com
The Trowbridge & District Amateur Radio Club meets at Southwick Village Hall, Southwick (nearest postcode is BA14 9QN). On August 20th it's a Natter night

WORCESTERSHIRE

Worcester RAA
Martin Carter. Tel: 07976 917987
E-mail: secretary@m0zoo.co.uk
www.wraa.co.uk
The Worcester Radio Amateurs Association meets on the second and fourth Tuesday at the Hallow Scout HQ, off Main Road, Hallow, Worcester WR2 6PP. Visitors, as always, will find a warm welcome at the new clubhouse, as will potential new members.

Club Secretaries

Please remember to include full details of your club, E-mail and telephone contact details and the postcode of your meeting venue - it helps potential visitors to find you!

SHOWROOM & MAIL ORDER:
Unit 1, Purfleet Industrial Estate,
Off Juliette Way,
Aveley RM15 4YA

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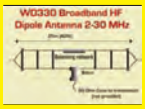

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Connectors	Length	Price
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Heavy duty universal mount. Includes 5m cable **£24.99**

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Geoff Simm's

antenna workshop

Geoff says that you don't need more than one feeder!

Three up, One Down. The alternative feed for your antennas.

Geoff Sims G4GNQ describes a simple system that can help reduce the number of coaxial cable feeders at your station.

How many coaxial cable feeders do you have coming into your shack? Originally I had one for each antenna but your system – like mine – can become much neater. Over the years in the G4GNQ shack, the principle I adopted was for an individual coaxial cable feeder per antenna. All my coaxial cables and a small rotator cable were contained in a 25 by 25mm covered ducting keeping it fairly tidy.

As my antenna farm expanded so did the number of coaxial cables! However, when I purchased a 3-element beam, first I needed a new rotator fed with a much larger cable. So something had to be done, as the ducting was full to overflowing!

Radical action was needed, either I had to increase the size of the ducting or reduce the number of feeders! I chose the latter as occasionally the wrong antenna had been plugged into the transceiver, with some very unexpected results.

Fitted The Bill

The solution I came up with seemed to fit the bill nicely but would it work in reality. Undaunted, I set about modifying the antennas to try the new system. As all my antennas were fed with 72Ω twin feeder from external individual baluns, any external work needed would be minimal.

It's a well-known fact that we can 'common' all the antennas at the feed-point and then continue into the shack using a single feeder. In reality however, you do need space for this procedure in order to reduce any mutual coupling between the different antennas. Sadly, the space I needed is lacking at home so, a compromise had to be made.

The first attempt involved connecting two of the antennas together at the feed point with a single feeder down to the shack. The 72Ω feeder made the job slightly more difficult and trimming to tune each antenna proved difficult due to mutual coupling between each of the antennas. Each of the original antennas was centrally supported on a single mast and fanned out to whatever structure was available for anchoring.

The final solution I came up with was to use 20mm round ducting to space and support all the antennas. This resulted in a much neater array, which also has an acceptable wind resistance.

I then turned to the revised feeding arrangements for the antennas. The obvious solution was to use relays for the antenna switching, provided I could find suitable relays!

A quick scan of my catalogues resulted in finding some suitable relays. These could be mounted on a small printed circuit board (p.c.b.) **Fig. 1**, in a waterproof box and mounted externally close the antennas. In this way each antenna could be fed with twin feeder with a single coaxial cable and control cable coming from the control box being routed into the shack – but would it work? Fortunately, after the development work the answer to that question is an undoubted yes!

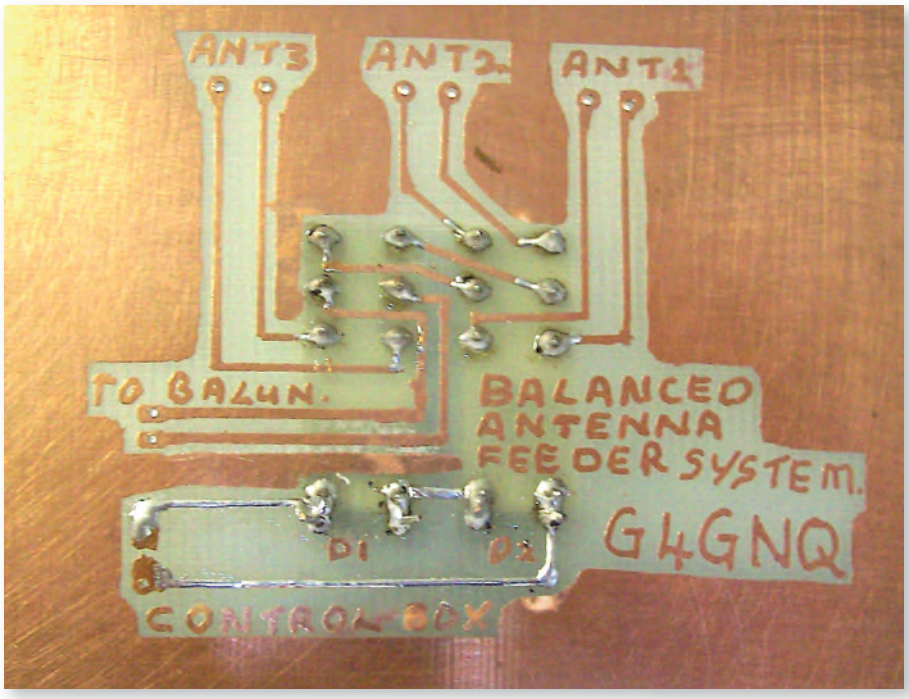

Fig. 1: The p.c.b. that Geoff created for the change-over circuit.

External Switching Unit

The external switching unit consists of two 12V double pole double throw (DPDT) sealed relays capable of switching at least 3A, **Fig. 2**. The relays are mounted on the small p.c.b. in a waterproof plastic enclosure, with the feeders fanning out through waterproof seals. A balun can also be mounted a balance-

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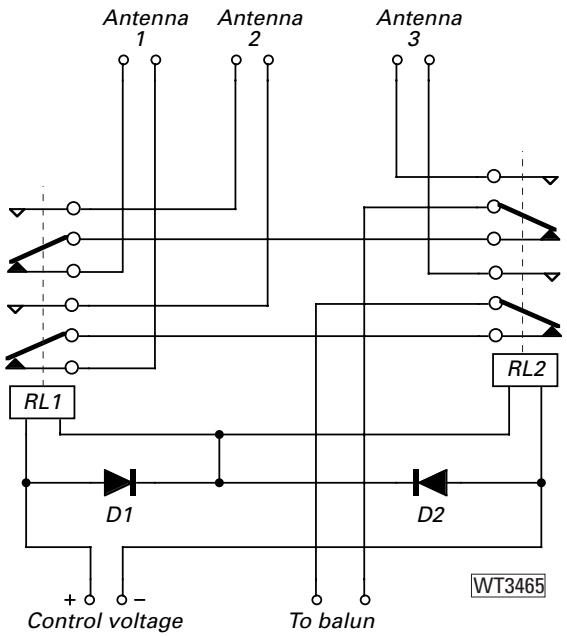

Fig. 2: The circuit of the dual-pole, dual-throw relays that allow three antennas to be used.

to-unbalance (balun) transformer inside to box to complete the installation.

I originally used 'choc block' connectors for connecting the antennas onto the board. Now though, I strongly recommend against this practice simply because over the space of time these connectors do go rusty and become difficult or impossible to unscrew. Additionally. there's the possibility of TVI due to the 'rusty bolt' effect.

Note: Readers might question my choice of splicing twin feeder cable together but although it sounds difficult, in reality it's rather easy. There's no chance of making a mistake as the feeder wires are coloured differently one, being copper coloured the other tinned copper wire.

When the splice is complete simply apply a layer of insulation tape over the completed joint. It's as simple as that!

Antenna Relay Box

I suggest that the p.c.b. is cut to size and fitted into the antenna box before starting any of the artwork. It would be fatal to find out after the etching has been completed nothing would go together neatly and it's also possible to drill through one of the tracks thus, destroying all the hard work.

Next, make a template of the relay base to suit the available relays. **Note:** I suggest that a small scrap of p.c.b. is used to fit one of the relays on. It really will make the final construction so much easier.

Using the template for the relays, mark out the p.c.b., allowing plenty of finger room. Remember there can be four feeder wires and the control wire contained in this box – plus the possibility of a balun.

Thoroughly clean the board to be etched and draw the design pattern. It's imperative the tracks should be kept as straight as possible to retain the radio frequency (r.f.) balance to minimise cross-talk.

Prior to etching, check the track work for any mistakes, now you can etch the board in the usual manner observing safety precautions very corrosive. Remember ferric chloride is very corrosive to both metal and skin so the utmost care is needed and anything it stains remains stained! Also don't discard the used etchant down the drainage system, **it's illegal**.

With the p.c.b. work completed, carefully drill the required holes in the box. It's preferable to drill the holes slightly undersized to ensure each seal will be completely waterproof.

Note: I don't advise using silicone sealing compound component to waterproof feeder wires as it will eventually fail due to feeder movement.

Check the track work with an ohmmeter for any track breaks and if continuity is complete on each track, the two relays can be mounted along with the diodes and power connector. Remember it's important to observe the polarity of the diodes – otherwise

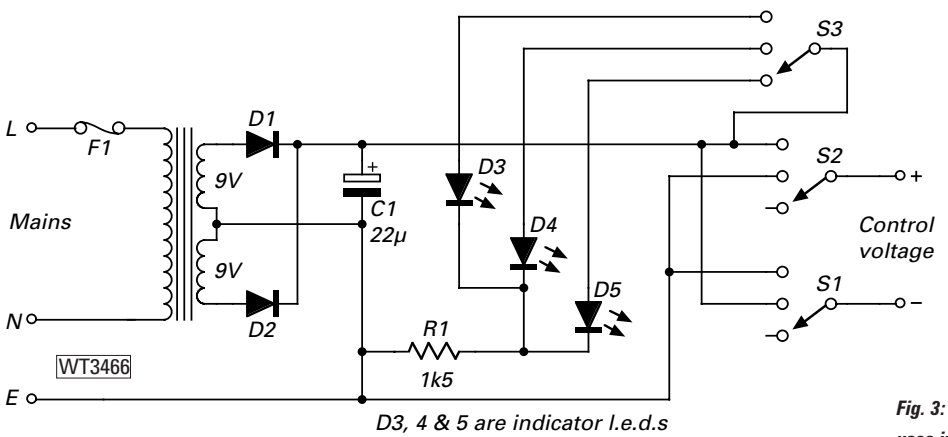

Fig. 3: The circuit of the control box that Geoff uses in his shack.

the switching sequence will not work properly. Finally, solder the four twin feeders to the p.c.b. making sure they are in correct phase.

Before mounting the relay board into the enclosure test the switching sequence and continuity of all the wiring. If it's all working correctly there's just one final job before the p.c.b. is fitted into the enclosure. It might seem a trivial item but I recommend you varnish the rear of the p.c.b. to protect the copper tracks from condensation, etc., and use at least three coats of exterior yacht varnish.

After fitting the p.c.b. into the enclosure finally fit the cable seals and if so desired an r.f connector for the coaxial cable feed. Don't forget to mark power connector with + (positive) and – (negative)..

The Control Box

Constructing of the control box is quite straightforward and no p.c.b. work is involved. All that's needed is a 12V mains transformer, a fuse holder, a bridge rectifier, three light emitting diodes (l.e.d.s), a four-pole three-way switch and some resistors, **Fig. 3**. These components are mounted in a suitable box. If you wish to save the cost of the transformer, any power supply in the shack can be used.

Drill the box to mount the transformer and fuse holder. Next, I used a small piece of perf board to mount the bridge rectifier and smoothing capacitor, with the board being fastened to the side of the box on small stand off insulators. Finally, I attached the control switch to the box lid and drilled three holes for the indicator l.e.d.s.

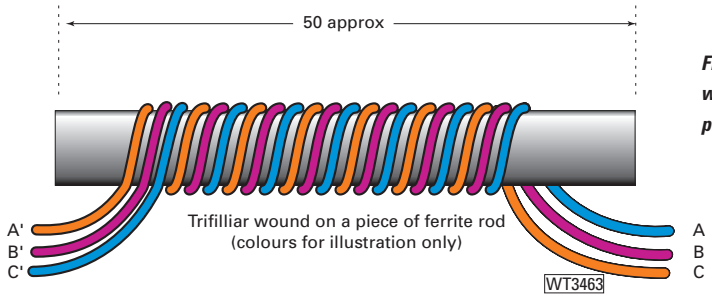

Fig. 4: The balun when built on a piece of ferrite rod.

Fig. 5: The toroid form of balun wound on a suitable toroid core.

Balanced Feeders

From the outset, my system was designed for balanced working to the antennas. Balanced feeders are lightweight, the feeder radiation is acceptable and the feeders for each antenna can be run with minimal spacing without too much inter reaction.

The next job is winding the balun and for this you'll need three lengths of enamel coated 18s.w.g.(1.2mm) copper wire about 250mm long (10in). Then twist or bind them very tightly together, this is the vital part of the process as I've found that after years of constructing baluns this method has proved to give the best results.

You can then either wind them onto a length of ferrite rod, **Fig 4**, with a slight space between each individual turn or use an iron powder toroid. I recommend – for frequencies between 3 and 30MHz – nominally five or six turns will suffice on a ferrite rod.

The aim is to provide sufficient inductance at the lowest operating frequency without an unacceptable reactance at the highest frequency to be used. **Note:** If you use an iron powder toroid the number of turns will need to be increased to between eight and ten turns (perhaps more) evenly spaced around the core, **Fig. 5**.

Clean the insulation from ends of the wire, then using your test meter (switched to measure resistance) test each of the windings for continuity/insulation. The windings can be marked for clarity if you wish, as it's easy to make a mistake at this stage. You then cross connect one of the three windings between the other two to produce a 1:1 ratio transformer. (See the diagrams **Figs. 6** and **7**).

Next, solder the each end of the crossed winding to the end of the third marked wire together.

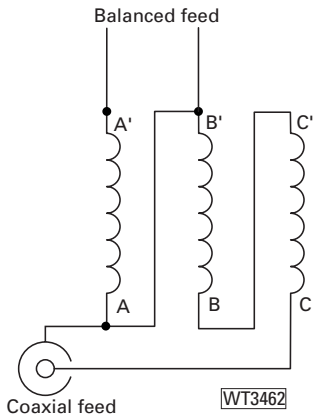

Fig. 6: The balun shown in a semi-diagram style.

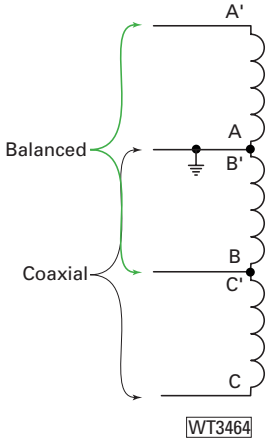

Fig. 7: The balun as it appears logically.

You should then be left with two connections at each end. If you have done the job correctly you should be able to detect a short circuit on either end. **Note**: It doesn't matter which end is connected to the unbalanced feeder.

Before fitting the balun into the enclosure I suggest you test your handiwork by applying some r.f. to the balun in conjunction with a resistive load and standing wave ratio (s.w.r.) meter to make a functional test. You should get an almost 1:1 s.w.r. – anything other than that means that there's a problem that needs to be resolved.

Feeding The Antenna

Feeding the antenna shouldn't pose any problems. Having mounted the box in a suitable position, connect the control cable and the coaxial cable to the balun. **Note**: If you use an r.f. connector on the box, ensure that the coaxial cable and connector is waterproofed with self-amalgamating tape.

My installation consists of an 3.5, 7 and 18MHz dipoles centrally supported on a 3 metre pole, **Fig. 8**. The balanced feeders are each spaced about 20mm apart and supported clear of the metal mast with an odd length of 20mm tubing. This prevents excessive movement to the feeders and keeps the assembly reasonably tidy.

The antennas are supported from the pulley by the knotting the rope through the eye of each antenna insulator, then, the feeders drop down the pole and are terminated in the switching box. I used 5A strip power connectors.

Be careful to observe the phase of the feeders and normally twin feeder has one bare and one tinned copper wire as a guide. When you have made the connections in the box fully tighten the seals and fit the lid in place, if you have obtained the correct box the housing should be fully weatherproof. You can run a layer of tape around the box joint to prevent ingress of water as added protection.

The antenna spacers are made from 20mm poly pipe. Each spacer is 250mm (12in) long in which you drill three equally spaced holes through the pipe. This is best done in a portable workbench to prevent the pipe from twisting. The antennas are threaded through the holes in the poly pipe and fastened with a binding wire.

The number of spacers required is dependant of you antenna system but I found the minimum requirement to be four spacers on each side without the wires tangling together. (See the diagram for support system).

Once the installation has been completed, working on the antenna system is very much easier. You can easily change to a different band by simply lengthening or shortening one of the dipoles and its associated spacers without adversely affecting the tuning to the other antennas.

I've used mine for well over five years and I'm replacing the relay box – not because it's worn out – it's simply a matter of routine resulting from my training as a railway telecomms engineer.

Finally one word of warning – never operate the switch on the antenna changeover box during transmission as it may damage or destroy the final power amplifier (p.a.) transistors, (costly) but such an action will also certainly cause damage to the relay contacts.

However, under normal use I've never had a relay flash over even when using 400W under both normal and high s.w.r. conditions. Yes – the system is really that good! ●

Shopping List

Relays: - RL1 RL2. Sealed miniature relay 5A DPDT 12V.
Diodes: - D1 and 2. 1N4001.
Three l.e.,d.s 1, 2, 3: 3mm Red.
Transformer 1. Pri: 240V, Sec: 9-0-9V @100mA.
Capacitor C1. 220μF /25V working electrolytic.
S1, 2, 3: 4-Pole 3-way. (Break before make preferred).
Pointer knob.
20mm Fuse holder
20mm fuse 500mA.
Single sided p.c.b. approx 100mm by 75mm
Box, 120/80/55 mm, approx. (prsonal choice).
Cable seals: Three, M12 by 1.5mm. (362-0045 - RS components.)
Aluminium box: 100mm by 100mm by 65mm approx for control unit in shack.
Short length of ferrite rod. Approx. 9.5mm diameter.
Or T200 toroid.
18s.w.g. (1.2mm) insulated copper wire. (125gm reel.)
BNC Round Chassis socket. (Optional).
20mm Polypipe.
Antenna centre insulators to suit.

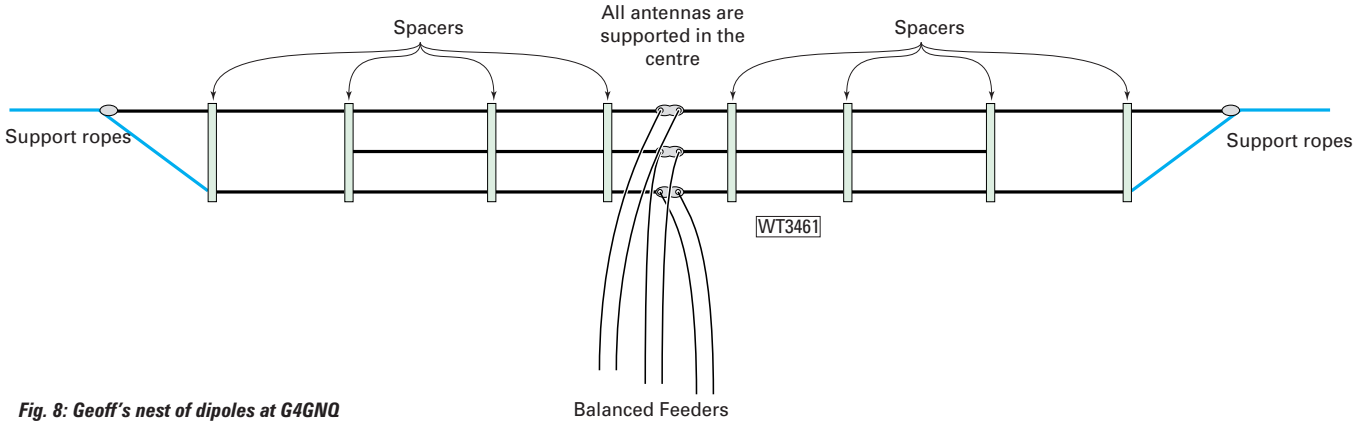

Fig. 8: Geoff's nest of dipoles at G4GNQ

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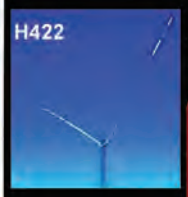

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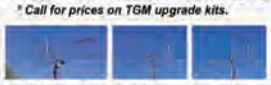

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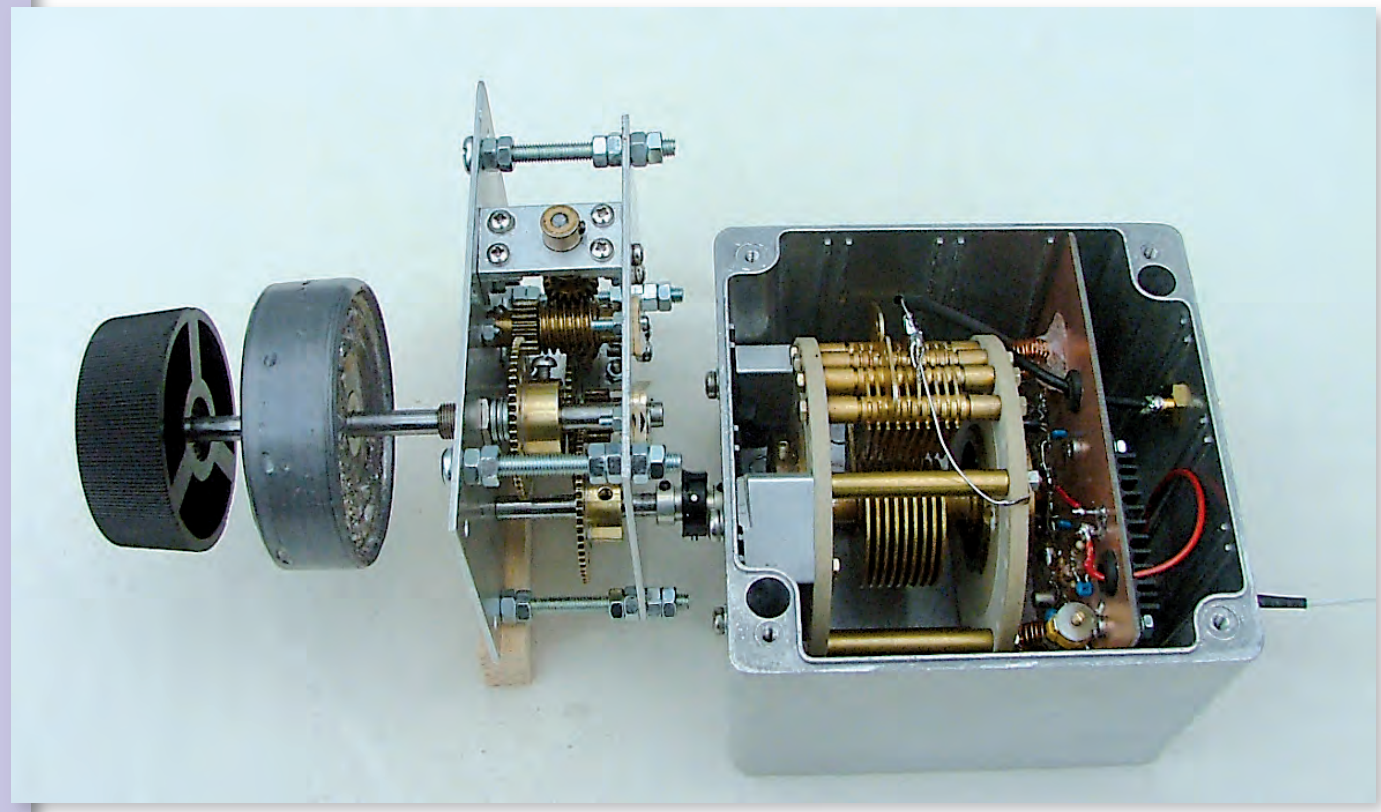
Feature

Building a Transceiver & Gearing up for Tuning



Mike Brett's completed tuning assembly using Meccano gearing. The Meccano gearbox is in the centre, with the 'lumpy' flywheel seen mounted behind the tuning knob.

I've been working on a large project for some time now, namely a multi-band superhet transceiver using modules from various sources and it was all coming together very nicely. I managed to obtain a high precision air spaced capacitor for the variable frequency oscillator (v.f.o.) and eventually needed a slow motion drive for the tuning.

I initially tried Jackson Brothers ball drives and to obtain the high reduction I needed, I tried three in series but even this was not high enough a reduction for tuning! Worst still was the fact that it almost needed a pair of pliers to turn what had become a very stiff assembly. This wasn't what I had in mind at all!

What I wanted was fly-wheel tuning so my attention turned to gear drives. I found several stockists on the internet but prices for their precision gear wheels was way beyond what I wanted to pay. Then my thoughts turned to my childhood passion, Meccano. Although not made in this country at the famous Binns Road, Liverpool factory anymore, a quick look on E-bay revealed gears of every size and description.

Meccano Gearing

In the event, I managed to get ten gear wheels, which included two worm-drives for the bargain price of £11.55. From another seller I purchased six Meccano spindles for £1.49. I only used eight of the gears for my reduction drive, the worms doing most of the work.

I thought that back-lash might be a problem but for something that is basically a child's construction toy (sorry Meccano fans) Meccano gears are very well made. Provided care is taken in mounting them properly, they mesh beautifully and back-lash shouldn't occur.

I started by building a frame from some old Meccano plates that I had in my junk box, **Figs. 1** and **2,** and if you haven't got any of these, a look on E-bay should help. Then spend some time trying the gears in different

Mike Brett 2E0LTJ puts Meccano gearing – a favourite of children of all ages – into use for fine tuning a transceiver!

positions until you've reached the reduction for your particular needs.

The ratio of my reduction drive is 1080:1! This may sound rather on the high side but when you consider that my variable capacitor only has to turn one-quarter of a turn to cover each entire band, that equals 270 turns of the main tuning knob, which is comparable to my main shack transceiver.

My gear box is built up from pieces of scrap aluminium and as some of the spindles turn at a higher rate, I added precision brass bearings. These were made from two brass hinges from B & Q cut in half).

Building A Gear Box

First, for those of you who think that building a gear box may be difficult, I should mention that I only have simple hand tools. This is backed up by a bench vice and a small bench pillar drill.

Start by cutting out two plates to form the sides of your gear box from reasonably thick aluminium, I used 2mm thick plate. Clamp them together and drill four holes, one in each corner, to take the bolt spacers – I used number five bolts.

All subsequent holes should be drilled with the plates bolted together. Marking out where to drill the holes for the spindles couldn't be easier. Simply note the holes where the spindles pass through the Meccano plates on your mock-up and use one of these as a template.

Meccano spindles are 4.02mm thick. However, you're unlikely to have a drill of this size in your tool box. To get a nice snug fit and gears that don't bind – do the following. Drill a hole through both plates using a standard 4mm drill. Next, put the Meccano spindle in the chuck and press this on to the hole. Being of harder metal, the spindle will pass through the hole in seconds. Leave the drill running for about another 30 seconds and this will leave you with a perfect play-free bearing.

A problem I encountered (you will too!) is the fact that capacitor spindles, and the knobs that fit them, are usually quarter-inch or 6.35mm. If you try to drill a hole as large as this in a Meccano wheel boss, there won't be much of it left, certainly not enough to take a grub-screw. My solution was to drill out the old Meccano boss and solder on a larger one cut from a 19mm brass bar, **Fig. 3**.

If, like me, you don't possess a very large soldering iron, maybe there is someone at your club who could help. The new boss will need drilling and tapping to take the grub-screw. Incidentally, don't throw away the old bosses. If you drill them out carefully, you can use them as retaining bushes on the spindle ends as I've done.

When it comes to the worm gears, one of these will have to be mounted at right-angles to the other shafts. I have made the bearing plates for this shaft from off-cuts of aluminium angle. Mount the shaft on the plates and make sure the gears mesh perfectly before drilling through holes for securing. As mentioned, I used pieces of brass cut from a hinge to enlarge the bearing surfaces of the first two spindles in the gear chain, **Fig. 4**.

Running Tight?

If upon final assembly, any of the spindles are running a bit tight or the gears are binding – don't make the mistake of reaching for the oil can! Find out first where the problem lies and then a little careful use of a needle file should sort it out. Once you have it running smoothly dry, then you can apply a little oil and it will be as smooth as silk.

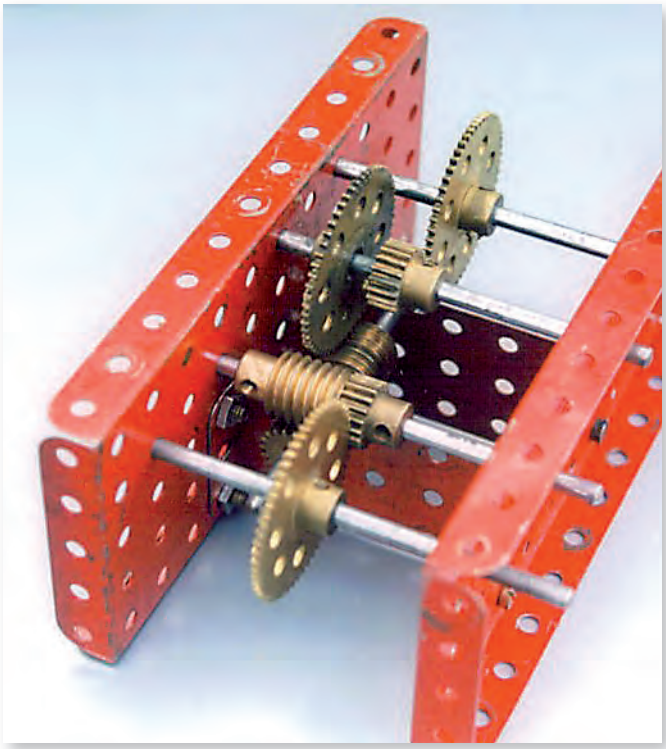


Fig. 1: Using Meccano plates for the gear box. All the holes on the plates are standard-sized and positioned on the plates.

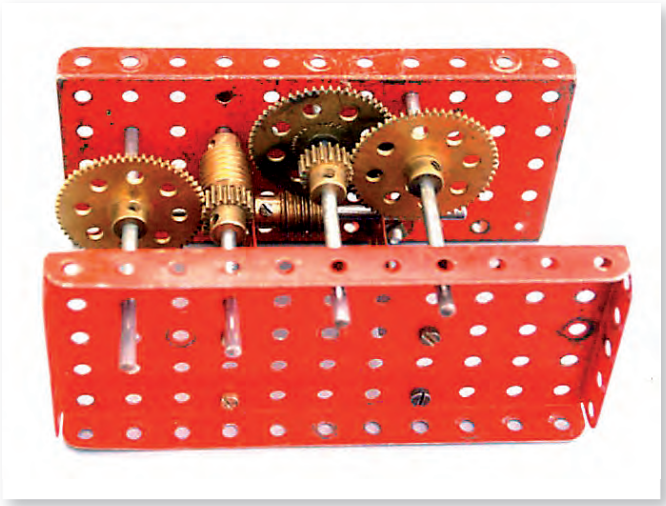


Fig. 2: Side-on view of the gearbox, showing standard hole positioning.

For real fly-wheel tuning you'll need some sort of weighted wheel to give it torque. I made mine by first making another boss from the 19mm brass bar. This was then tapped and drilled for the grub-screw.

I then made four extra holes below this, drilled and tapped, into which I screwed four one inch screws. You should end up with something that looks like a spoked wheel, without the rim. I then placed it in the bottom of a suitably-sized tin can and poured molten lead over the whole assembly.

The one inch spokes act as a key for the lead. Once it had cooled, I spun the whole assembly in the chuck of

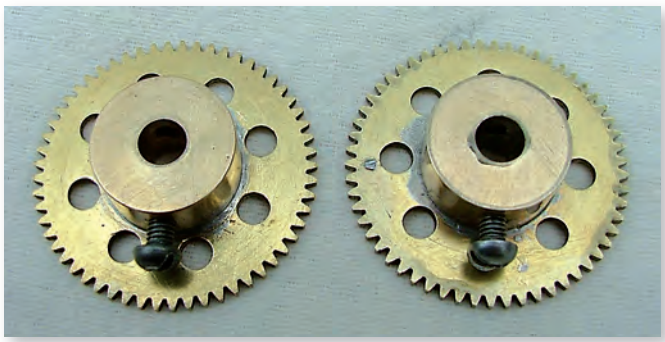


Fig. 3: Renewing the centre boss by soldering on a larger unit.

my drill and shaped it with a file and emery paper. **Note**: The 'flywheel' is the 'lump' behind the control knob in the heading photograph.

The Bee's Knees!

Having now tested the drive in my rig, I can say it really is the bees knees! Spinning the large tuning knob, I can quickly traverse the dial from one end to the other. However, if I want to fine tune, turning the knob slowly I can't perceive the capacitor turning. It really is slow motion – so get geared up and try it for yourself! ●

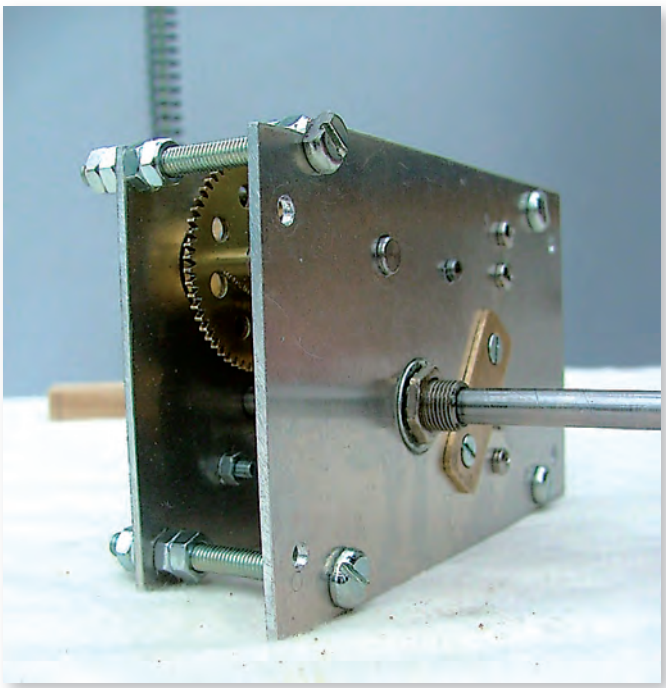


Fig. 4: Using an extra piece of brass (cut from a brass hinge) to increase bearing surface area.

rallies

Radio rallies are held throughout the UK. They're hard work to organise so visit one soon and support your clubs and organisations.

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September 14th
Lincoln Hamfest
Roger. Tel: (01522) 693848
E-mail: hamfest@g5fz.co.uk
The Lincoln Short Wave Club will hold Hamfest in Lady Eastwood Hall at the Newark & Notts Showground, Lincoln Road, Winthorpe, Newark, Nottinghamshire NG24 2NY.

October 5th
Autumn Militaria, Electronics & Radio Amateur Hangar Sale
Rod Siebert. Tel: 01270 623353
www.hackgreen.co.uk
The Autumn Militaria, Electronics & Radio Amateur Hangar Sale will be held at the Hack Green Secret Nuclear Bunker, Nantwich, Cheshire CW58AP.

October 10th - 12th
RSGB HF Convention
www.rsgb.org
The RSGB HF Convention will be held at Wyboston Lakes Conference Centre, Great North Road, Wyboston, Bedfordshire MK44 3AL.

October 11th
Chesterfield Rally
Martin. Tel: (01246) 217499
E-mail: martin.briddon@ne-derbyshire.gov.uk
http://GB3EE.com
The GB3EE Repeater Group Chesterfield Rally will be held at Hasland Village Hall, Eastwood Park, Hasland S41 0AY (M1 j29/30). Doors open 10am - 4pm and there will be trade stands and a Bring & Buy.

October 12th
Great Lumley AR & ES Rally
David Barclay. Tel: 0191 3888113
E-mail: m0bpm@btinternet.com
Great Lumley Amateur Radio and Electronics Society Annual Rally will be held at the Great Lumley Community Centre, Great Lumley, Front Street, Chester-le-Street, Co. Durham DH3 4JD. Doors open at 10.30am. There will be trade stands and a Bring & Buy.

October 19th
Blackwood & DARS Rally
Dave. Tel: (01495) 228516
E-mail: ddlewhbk@btinternet.com
www.gw6gw.co.uk
The Blackwood & DARS Rally will be held at Coleg Gwent, Risca Road, Crosskeys NP11 7ZA. Admission is £2 and doors open at 10am for disabled visitors and 10.30am for others. There will be trade stands, a Bring & Buy and special interest groups as well as plenty of parking.

Galashiels & DARS Radio & Computer Rally
Jim. Tel: (01896) 850245
E-mail: ngm7lun@qsl.net
The Galashiels & DARS Radio & Computer Rally will be held in Volunteer Hall, St John's Street, Galashiels TD1 3JX. Doors open at 11am and entry is £2. There will be trade stands and a Bring & Buy.

October 24th & 25th
Leicester Amateur Radio Show
Geoff Dover. Tel: (01455) 823344
www.lars.org.uk
The Leicester Amateur Radio Show will be held at Donington Park, Castle Donington, Derbys DE74 2RP. Doors open 9.30am to 5.30pm on Friday and 9.30am to 4.30 pm Saturday.

November 1st
14th RADARS Annual Traditional Radio Rally
Dave. Tel: 07710243017
E-mail: dave.shaw@zen.co.uk
The Rochdale and District Amateur Radio Society (RADARS) will hold their rally at St Vincent's Church Hall, Caldershaw Road, Rochdale OL12 7QL starting at 10.30am. Entrance will be £2.00 (concessions for U 12s and seniors), which includes a donation to The Floyd Neuro-Rehabilitation Unit. There will be trade stands and flea market together with a large Bring & Buy stall. Refreshments will be available including the famous bacon butties.

Want your rally to appear here?
Then send all the details in an E-mail to:**newsdesk@pwpublishing.ltd.uk**

Harry Leeming's

in the shop

This month Harry G3LL looks at a timing circuits and the cleaning of switching and wiping contact radio components.

Welcome to *In The Shop* where I think that necessity is the mother of invention! Invention and innovation are often more a matter of being in the right place at the right time, and having the right assistance, rather than great skill. After my National Service in the Royal Electrical and Mechanical Engineers (REME), I went to work for my future father-in-law to repair tape recorders and film projectors and to develop the electronic side of his photographic and audio business.

The shop did quite a turn over in the older non-automatic cameras but particularly with second hand items, although selling these sometimes resulted in irate customers with ruined over-exposed films. This was usually due to a faulty mechanical shutter running slow and so in the late 1960s a member of staff had a bright idea and asked me, "Can you make us an electronic camera shutter speed tester?"

I wasn't at all interested in photography then and knew nothing about camera shutters! Despite this the problem intrigued me and we ended up developing and patenting what UK and USA photographic magazines described as 'The World's first low priced easy-to-use camera shutter tester'.

First I started telephoning some of the companies that we sent cameras to for repair, and was shocked to find that many of them had no electronic means of checking the speed of a shutter. Instead. 'they relied on experience'!

Librarian Referenced

I telephoned the nearest equivalent we then had to the modern Google search engine, one of my hi-fi customers Blackburn Librarian **Brian Darbyshire**. Within a day he had assembled a marvellous selection of books and photocopies, giving full details of the international standards for camera shutters, the test methods and theory of operation.

I found that a camera shutter does not open instantly but during quite a proportion of the total time, it's only partially open. When a speed is labelled – let's say '500', it doesn't mean that the shutter has to be fully open for a 500th of a second (2ms).

Instead, the shutter may be partially open for a longer time – perhaps three hundredths (3ms) of a second – but it must let the same total amount of light through and expose the film by the same amount, as if it had been fully open for five hundredths of a second (2ms). This is named the 'effective exposure', and according to the international standards, this is what had to be measured. Incidentally, the accuracy required for the camera shutter speeds was in the region of ±25%.

My mind when back to my training as a television engineer to the lectures about capacitors charging and I started experimenting. The circuit in **Fig 1** is very simplified version of my first efforts, and presumes that the photo-sensitive device has zero source impedance.

The charge going into the capacitor is proportional to the strength of light falling on the photo-transistor and to the length of the pulse, it's inversely proportional to the value of the resistor, which can be altered for different speed ranges.

The charge going into the capacitor, C1, becomes very none linear as it becomes charged. However, it's reasonably linear if it's only used over the first 10 or 15% of charge, to say 'X,' it's virtually a straight line, **Fig. 2**. This bit seemed to work but now how could I measure the charge?

In operation C1 had to hold the charge – so what should the value of the capacitor be? Additionally, as the capacitor was in the timing circuit it had to be stable in value and of very low leakage, hence it could not be an electrolytic.

How long a capacitor holds its charge depends on the time constant of the capacitor and the resistance in parallel with it, (time constant in seconds = C * R). As the largest value of polystyrene capacitor I had was 2.2μf, it would discharge to about 37% of its charged voltage in two seconds with a 1MΩ load, (0.0000022F* 1000000Ω = 2).

I wanted it to hold 99% of its charge for long enough to give a steady meter reading and so I decided that the input impedance of the metering circuit 'M' was going to have to be over 1000MΩ. In those days the high impedance field effect transistors (f.e.t.s.) were rare, expensive and would not stand much voltage. How then could I wire up a couple of 10 pence transistors and one resistor to make up a buffer stage

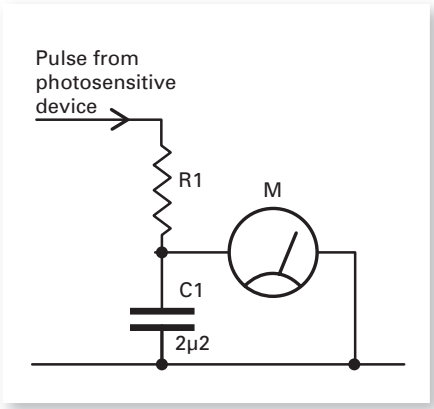

Fig. 1: Harry's original simple circuit– developed many years ago – for checking camera shutter speeds posed some interesting electronic problems.

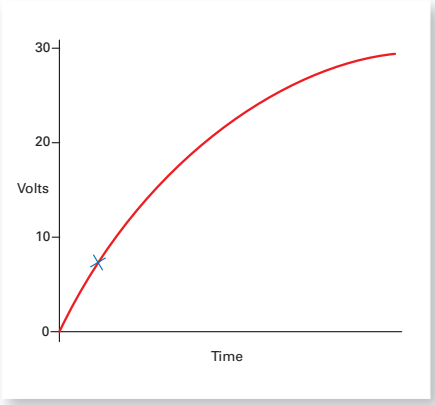

Fig. 2: Showing the charging curves of the electrolytic capacitor.

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Fig. 3: Three types of cleaner that Harry recommends but don't forget each has its own use!

that will achieve this?

Additional questions remained: What was the best photo sensor to use and why do seven transistors made with exactly the same process at the same time on the same production line, end up having seven different numbers stamped on them?

Luckily we had a friend who was a Mullard technician, watch this space for the answers to my design problems!.

The FDK Rigs

The FDK very high frequency (v.h.f.) frequency modulated (f.m.) rigs such as the 'Multi 700' were very popular some years ago. They were well priced, simple to use and reliable. However, problems started when FDK brought out the 'Multi 750', which was a very nice 144MHz multi-mode mobile unit.

After a while the '750 started to develop various intermittent faults. The unit used a double-sided printed circuit board (p.c.b.), on which the connections between the two sides were made with a dozen or more pins. Unfortunately, something on or around the pins had made them resist bonding correctly to the solder and hence after a year or so some of the rigs had quite literally become a 'box of dry joints'!

There must be still many of these rigs lurking around in dusty corners, which the owners have given up as unrepairable. This is a pity as apart from this fault, there's something nice about these easy-to-use rigs.

Of course, I realise from my many years servicing equipment that intermittent faults aren't something that can always be economically repaired on a commercial basis. However, in the case of a none functioning FDK 750, I think it's well worth having a go yourself.

By looking carefully at the p.c.b. panels the many short pins will be seen, along with the odd component soldered on the top and the bottom of the boards. These are the troublesome connections!

Next, carefully look for and examine all the top and bottom joints. Finally, re-solder them all with a really hot soldering iron and a little fresh solder and with a bit of luck the rig will then spring back into life!

Contacts & Controls

One of the failings of human nature is that we presume that people know things we haven't told them! I've often referred to cleaning controls and switches but I recently received a very nice letter, plus stamped addressed envelope, from a gentleman in his mid 80s asking **how** to clean the switches and contacts on his FT-101ZD.

After the letter arrived, I thought some general advice might help – so off we go! To work on most Amateur Radio equipment we need two or three kinds of cleaner. First, a cleaner that has no lubricant included such as ***Servisol Aero-Klene 50***, second a cleaner that includes a lubricant such as ***Servisol Super 10***, and possibly some ***WD40***.

All the cleaners/lubricants shown in **Fig. 3** are obtainable from Maplin and quite a few other electronically orientated businesses. However, whatever cleaner you personally choose, please ensure you try a small spot on a corner of the switch first and be very careful as to where any excess drips. I well remember as an apprentice, spraying a valve holder that totally melted and I also accidentally removed the paint from a radio's tuning scale with some cleaner!

There are basically three kinds of contacts that are likely to need cleaning. First, there are the contacts such as those in rotary switches that wipe over each other and are to some extent self-cleaning. Secondly, contacts that just make and break without rubbing against each, such as those in relays. Thirdly, contacts that never normally move such as plug-in circuit boards, or valve pins.

Rotary switches are best cleaned by first applying a cleaner that has no lubricant included, and then before the switch has time to dry, rotating it quickly a few times. This should clean up the contacts but if they are left without lubrication they will wear out quickly due to friction. So, to prevent problems apply a small amount of cleaner that includes a lubricant, rotate it a few times and then leave the switch to dry.

Cleaning Relays

Large relays should be removed and the cases taken off. To clean them, draw a car spark plug feeler gauge through the contacts whilst wetting them with a cleaner that does not contain lubricant, and does not leave a deposit of any kind. Do this a few times and providing that the relay is not too worn, it should then operate reliably.

Note and warning: Relay contacts don't slide over each other. Anything left behind will eventually result in a bad contact, and can be extremely difficult if not impossible to remove. Please **do not** use cleaner with lubricant on relays.

Next, it's on to small relays that can't be removed and only switching low voltages. First, note and mark as to which way round the plastic cover

fits before removing it. If you don't do this you will regret it!). Spray with a cleaner without lubricant, power up the rig, and press the push-to-talk (p.t.t.), or what ever control is needed to make the relay operate, quickly for a few dozen times while it's still wet. Power down the rig, re-fit the relay cover, and all should be well.

Slide switches and push buttons can normally be cleaned in the same way as rotary switches although some don't seem to respond to this treatment. So, when all else fails, as it seems to on the variable frequency oscillator (v.f.o.), the clarifier buttons on the FT-101ZD, and on the I/C switch on the earlier FT-101s, I find WD40 seems to do the trick.

Note: Although I wouldn't recommend the smelly messy WD40 for general control cleaning – but in this case as it works I use it.

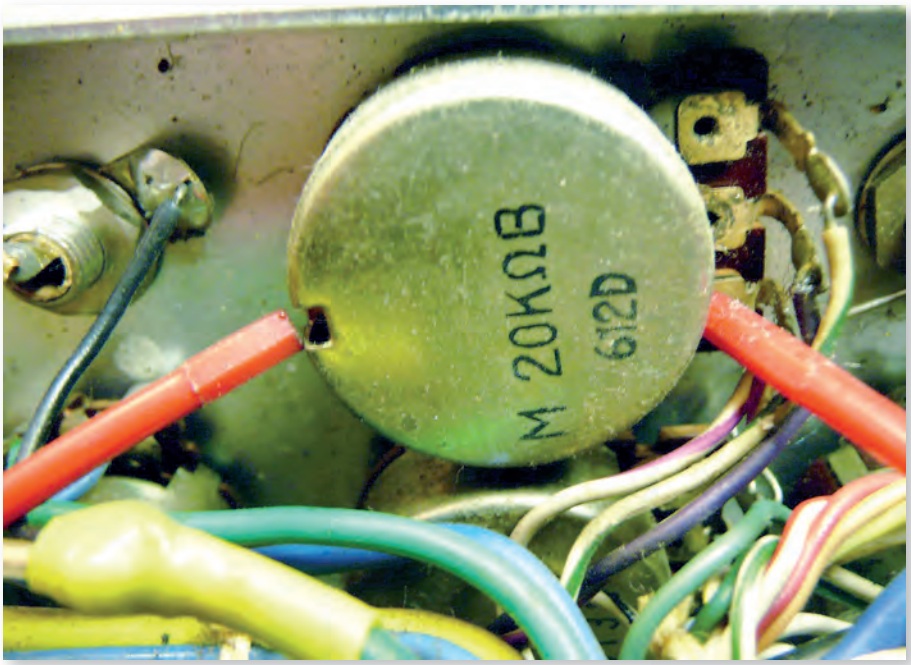

Fig. 4: Cleaning components is possible either through small inlet holes or from underneath, as shown here.

Potentiometers & Other Components

Potentiometers, such as volume controls, should be sprayed with a cleaner that includes a lubricant, rotated two or three times, and then left to dry. Note that some controls have a little hole in the case through which cleaner can be sprayed, on others access for cleaner is via the base of the solder terminals, as per **Fig. 4**.

Circuit boards of the plug-in variety (and other plugs and sockets) often develop unreliable contacts. Remove the plug or board, clean its contacts with a clean cloth and some non-lubricated cleaner, spray the socket and while it's still wet plug it in and out a few times.

The larger octal valves and holders don't usually give trouble but the smaller ones with a glass base (B7G, B9A types, etc.) may need cleaning. Remove the valve, clean the pins with a penknife or small file, spray the holder and then plug the valve in and out a few times as I've already mentioned. If the holder has lost its tension (grip onto the pins) carefully tighten the contacts by using a needle between the outer pin clip and the holder, which forces the clip together to provide a firmer grip between the holder and valve pin .

Note: Avoid using large quantities of cleaner with lubricant as it will attract dust, and do not apply power to any high voltage circuit until the cleaner has dried.

Finally, here's something to think about. In most libraries, books about computers are next on the shelf to those on Witchcraft and Paranormal. Are they – perhaps – trying to tell us something? Cheerio until next month. ●

Problems

I like to hear about problems with older equipment, particularly pre 1990 Yaesu rigs. Please E-mail me, (add some radio related term in the subject heading, to differentiate against spam), or write and enclose a stamped addressed envelope. Remember that electricity is dangerous, if you're not familiar with safety precautions you must never work on your equipment whilst it's plugged into the mains. (Switching off at the wall socket does not necessarily make equipment safe).

David Butler's vhf dxer

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David Butler G4ASR has reports of Sporadic-E openings during during the month of July on the 50, 70 and 144MHz bands.

Many UK operators have been heard bemoaning the lack of Sporadic-E (Sp-E) propagation on the v.h.f. bands during this year's summer season. Openings via this mode got off to a good start in May with 50MHz openings nearly every day throughout the month.

The 70MHz band was also open for DX contacts particularly during the last two weeks of May. There were even two openings on the 144MHz band with one event to Portugal (CT) and the other to stations in Russia (UA). All-in-all it looked a good start – but as the Sp-E season unfolded it was obvious to many operators that propagation was definitely much poorer than in previous years.

Although there were 50MHz openings virtually every day during June there were no real instances of blanketing Sp-E that covered large areas of Europe for hours at a time. Instead the openings on the 50MHz band were quite poor both in intensity and duration. However, there were 17 days during June when the transatlantic path opened up with contacts being made into both orth and South America. Considering the lack of E-layer propagation throughout much of Europe the path to North America was most surprising indeed.

The 70MHz band suffered somewhat but nevertheless the band was open for DX contacts – although some openings were quite brief – on 21 days during June. Most disappointing though was the lack of any substantial Sp-E openings on the 144MHz band with just over one hour's worth of openings spread over four events during the month.

Situation Changing?

Many stations were hoping that the situation would change during July but it wasn't to be! Day after day there was hardly any Sp-E propagation on the 50MHz band during the morning hours, the situation slightly improving during the afternoon and early evening periods. Even so, there was still some form of Sp-E opening everyday during the period except for two days during July.

Interestingly the transatlantic path proved to be the saviour for those looking for DX contacts with a total of 15 days during July with openings into North and South America. Conditions on the 70MHz band were fairly similar to that on 50MHz, with Sp-E openings more likely to occur after 1500UTC rather than the morning hours.

Surprisingly though, the band was open nearly every day during the month with only three days when nothing was reported. It was again the 144MHz band that really suffered, in terms of Sp-E propagation, with only six events being reported during five days in July.

The 70MHz Band

In fact, Sp-E propagation was reported on the 70MHz band every day during July except for the 8th, 21st and 29th. Most of the openings though, were of fairly short duration, mainly in the late afternoon and early evening period.

On July 11th after I spent a day of listening to white noise, the 70MHz band sprang into life via Sp-E propagation between 1600-2045UTC. At my 70MHz station, consisting of a TS-660 transceiver, a home-made transverter and a pair of 7-element DK7ZB Yagis, I made c.w. and s.s.b. contacts with the stations of CT1HZE, I1NAI, I3VWK, I4CIL, IW4BET, IK5MEN, IZ5EME, OK1MAC, OK1MP, OK2POI, S57A, S59MA, 9A1Z, 9A2SB, 9A2ZH, 9A3LN and 9A6R.

The stations of 9A1Z and S51DI were also worked on the f.m. calling frequency 70.450MHz. Best DX of the evening were QSOs with IT9DLN (Sicily) at 2023km, IZ8DWF (Italy) 2112km, SV2DCD (Greece) 2253km, SV8CS 2429km and SV1DH at 2611km.

Daran Josey MW0HMV (Carmarthenshire IO71) reports that he was active in the opening on July 11th between 1715-2035UTC. You can see his impressive shack in the photograph, **Fig. 1**. He made s.s.b. contacts with the 70MHz stations of CT1EAT (IM68), I0DLP (JN61), IK0NOJ (JN61), I4CIL (JN64), IK5MEN (JN53), IZ8DWF (JN67), OK1MAC (JN79), OK2POI (JN99), 9A3LN (JN95) and

Fig. 1: The shack at the station of Daran Josey MW0HMV.

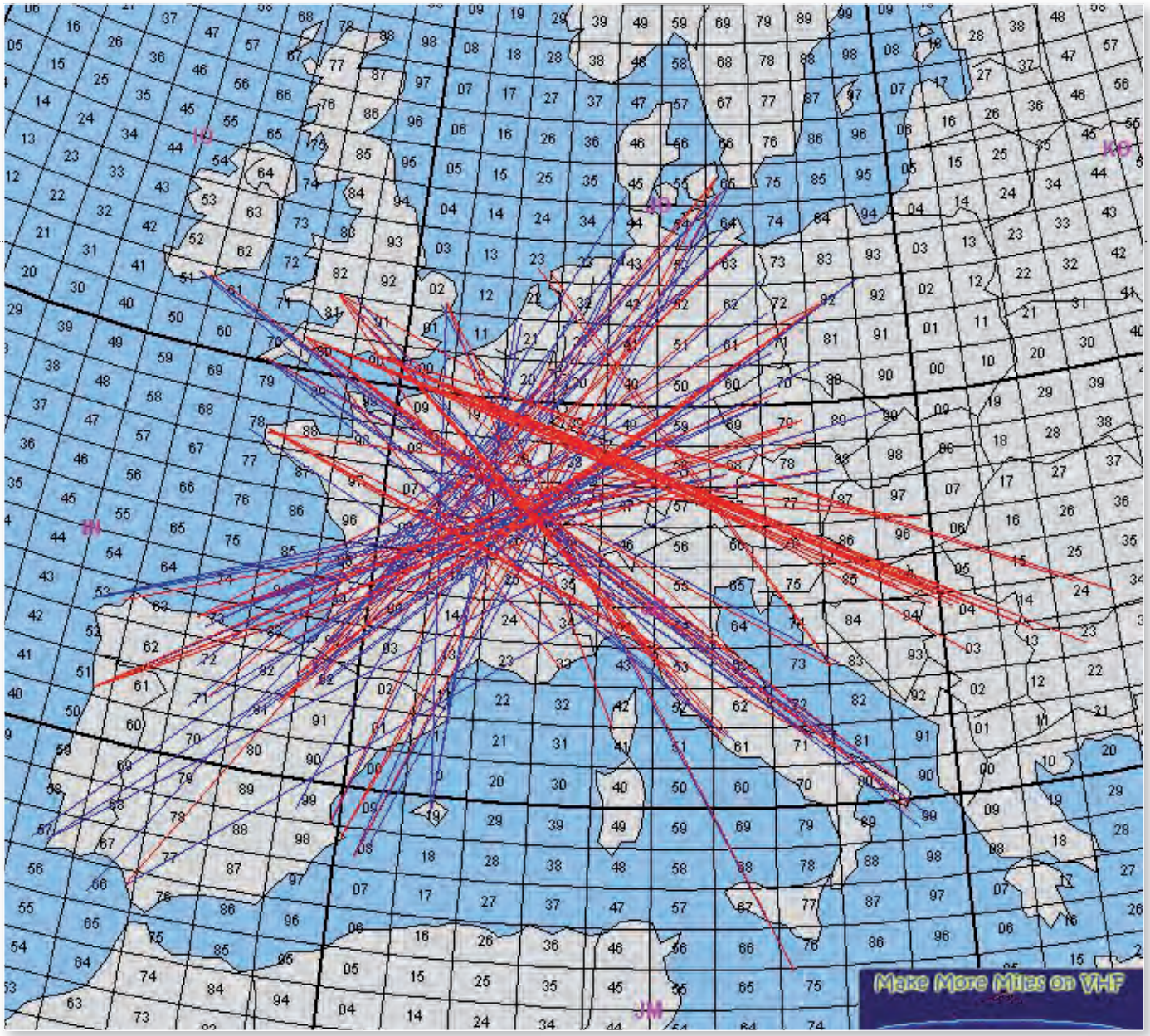

Fig. 2: The 144MHz Sporadic-E opening on July 2nd 2008.

9A6Z (JN75). Contacts with Greece were a new DXCC country for Daran and he managed to contact SV2DCD (KN00), SV8CS (KM07) and best DX of the evening SV1DH (KM27) at 2765km. Daran mentions that the furthest he's worked on the 70MHz band is a contact made in May 2007 with the station of SV9GPV (Crete KM25) at 2925km.

However, even further distances have been accomplished this year! On July 12th at 1650UTC the stations of **CT1HZE** (Portugal IM57) and **W3EP** (USA FN31) completed a 70 to 50MHz cross-band QSO over a path length of 5334km. **Emil Pocock** W3EP reports that he had been in 50MHz contact on and off with **Jo** CT1HZE who was periodically transmitting on 70.200MHz.

At 1650UTC Emil copied Jo sending both callsigns in c.w. on 70MHz and immediately went back to 50MHz to conduct the first 70/50MHz Europe-to-USA contact. But it wasn't the first Europe-to-North America cross-band QSO. No doubt, some readers will remember that last year – June 2007 – the station of **G7CNF** completed a 70/50MHz c.w. contact with **VE9AA** over a 4612km path. But even that wasn't the first 70/50MHz transatlantic QSO as the first authenticated contact was achieved some 28 years ago!

The evidence of DX possibilities on the 70MHz band came in January 1957 when the station of W2ZKE (USA) claimed to have heard G3EHY. Later in the same year in November 1957 the station of W2IDZ heard UK Amateur signals around mid-afternoon but was unable to confirm any callsigns.

It was two 11-year Solar Cycles later at 1627UTC on November 17th 1980 when the first authenticated transatlantic cross-band contact took place between **G4BPY** on the 70MHz band and **VE1ASJ** on the 50MHz band over a distance of 4591km. Then, almost one year to the day on November 4th 1981 the transatlantic path was broken again with the Canadian station of **VE1ASJ** making cross-band contacts from the 28MHz band with the 70MHz stations of **G4JCC** at 1356UTC and **GW4HXO** – for the first GW – at 1422UTC.

Further cross-band contacts were made on December 8th 1981 with VE1ASJ – this time on the 50MHz band – completing QSOs with **EI6AS**, **EI6DT**, **G2AOK**, **G3APY** and **GW3MHW**.

All the cross-band F2-layer contacts were made in the period November-January at the peak of the Sun Spot cycle. The contact in 2007 between

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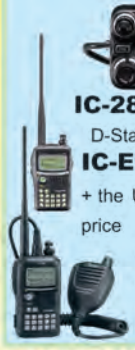

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G7CNF and VE9AA and the most recent one in 2008 between CT1HZE and W3EP were achieved via Sp-e propagation in the June-July period. Interestingly, all previous F2 and Sp-E assisted cross-band contacts from the UK have only been made with Canadian stations. No one yet has made a UK to USA 70/50MHz QSO. Maybe you will be the first to achieve it!

The 144MHz Band

Although Sp-E propagation was relatively poor on the 50 and 70MHz bands there were occasions when ionisation was sufficiently intense to enable long distance (DX) contacts to be made on the 144MHz band. These type of openings occurred on July 2nd, 9th, 10th, 11th and 30th and I'll now take a look at them in more detail.

There were actually two opening on July 2nd with the first in the early morning to the Balearic Islands (EA6), Corsica (TK), Croatia (9A), Italy (I) and Malta (9H) and the second early in the evening to Bulgaria (LZ), Romania (YO) and Serbia (YU).

From 0555UTC the 50MHz band had been open to stations in Italy and the Balkan peninsular, although there were no real indications from these Six Metre signals that the 144MHz band would open up later. However, there were indications on the 70MHz band from 0710UTC when very strong signals were received from stations in Croatia and Italy.

Signals were so strong that some UK operators were making frequency modulation (f.m.) contacts with stations in Italy and that's a sign that ionisation might be intensifying. Indeed, it was and at 0720UTC the 144MHz band opened up to stations in a similar area as shown in the diagram, **Fig. 2**.

I first noticed the 144MHz opening at my QTH (Herefordshire IO81) at 0722UTC and then went on to make s.s.b. contacts with the stations of IK0FTA, IK0SMG, IW0FFK, I1DMP, IK1JXY, I5JRR and IK5CQV. At 0750UTC I heard the station of I7RHP/7 (JM99) peaking 59 over a path length of 2122km. Unfortunately, his signal dropped into the noise just as he was giving me my report and the contact could not be completed.

Paul Pasquet G4RRA (Devon IO80) reports that he managed to work I7RHP/7 at 2096km, IK7UXW (JN80) at 2022km, IZ4AIK (JN63) and I7CSB (JN71).

Further to the south-west the station of **Tim Fern G4LOH** (Cornwall IO70) also contacted I4RHP/7 over a 2151km path, IW0FFK (JN61), IK7UXW and 9A5ST (JN83).

Meanwhile, from the opposite side of the country the **Martlesham Contest Group** station of **G0KPW** (Suffolk JO02) made s.s.b. contacts between 0721-0852UTC with the stations of AO6SA (JM19), TK5JJ (JN40) and 9H5DH (JM75).

The second Sp-E opening of the day was a brief 21 minute event between 1714-1735UTC to Bulgaria, Croatia, Romania and Serbia. **Rady Nikolov LZ2ZY** (Bulgaria KN13) using a Kenwood TS-780 transceiver, a 250W amplifier and two 9-element Yagis, reports contacting the stations of G7RAU (IO90) at 1992km, G4IGO (IO80) at 2105km, G4RRA (IO80) at 2171km and G4LOH (IO70) at 2253km.

Dave Edwards G7RAU (Isle of Wight IO90) running 400W into a 12-element Yagi, worked the stations of LZ2ZY, YO3DMU (KN34) at 2164km, together with YO7DAA, YT1TM, YT1VV, YU1CQ, YU1IO, YU2JA, YU8KG, 9A2YF and 9A5SG.

The 144MHz station of G4RRA runs 400W into an array of four 10-element Yagis and this enabled contacts to be made with LZ2ZY, LZ2CC (KN23) at 2309km, YT1TM, YT1VV, YU1IO, YU7TRI, YU8KG and 9A5SG.

Tim G4LOH reports that he missed most of the short opening as he was waiting for his valved amplifier to warm up! However, when it was up and running Tim went on to make s.s.b. QSOs with the stations of LZ2ZY, LZ2PI (KN23) at 2441km and YT1TM, YU8KG and 9A5SG.

The next 144MHz Sp-E opening occurred one week later on July 9th but it was a very short event lasting just 11 minutes between 1029-1040UTC. The band was open to Portugal with only the stations of CT1FJC and CT1HZE being worked by operators located in southern England.

An opening on the following day, July 10th, was much better lasting for 45 minutes between 1929-2014UTC. Some of the DX stations contacted on s.s.b. were EA3CBH/6 (JM19) and EA6VQ (JM19) both located in the Balearic Islands. Also contacted were EA5/DL8EBW (Spain JM08), EA5DIT (IM99), EA5DWS (IM98), EA5EN (IM97), EA5NZ (IM97), EA5RM (IM98), EA5ZN (IM98), EA7AJ (IM87), EA7RZ (IM86), EB5GP (IM97) and EA9IB (IM85) located in Mellila, North Africa.

The opening on July 11th between 1829-1843UTC was yet again another short lived event for stations located in the southern part of the country. It seemed to catch most operators 'on the hop' as the only reports came from **Lyn Leach GW8JLY** (South Glamorgan IO81) who worked S52XA (Slovenia JN76) and **Tim G4LOH** who worked the station of S54O (JN75).

Tim also mentioned that after the Sp-E event had ended there was a field aligned irregularities (f.a.i.) opening where stations have to beam at a specific scatter point to make a contact. Between 1905-1911UTC whilst beaming at 80° from his QTH he made c.w. contacts with HA1FV, HA5CH, IZ4BEH, I8MPO and YO2LEA (KN06) at 2032km.

The final Sp-E opening of the month started at 0936UTC on July 30th but only lasted for 11 minutes. Stations in southern England mentioned contacting CN8SG (Morocco IM64), EA7BYM (IM66) and EA7RZ (IM86) but very little else.

As I mentioned earlier, all-in-all it was a pretty dismal 144MHz Sp-E season especially as virtually all of the propagation was restricted to UK stations situated in southern and central England. Indeed, if your home QTH was north of Birmingham then it was very unlikely that you heard any Sp-E signals at all on the 144MHz band during the entire summer season! Oh well - there's always next year!

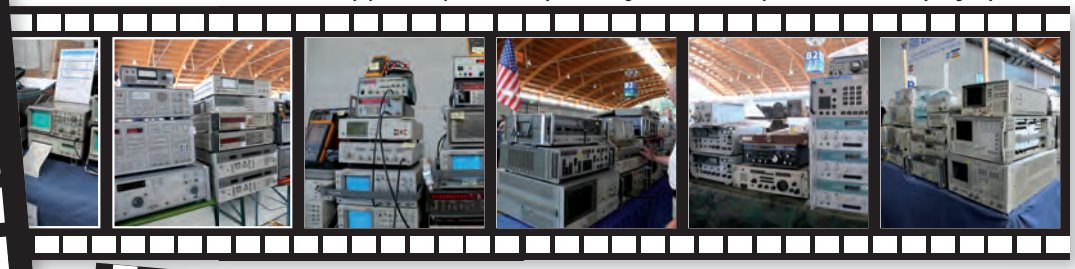
Autumn Tropo!

That's it for this month – the Sporadic-E season is now over but by the time you read this the autumn tropo season will have started! Tropospheric openings normally affect the 144, 430MHz and higher frequency bands and occur in the period September through to November. This is the period when warm anti-cyclonic weather (high pressure) drifts in from the West and settles over the UK.

In favourable locations, enhanced tropospheric propagation may allow contacts to be made deep into central Europe on the v.h.f. and u.h.f. bands. If you hear or work any DX stations then please send me your reports – or any other news – to reach me before the last Saturday of the month. **73 David G4ASR.**

Roger Hall went to the 33rd Ham Radio/Hamtronic event in Friedrichshafen, Europe's biggest radio show.

Test equipment was plentiful and anyone wanting to fit out a workshop would have found everything they need here.



Friedrichshafen 2008

This year's Ham Radio/Hamtronic event in Friedrichshafen was almost a milestone because it attracted 17,100 visitors. Although this was not a record for this show, it was nearly as many as the 17,253 people who went to the Dayton Hamvention this year. If just another 154 people had turned up at Ham Radio, it could claim to have pushed Dayton into second place. Of course, this would only have been true for the number of visitors because the show itself is far smaller. Dayton usually has about 450 exhibitors and almost 2,000 vendors in the flea market whereas this year's Ham Radio/ Hamtronic had 92 exhibitors and 308 flea market vendors. That's still far more than we ever see at a UK show and it's more than enough to occupy visitors for the three days that the show is open.

The main hall (A1) housed the exhibitors and the 75 clubs from around the world. All the main manufacturers were there along with retailers from around Europe.

The massive flea market was, as usual, the main attraction and it occupied halls B1, 2 and 3. Test equipment featured heavily again th is year, along with Second World War equipment and vintage receivers and I would have been tempted to buy a lot more than I did if I hadn't flown with an airline that counts anything more than a toothbrush as excess baggage. ●

Christina Hildebrandt DO1JUR of the DARC signing copies of her latest book.

Enigma machines are always popular at Ham Radio. Tom Perera W1TP was there fresh from Dayton and for those who couldn't afford the many thousands of dollars that an original machines costs, there was an electronic version on sale. This is supplied in kit form for just over £100 and full details can be found at www.xat.nl/enigma-e

The UK was well represented.

If you're thinking about going next year, Ham Radio/ Hamtronic will held on June 26th to 28th, Ryanair fly there from Stansted for less than £100 and hotel rooms can be had from £50 a night.

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Feature

DC Power Supply for Eddystone Receivers

On impulse, I recently bought two Eddystone valved receivers on eBay at very reasonable prices. I couldn't afford them when I was young and, like many others, I simply ogled the pictures in the magazine adverts of the time and then turned to the next page!

I bought them because I'd never owned an Eddystone and felt it was time to correct this. The first set was an S840C, covering 480kHz – 30MHz in five bands and equipped with the superbly-smooth and legendary Eddystone slow motion drive and slide-rule type scale.

Power Supply

The S840C set was equipped with a 110V/220 /230V a.c./d.c. power supply, although the power supply is very well designed. The dropper resistor runs hot (as we'd expect) but it wasn't discoloured in my model, so it was operating well within its power rating.

The frequency stability of the radio was admirable after a reasonable time for warm-up. So, I was confident that the Eddystone designers knew what they were doing in the field of what we now call 'thermal management'.

The second set I bought was an S870A, an amplitude modulation (a.m.) only set covering 150kHz – 24MHz, again in five bands, with a 465kHz intermediate frequency (i.f.). The set is a compact 279 x 178 x 152mm (11 x 7 x 6in). It was finished in a rich dark green. Again, the S870A is fitted with an a.c./d.c. power supply.

The HT Supply

The unit I'm describing here generates high tension (h.t.) supply at about 100V at 200mA, supplying both the h.t. and heater (valve filament) current for my Eddystone S870A. It's also suitable for many other a.c./d.c. radios.

I used components available from various suppliers to build the unit completely from new, so that I was sure constructors would have no problems sourcing the 'bits'. However, the experienced constructor with a decent junk box may have many of the components to hand.

Before I venture further – let's look at the 'universal' power supply. A fundamental aim of the designer of an a.c./d.c. power supply is to eliminate the need for a mains transformer in a piece of mains-powered electronic equipment.

Unfortunately, 110V/240V a.c./d.c. power supplies have two drawbacks. Firstly, the valve circuits (frequency changer, i.f. amplifier, etc.) in the set have to be designed to operate from the relatively low h.t. voltage that can be generated from a 110V supply. This means that when operating from 240V, excess voltage has to be 'dropped' in a resistor and not simply stepped-down by a transformer. Additionally, although the heaters of the valves can be connected in series, again even when operating from 110V, some voltage often has to be dropped in a resistor to run the heaters within specifications.

On a 240V supply, even more voltage has to be dropped to ensure that the heaters aren't over-driven as the heater supply typically needs to supply somewhere between 100-200mA, depending on the valve types used. All this voltage dropping adds up in terms of power and often the power supply has to dissipate 20-30W of heat when connected to the 240V a.c. mains, on top of the typically 20W of 'useful' power used by the radio's electronics.

The Eddystone Solutions

The diagram, **Fig. 1**, shows the a.c./d.c. power supply arrangement used in the S840C model. The mains supply (a.c. or d.c.) passes through 500mA fuses, the on/off switch (ganged with the tone control) and then the live (in the case of a.c.) or +ve (in the case of d.c.) leg meets the voltage selector, which is a small adjustable plug panel.

Stefan Niewiadomski describes how he made a separate power supply for his favourite receiver, enjoying every minute of the project!

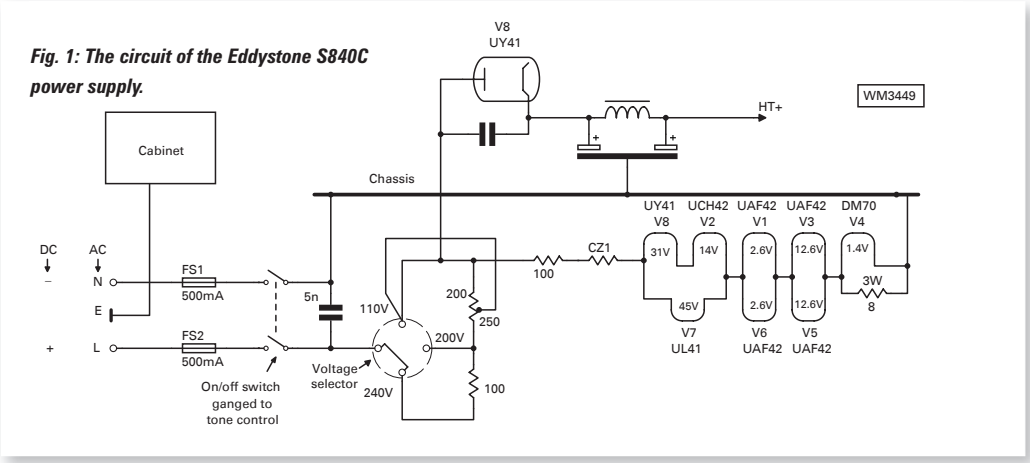

Fig. 1: The circuit of the Eddystone S840C power supply.

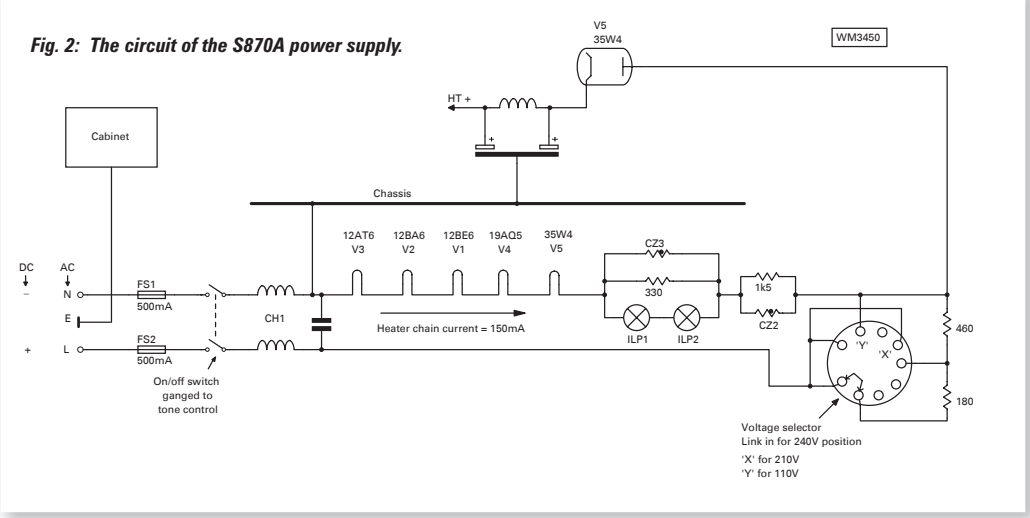

Fig. 2: The circuit of the S870A power supply.

The drawing shows the plug in the 240V position, which means that the 240V supply feeds the full 100Ω and 250/200Ω dropper resistor chain. The anode of the half-wave rectifier valve, V8, is fed from the approximately half-way tap on the 250/200Ω dropper resistor, and its cathode supplies rectified h.t. to the smoothing capacitors and choke and hence to the anodes of the radio's valves.

The heater chain is fed with a current of 200mA via the 100Ω resistor and a CZ1 thermistor. The valves' individual heaters also have a clever series/parallel arrangement (including an 8Ω resistor which generates the 1.4V heater voltage for the DM70 tuning indicator).

Note that all the h.t. and l.t. current passes through the 250/200Ω dropper resistor, which in fact dissipates about half the power supplied to the radio. My S840C takes about 65W from the 240V mains and so this resistor has to dissipate about 30W of heat.

The thermistor has a high resistance (about 7kΩ) when cold and hence controls the switch-on surge down the heater chain. This prevents the alarming (and life-shortening) bright glow of the cold heaters in many cheaper sets as they are switched on. As the thermistor heats up its resistance drops to less than 100Ω and the heater chain current settles at about 200mA. Note how the heater voltages of the various valves have been chosen to balance each other and produce the overall 200mA.

Next, we'll look at what happens when the set is connected to a 110V supply (either a.c. or d.c.). The voltage selector switch bypasses the 100Ω and 250/200Ω resistor chain and the only power "wasted" is dissipated in the 100Ω resistor, the thermistor and the 8Ω resistor, which is much less than in the 240V case.

Note that the chassis of the S840C is connected to mains Neutral (and not mains Earth) via the on/off switch. The chassis is in fact 'floating' independently of the cabinet, including any parts of the front panel that the user might touch. This is because firstly, mains Neutral and Earth are not at the same potential (neutral typically sits a few volts a.c. 'above' earth) and so if they were to be connected together, this could blow the fuses (it would almost certainly trip an Earth-leakage Circuit Breaker), and secondly (and more importantly) if the mains were connected the wrong way round, the set would still work but the case would now be live to the mains, posing a considerable safety risk.

Because there's no transformer in the power supply, it works equally well from an a.c. or d.c. input. In the case of a d.c. supply being applied, the rectifier valve doesn't do much and simply passes the current to the h.t. supply for the valves, as long as the d.c. is connected the right way round!

The S870A Power Supply

The diagram, **Fig. 2**, shows the a.c./d.c. power supply arrangement used in the S870A model. This is pretty similar to the S840C circuit but has two front panel bulbs.

Another feature of the S870A is the series choke and parallel capacitor mains filter, following the on/off switch. This was fitted specifically to clean up the d.c. mains supply on ships as these were notoriously noisy. The receiver has a neat metal deflection plate mounted above the dropper resistor to deflect heat out of the cut-out in the side of the cabinet.

Circuit Description

The diagram, **Fig. 3**, shows the schematic for my d.c. power supply for the S870A. The mains input to the unit is switched by SW1, powers a front panel mounted neon N1, and feeds in parallel the primaries of three mains transformers T1, 2 and 3. The 30V secondaries of these transformers are connected in series and feed a bridge rectifier consisting of D1-4, the rectified output of which forms the un-smoothed d.c. supply.

Off-load, the three 30V secondaries in series produce about 90V RMS, which when rectified and smoothed gives about 126V d.c.

The arrangement of using three mains transformers

may look clumsy, but it allows low cost, off-the-shelf components to be used. If you already have a transformer that can supply about 90V RMS at 200mA, then use it by all means.

The resistor, R1, protects the smoothing capacitors from switch-on surges and capacitors C5-C7 filter and smooth the HT rail. Three 2200μF 63V components are used in series, giving an overall capacitance of about 700μF at 190V voltage rating. The resistors, R2-4 balance the voltages across the three smoothing capacitors and bleed the charge from the capacitors when the unit is switched off.

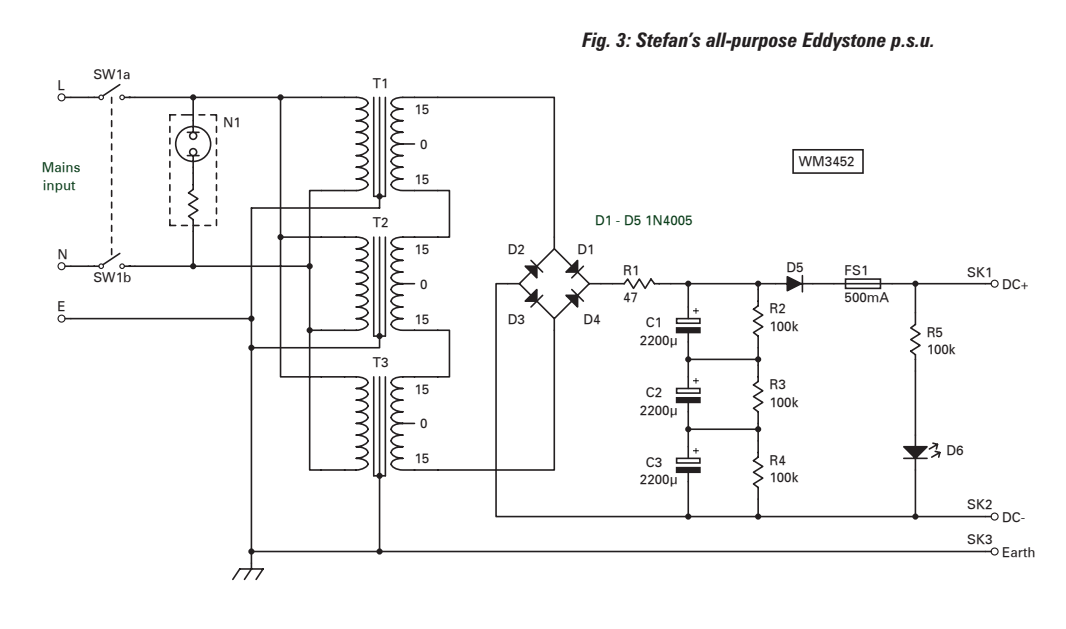

Fig. 3: Stefan's all-purpose Eddystone p.s.u.

A series diode D5 and the 500mA slow-blow fuse are included in the positive d.c. path to the output socket SK1. The diode, D5, protects the power supply from reverse current in case the unit's reservoir capacitors discharge more quickly than the set's internal smoothing capacitors. It also guards against connecting the supply the wrong way round to the receiver although in fact this shouldn't have any effect, as the valve rectifier is still in circuit in the receiver, and will prevent any chance of a reverse current flow.

The postive d.c. supply also feeds a panel mounted high-brightness light emitting diode (l.e.d.) D6 via current limiting resistor R5. The d.c. negative supply is at SK2, and SK3 providers a mains earth to the receiver.

Prototype Unit

The diodes, capacitors and resistors (except R5) in the prototype unit were mounted on a printed circuit board (p.c.b.). When looking in my stock of cases to house the unit, I was very pleased to find a die-cast aluminium box of about the right size (185mm x 120mm x 80mm). When I looked inside it I saw the words 'Eddystone Radio box 6357P' cast into the metal, an incredible coincidence and, of course, I had to use it!

The individual constructor can use any box of about the same size. The placement of the components isn't critical and so tag board construction, 'ugly' construction or even Veroboard could be used if you don't want to invest in a p.c.b.

The photographs in **Figs. 4**, **5**, and **6** show the p.c.b. and the box and component layout I used. Mount the components in ascending order of size, taking care to orientate the diodes and the electrolytic capacitors correctly. Initially, I was concerned about the power dissipation of R1 and so I intended for it to be mounted on flying leads away from the smoothing capacitors. In the end its calculated power dissipation was only just over 1W, so as this wasn't too bad I mounted it on the p.c.b.

Insert 1mm terminal pins into the holes for the inputs and outputs to the board to facilitate inter-board wiring, rather than trying to insert wires into the board itself.

Readers can work out their drilling details of the front and rear panels from the photos of my prototype unit. Make sure you have all the panel-mounted components before you start drilling; exact dimensions of the mains on/off switch, the neon, sockets, l.e.d., and the fuse holder from different suppliers may vary. So, be sure you have all the components before you drill the case!

I mounted the fuse holder on the front panel of my prototype but if desired this can be located on the rear panel. Hopefully, the fuse won't blow too often and so having them round the back won't be too inconvenient!

The only holes needed in the rear panel allow the mains cable to enter and the d.c. outputs (DC+ and DC-) and Earth to leave the unit. A rubber grommet should be used for the mains cable, and the cable clamped to the chassis inside the unit so that it can't be accidentally pulled from the outside. The earth wire from the mains cable is connected to the metal chassis via the 'transformer connection board' (see later).

Although my unit didn't run very warm, I drilled a series of holes in the top and bottom of the case to aid ventilation. You should also fit rubber feet on the bottom of the case. Then double-check the unit, specially the mains wiring.

Wiring Up & Testing

Next, it's on to wiring up and testing. Thoroughly check the locations and polarity of the components on the p.c.b. and check that all the solder joints are good, with no solder bridges or shorts on the undersides of the board.

Because the transformers I used for T1, 2 and 3 have flying leads for their mains inputs and secondary outputs, I used a piece of single-sided p.c.b. material (about 100mm x 50mm) with isolated areas ('islands') cut to make these connections. I made the islands using a burr in a p.c.b. drill, rather than going to the trouble of making a second board for the unit, **Fig. 5**. This connection board is bolted to the side of the case with a 60mm length of aluminium angle,

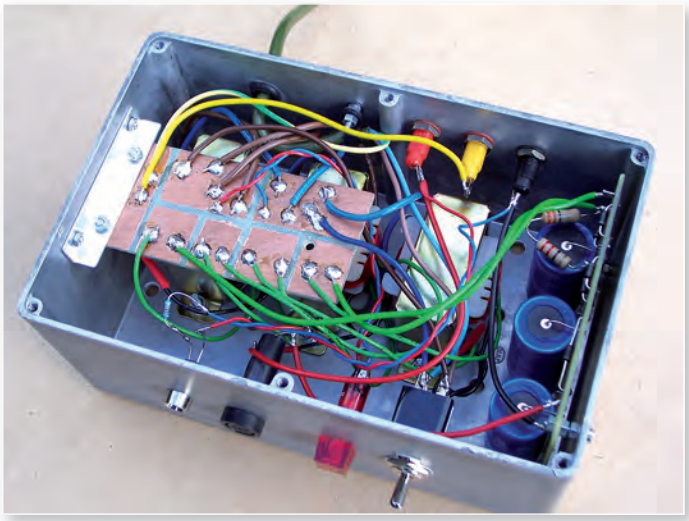

Fig. 4: Inside view of Stefan's unit.

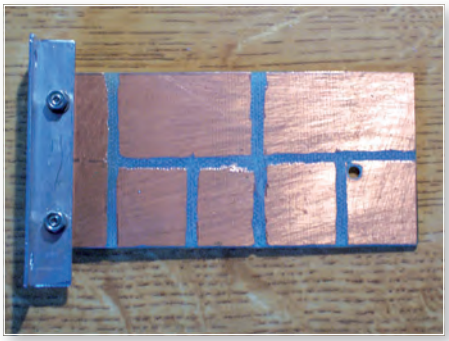

Fig. 5: The overall lay-out of the p.c.b., combining the outputs of the transformer (not to scale or size).

which also provides the earth connection to the metal case, for safety reasons. **Warning:** Don't allow this p.c.b. to remain loose inside the case – it must be firmly bolted to the case to be safe.

Note the way the primary windings on T1, 2 and 3 are connected in parallel, and the secondary windings are wired in series. So, make sure you keep the phase of the secondary windings in phase so that their voltages add together to produce the 90V RMS needed for the project.

Next, it will be time to plug the unit into the mains. Switch on with S1 and check that N1 and D6 (the DC+ on l.e.d.) illuminates. If D6 doesn't light, chances are that it's wired the wrong way round. Once this initial stage has been passed successfully, check that about 125V is present between the DC+ and DC- output sockets.

If required the supply can then be 'loaded' to check its regulation under different loads. The d.c. output can be loaded up to 200mA, by using a resistor of about 500Ω. Note that the power dissipated by this resistor will be about 20W, so use a big resistor (or more likely use a combination of say two 1kΩ 10W resistors in parallel) and be careful not to burn yourself!

Using the Unit

The unit is very simple to use. Connect the DC+, DC- and Earth sockets to the receiver being powered using flying leads plugged into the appropriate sockets.

Component List

R1	47Ω 2W carbon film	
R2-R5	100kΩ 0.25W carbon film	
C1-C3	2200μF 63V radial electrolytic	
T1-T3	Transformer, mains input, 12VA 15V-0-15V outputs at 500mA (ESR 311-512 or similar)	
D1-D5	1N4005 diode	
D6	Panel-mounting ultra-bright l.e.d. and mounting clip	
N1	Panel mounting mains neon (Maplin BK52G or similar)	
SW1	Mains on/off double pole toggle switch (Maplin FH39N or similar)	
SK1	Banana socket (red)	DC+
SK2	Banana socket (black)	DC-
SK3	Banana socket (green)	Earth
FS1	Fuse holder (20mm) plus 500mA slow-blow fuse.	

Printed circuit board. Single-sided PCB material 100mm x 50mm (and aluminium angle for mounting) for transformer connections, 1mm terminal pins. Case to suit.
Insulated connecting wire. Mains cable, grommet and cable clamp, p.c.b. mounting screws and nuts. Earth tag, screws and nuts.Rubber feet for case (4-off).

Don't forget to set the voltage selector switch on the receiver to 110V.

Switch the power supply's mains on at SW1 and switch the receiver on. When cold my S870A takes just a few milliamps, and slowly rises to about 160mA after a few minutes. The power supply takes about 27W from the mains, compared to the 49W the S870A itself takes from the mains when operating from 240V mains, a considerable saving in power and therefore heat. So I'm doing my little bit to prevent shack (and global) warming!

The Eddystone User Group

Most of the Eddystone-related information for this article comes from the **Eddystone User Group's** (EUG) website at **http://www.eddystoneusergroup.org.uk/** The site is a great source of information on the history of the company and the Eddystone sets (transmitters as well as receivers) it produced.

The EUG are very responsive to E-mail queries and the help of the group, especially **Graeme Wormald G3GGL** and **Chris Pettit G0EYO**, is appreciated in the preparation of this article.

The set will now run much cooler and its life will be extended and mains hum is eliminated. I don't know whether my S870A ever went to sea? If it did, I wonder if was it in a first class cabin on the RMS *Queen Mary*, or a simply in the crew's mess on an old tramp steamer? ●

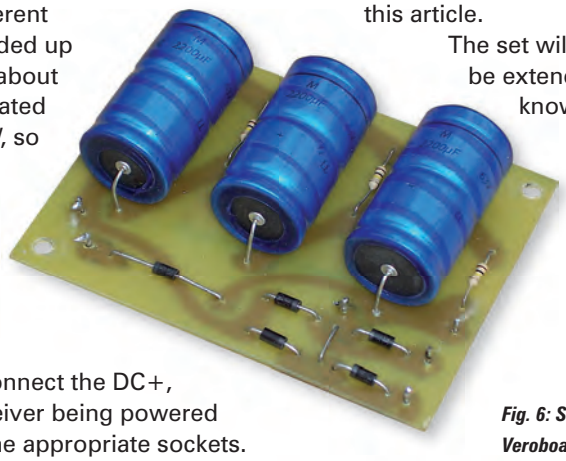

Fig. 6: Stefan created a p.c.b. for his project but you can use Veroboard or Perf board as an alternative.

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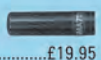

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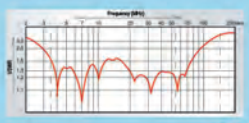

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Colin Redwood's

what next?

Colin Redwood G6MXL chats about the Amateur Radio logbook – no longer a legal requirement but still very useful!

Welcome to *What Next?* (*WN?*) where this month I'm looking at keeping an Amateur Radio logbook. A log is a detailed record of your Amateur Radio operations. It can be used to record the stations you've heard, worked and tests that have been conducted.

Until the licence changes at the end of 2006, all Radio Amateurs in the UK were required to keep an accurate log of their contacts as a condition of their licence. The main exceptions to this were for portable and mobile contacts where the logistics of keeping a log at the same time as operating a radio and driving a car, really made keeping a log impractical and even unsafe.

For most of us, there's no longer any required to keep a log as a condition of our licence. However, in the UK the Ofcom agency can require us to make log entries, perhaps to assist in the resolution of an Electromagnetic Compatibility (EMC) complaint.

Note: *WN?* readers outside the UK should check with their own Amateur Radio licensing authority regarding the need to keep a log. Many countries still require a log to be kept, so UK amateurs holding a full licence and operating abroad under CEPT or reciprocal licensing arrangements will almost certainly need to keep a log to comply with the local requirements.

Although it's no longer a requirement in the UK to keep a log, there are many benefits of doing so. Perhaps the most important are to assist in resolving the already mentioned EMC issues and when you want to send and receive QSL cards.

Looking At EMC

Let's look at EMC first of all. If you receive a complaint from a neighbour that you are causing interference to their television picture, the first step in my view is to establish whether your station is causing the interference.

A few years ago I received a complaint from a neighbour – about five houses away – that I was causing interference. I asked them for details of when this occurred and they were able to tell me that it was for duration of one particular television programme. The interference, they said, started almost immediately the programme began and stopped almost as soon as the programme finished.

By referring to the television schedule I was able to establish the time and channel on which the programme was transmitted. I then checked my log, and noted that I had a long QSO on 432.220MHz upper sideband (u.s.b.) that coincided almost perfectly with the time TV programme was broadcast. Further more, I noted in my log that the station in question was in Torquay, and therefore my high-gain directional antenna would have been pointing exactly at my neighbour's house at the time of the TV programme.

I looked at the neighbour's house and noted that they had no outside television ultra high frequency (u.h.f.) antenna. In discussions with the neighbour it turned out that they had a directional TV antenna in their loft, which was pointing at the main TV transmitter mast many miles away, which was also in line with my antenna. To overcome the weak signal they received they had fitted a pre-amplifier.

I realised my signal was probably overloading their pre-amplifier. Fortunately, the situation was resolved by the neighbours agreeing to fit a tuned notch filter ahead of their pre-amplifier.

Without my log, it would have been difficult to be certain that my transmissions were responsible for causing the interference. Equally, if there has been no entry in my log for that day, I could have told them that it could not have been my station causing the interference as I wasn't on the air at the time.

Besides helping to resolve EMC issues, a log book can also become the main record of your Amateur Radio conversations, keeping note of Amateur's names, locations, etc. Additionally, if you want to study propagation, a detailed log of what you've heard and worked can form the raw data on which to base any analysis.

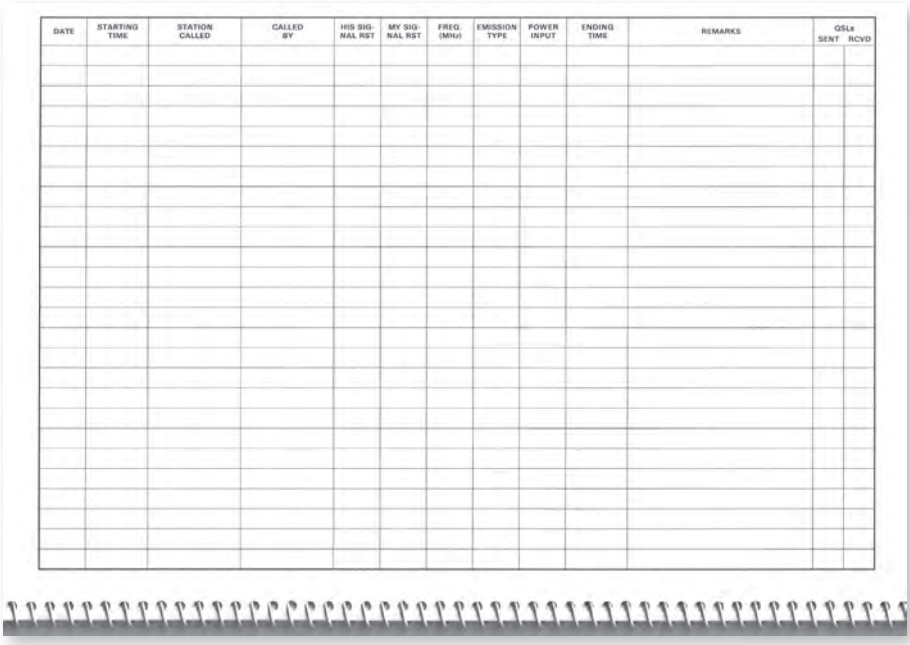

Fig. 1: A typical blank page in a log book.

What Information?

So, just what information should you record for each contact in your log? To help, I would suggest the following

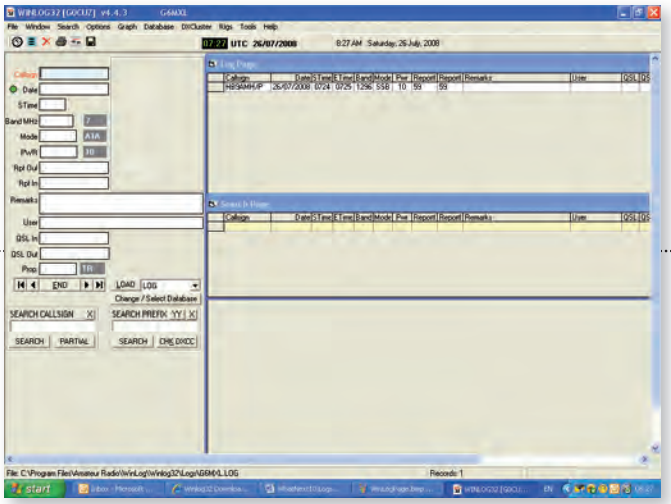

Fig. 2: The WinLog main screen showing time in UTC and BST

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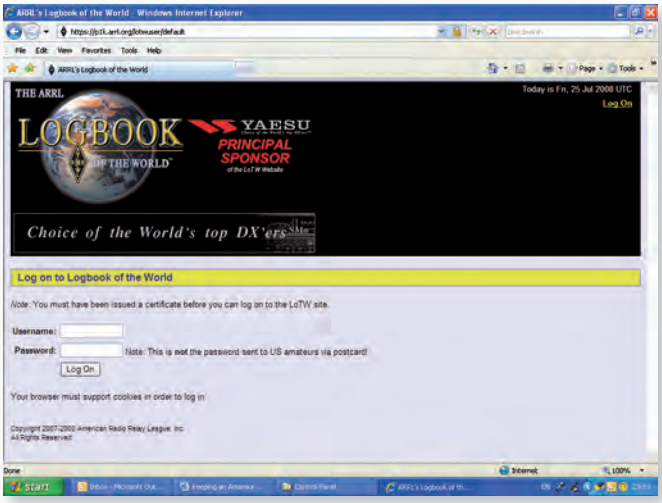


Fig. 3: The Log Book of the World (LoTW) web site

items take priority.

1: The Date, Start and End Times (all in UTC – see below).
2: The callsign of the station you worked.
3: Frequency preferably (or at least band).
4: Mode (e.g. c.w. (Morse), u.s.b., lower sideband (l.s.b.), slow scan TV (SSTV), radio teletype (RTTY etc.).
5: The power used.
6: The report sent.
7: Report received,
8: Comments (such as name, locator, town, Island on the Air (IOTA) reference, Worked All Britain (WAB) Worked All Ireland (WAI), etc.
9: Whether you sent a QSL card.
10: Whether you have received a QSL card

Traditionally, the information I've listed has been kept in a pre-printed log book. These are available from most Amateur Radio retailers, the PW Bookstore and the Radio Society of Great Britain (RSGB). A typical log book page is shown in **Fig. 1**.

Reports Sent & Received

When exchanging reports on the air, it's really helpful to the station at the other end to receive a meaningful report. I'm mentioning this because – very often – reports of RS 5&9 (Readability 5, Strength 9) are exchanged, and on many occasions it's nothing like the reality of the situation!

A good operator will tailor their operating style to the report they receive. For example, if they receive a report of 3&4 (Readability 3 and Strength 4) they'll keep their overs ('overs' are the periods we share in turn to talk) shorter and perhaps would repeat important information to help the other station. With a 5&9 report there's no need to do this. But, what do these numbers really mean?

To start answering the question the first digit represents readability (usually abbreviated as R). Readability 1 means that the signal you are hearing is unreadable. Readability 5 means that the signal you are hearing is perfectly readable.

R	Readability
1	Unreadable.
2	Barely readable, occasional words distinguishable.
3	Readable with considerable difficulty.
4	Readable with practically no difficulty.
5	Perfectly readable.

The second digit represents signal strength. The weakest signals that are barely perceptible are S1. Extremely strong signal are S9. Note that there's no such thing as S0. Please be aware that on many receivers and transceivers the S-meter is very poorly calibrated and good operators base the reports (particularly s.s.b. reports) they give to other stations on the perceived strength as heard by the ear and ignore what the S-meter shows.

S	Strength
1	Faint signals, barely perceptible.
2	Very weak signals.
3	Weak signals.
4	Fair signals.
5	Fairly good signals.
6	Good signals.
7	Moderately strong signals.
8	Strong signals.
9	Extremely strong signals.

For c.w. operations there's an additional digit representing the tone (abbreviated T) of the signal. T1 represents an extremely rough hissing noise, whilst T9 represents the purest note (i.e. undistorted). A c.w. report would be made up along the lines of

Colin's waiting to hear from You!
I like to solve problems with anything to do with amateur radio! I can answer questions and publish my findings here for the benefit of all *PW* readers.

Remember the mains supply is potentially lethal. Unless you really know what you are doing, always pull the mains plug out, do not just switch off at the wall socket, when working on equipment.

as RST599 , Readability 5, Strength 9 and Tone 9.

T	Tone
1	Fifty cycle a.c or less, very rough and broad.
2	Very rough a.c., very harsh and broad.
3	Rough a.c. tone, rectified but not filtered.
4	Rough note, some trace of filtering.
5	Filtered rectified a.c. but strongly ripple-modulated
6	Filtered tone, definite trace of ripple modulation
7	Near pure tone, trace of ripple modulation
8	Near perfect tone, slight trace of modulation
9	Perfect tone, no trace of ripple or modulation of any kind

Thus, (A really good!) c.w. report would be made up as RST 599, Readability 5, Strength 9 and Tone 9. Historically, suffixes were added to the last figure representing tone quality. Occasionally on c.w. you may still hear the letter **X** after the last figure and this represents Crystal (Xtal) control quality, while **C** represents 'chirp' (frequency shift when keying) and **K**, which meant key clicks can be heard.

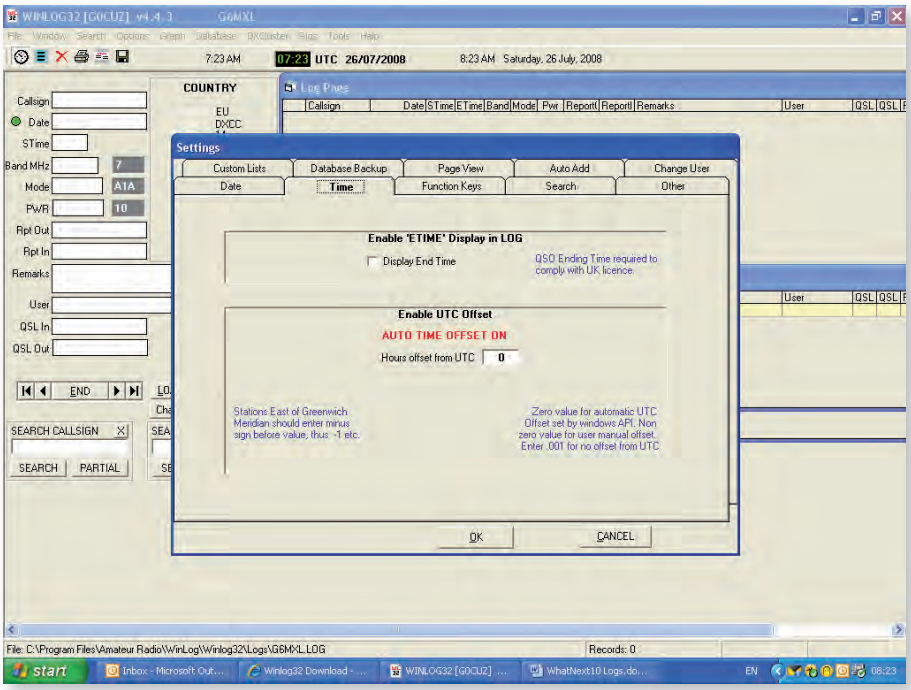
Why Use UTC?

Let's now turn to how to record our times of working. Here, you might ask, "What is Univeral Co-ordinated Time (usually presented as UTC) and why do we need the date and time in UTC?" To answer this quite simply, it's because around the world there are different time zones and various countries have different policies regarding changing time between summer and winter.

If (for example) you're in the UK and at 1400 British Summer Time (BST) you work a station in Moscow, it will be 1700 Moscow time. If you then send a QSL card to the Russian station with 1400 on it, the operator probably won't find your contact in their log book. However, if both stations record the time as 1300 UTC, then it will be easy to find the contact in both stations' log books.

For *WN?* readers in the UK, UTC is – for all practical purposes – the same as Greenwich Mean Time (GMT), so UTC is normal 'clock time' during the winter months. During the summer months when in Britain, we have British Summer Time (BST), we need to remember to take one hour off the time to get to UTC. So when it's 1100 BST, it's 1000 UTC.

Some operators have a separate 'shack clock', which is kept set to UTC. If you operate in a portable contest such as the *Practical Wireless* 144MHz QRP contest, then it makes sense either to have a dedicated clock set to UTC or to set your watch to UTC for the duration of the contest.



A comprehensive settings panel within* Winlog 32 *showing the time setting mode.

Computer Logs

Now it's time to look at the actual log and as an alternative to keeping your log on paper, there are many computer logging programs available for computers. However, if you decide to use a computer to log your contacts as they happen, make sure that its clock is set to UTC. Most good computer logging programs will provide a setting to ensure that your log is kept in UTC regardless of what your computer time is set to.

If you are looking for a logging program, you might like to try *WinLog* by **Colin Morris G0CUZ**, which can be downloaded for free from **http://www.winlog32.co.uk/** As you can see in **Fig. 2**, by default it automatically logged in UTC, even though my computer was operating on BST.

If you use your own program (perhaps using a spreadsheet program such as Excel), then you will need to manually key the time in UTC for each contact, or insert a formula to make the conversion for you.

World Wide Log Book

The **American Radio Relay League** (ARRL) the American equivalent of the UK's RSGB launched a world-wide electronic log book (*WWLB*) in 2003. Once registered, amateurs can enter details of their contacts on to this log.

The *WWLB* has the advantage that once two stations involved in a QSO have entered the details of the QSO, an electronic QSL card is made available for stations chasing ARRL awards. To date over 75 million QSOs have been entered!

If you want to use this, then you will need to download the software to your computer from **http://www.arrl.org/lotw/** and request an electronic certificate. Once the full enrolment process has been completed, you can then upload your logs securely.

However, while I can see plenty of benefits in using *Log Book of the World* (a popular term for the service), I'm reluctant to recommend it to *WN?* readers as most award schemes, including those run by the RSGB, still rely on real ('hard-copy') QSL cards for their award schemes. Despite my reservations – perhaps any *WN?* readers who have used it could let us all have their views?

Next month I'll be looking at QSL cards. Cheerio until then!

●

The Rev. George Dobb's

carrying on the practical way

Classics

While the Rev. George Dobbs G3RJV is moving house after his retiremeent, we're republishing some of the 'classic' articles and the second covers a regenerative receiver module. Editor.

George G3RJV writes: Like many Amateur Radio projects, the subject of this month's column has a long history and an interesting evolution and includes the 'Super-gainer' receiver discussed in **Pat Hawker G3VA's** *Technical Topics* in *RadCom*. This is an old Amateur Radio idea for building a superhet receiver with a regenerative intermediate frequency stage and detector.

Later, **Des Vance GI3XZM**, (*RC* October 1987) described a regenerative receiver with an infinite impedance detector and *Q*-Multiplier. This was followed (*RC* February 1991) by a circuit from **Tony Langton GM4HTU**, using the GI3XZM regenerative receiver as the 'back-end' of a 7MHz Super-gainer receiver.

Active Crystal Set

In the meantime I had been reading a paper called 'An Active Crystal Set' by **Chris Garland G3RJT**, from Holmfirth in Yorkshire, published by the **Denby Dale Radio Club**. It was a short wave crystal set and moved on to a field effect transistor (f.e.t.) infinite impedance detector with *Q*-Multiplier. He even produced a whole QRP transceiver based upon his version of the receiver!

Later, in the G-QRP Club journal, *Sprat* (number 70, Spring 1992), **Colin Davies G3VMU** described a receiver called 'Nicky's TRF', a simple receiver that Colin built for his son using the basic circuit idea from GI3XZM. The circuit looked interesting and I developed a printed circuit board (p.c.b.) and built several of them and I was amazed at how well the receiver worked.

The Circuit

The diagram, **Fig. 1**, shows the circuit of the receiver which follows the general pattern of the 'Nicky TRF'. The first f.e.t. is an aperiodic stage that isolates the antenna from the detector circuit.

A 1kΩ linear potentiometer provides a rudimentary r.f. gain control to the impedance matching transformer, T1. This matches the typical low impedance amateur antenna input. If a short wire antenna is used, it may be connected to the gate of the f.e.t. via a small value capacitor, C_x. (The value of C_x is open to experimentation and it could be a small trimmer or variable capacitor. This source follower circuit feeds to the input winding of T2, which is the only tuned circuit in the receiver).

I think it's now best to refer to **Fig. 2** to look at the function of the next two stages. Incorporated into Fig. 2, is the oscillator (*Q*-Multiplier) and detector section of Fig. 1. And here you may recognise the BC183 stage as a Colpitts Oscillator with capacitive tapped feedback from the emitter to the base. A small value (39pF) capacitor couples to the tuned circuit formed by T2 and C1.

The bias voltage on the base of the BC183 is controlled by a 10kΩ, ten-turn, potentiometer. This provides adjustment through the threshold of oscillation. **Note:** It's useful to select a high gain BC183 for the oscillator circuit.

Incidentally, the ten-turn potentiometer provides a very smooth 'reaction' control (this is the term often used for feedback controls used in regenerative receivers). However, **although it is possible to use a single turn potentiometer** the adjustment is very critical (be warned!). There are ways of avoiding the use of a ten turn potentiometer, which I will describe another time.

The tuned circuit (C1 and T2) is

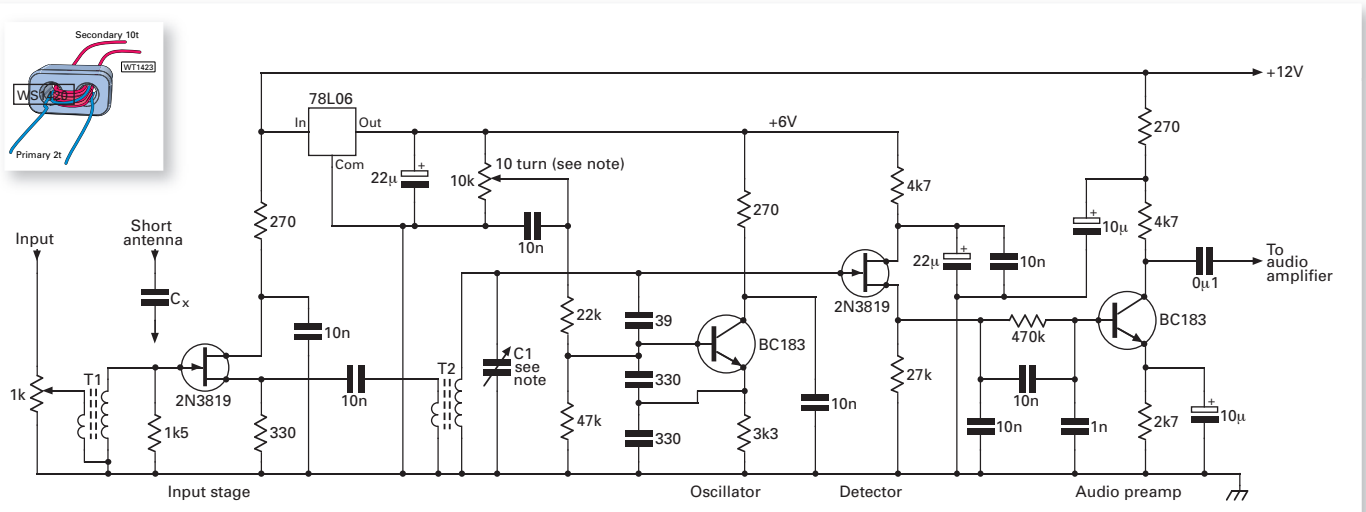
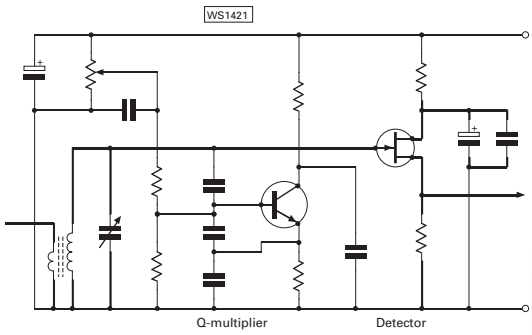


Fig. 1: The circuit of the receiver which follows the general pattern of the 'Nicky TRF' (see text). The first f.e.t. is an aperiodic stage that isolates the antenna from the detector circuit. Transformer, T1 (inset), is wound on a ferrite binocular core from JAB Electronic Components and is ten turns secondary, two turns primary using 36s.w.g. enamelled wire. Wind secondary first and mark, primary goes to input and secondary goes via capacitor to f.e.t.



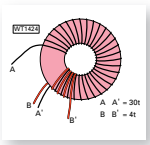


Fig. 2, Incorporated into this circuit is the oscillator (Q-Multiplier) and detector section of Fig. 1. Here you may recognise the BC183 stage as a Colpitts Oscillator with capacitive tapped feedback from the emitter to the base (see text). Transformer, T2 (inset), is wound on a T50-2 core and is 30 turns, 26s.w.g. shown as 'A - A'. Link winding is four turns shown as 'B - B' and A and B connect to ground. B connects to capacitor from f.e.t. amplifier and A connects to 39pF oscillator.

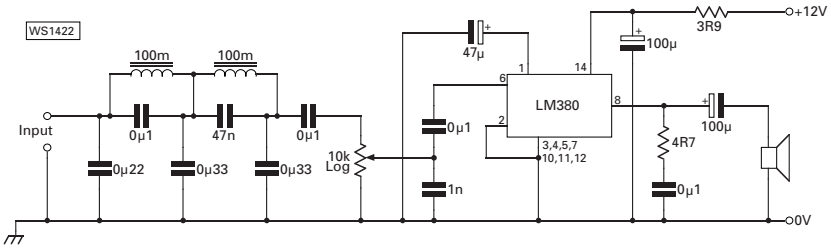


Fig. 3: Circuit of the audio output stage that G3RJV used with his prototype receiver. The input feeds to an audio low-pass filter. Two commercial moulded chokes form the basis of the filter (see text).

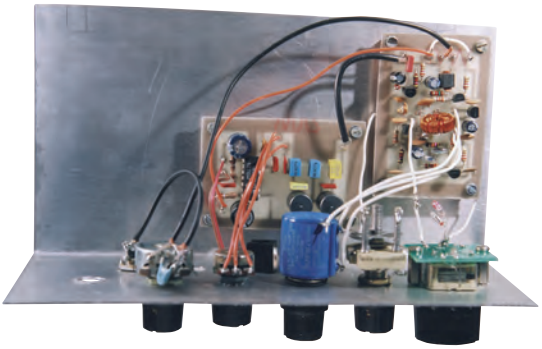


Fig. 4: An 'overhead' view of G3RJV's prototype receiver showing the lay-out and subsequent front panel controls (see text).

connected to a detector circuit, which is shown in heavy outline in Fig. 2. If you imagine the f.e.t. as a triode valve, older constructors will probably recognise this circuit as an infinite impedance detector.

The high impedance of the detector enables it to be connected directly across the tuned circuit without any damping effect. The f.e.t. also provides a small amount of audio power gain for the detected signal.

Audio Output

Returning to Fig. 1, the audio output for the detector f.e.t. is r.f. decoupled by a resistance and capacitance filter and fed into the second BC183. This stage is an audio pre-amplifier designed to give enough output to feed the audio output stages.

The diagram, **Fig. 3**, shows the audio output stage that I used with my prototype receiver. The input feeds to an audio low-pass filter. Two commercial moulded chokes form the basis of the filter, which cleans up the audio output from the detector. (This filter originated with **DK4RW** and was described by **G3XJS** in *Sprat*).

An LM830 audio chip provides the output stage. There are losses in the low-pass filter but there is sufficient output to drive a small loudspeaker and plenty to drive the portable cassette player type of headphones. (The filter may seem to be over-kill but it really is worth the effort).

Ugly & PCB Style

I built the receiver (Fig. 1) and audio amplifier (Fig. 2) boards 'ugly' style and then transferred the design to a home-etched p.c.b. because I wanted to build more than one of each for future experimentation. The boards are shown in the photographs. You could also 'Perf' board to provide another construction option.

The transformer T1 is wound on a small (about 6 × 6mm) 'pig nose style' ferrite core. I used the 4300 2402 core from **JAB Electronics** (PO Box 5774, Birmingham B44 8PG) with ten turns of 36s.w.g. enamelled wire for the secondary and three turns for the primary.

Next, T3 is wound on a T50-2 core with 30 turns of 26s.w.g. enamelled wire for the tuned winding and four turns for the link winding. The link winding is wound over the 'ground end' of the main winding. This allows the tuning of the 7, 10 and 14MHz Amateur bands with a suitable variable capacitor.

Polyvaricon Capacitor

Inexpensive variable capacitors are getting difficult to obtain. For my version of this receiver, I used a polyvaricon capacitor kit sold by Jab Electronics. The PV01 polyvaricon kit includes a variable capacitor of the type used in portable medium wave and Band II v.h.f. receivers with a mounting kit and shaft extender.

It is possible to get several combination of capacitance swing by using the available sets of vanes. I used the 4-125pF range for a general coverage version and the 4-22pF range for a 7MHz only version of the receiver.

With careful use of the reaction control (just bring it into oscillation for c.w. and s.s.b. reception) surprising results can be achieved! ●

Fig. 5: Close-up of the main receiver p.c.b. of the receiver. The 'pig nose' ferrite bead transformer (described by G3RJV) can be seen mounted immediately to the left of the electrolytic capacitor in the lower centre of the p.c.b., just above the terminating coaxial connection (see text).

Fig. 6: The audio amplifier p.c.b. (see text for suggestions).

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FREE DVD
As last year, the RSGB Yearbook 2009 also includes a free video and computer DVD. In video mode viewers can watch a short film called "24 hours in Brazil" on the 2006 WRTC. There is also an interesting trailer on digital voice which gives a great insight into D-Star and other digital modes. In computer mode there is all the material submitted by clubs from across the UK and a wide selection of amateur radio software.

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E-mail: g8emx@tiscali.co.uk

"I think we can say we have woken up the world", says **Trevor Brown G8CJS**, Chairman of the British Amateur Television Club.

"I am enthusiastic and excited by the **BATC.tv** development, it is the best thing we have done for years. It brings the skills of television that we have, into the 21st century, welding video, internet and r.f. (repeaters) together, stated **Brian Summers G8GQS**, Treasurer.

So, two quotes from members of the BATC committee. But, you may ask. "What, exactly is BATC.tv?" To answer the question simply – it's video streaming and I'll now try to bring readers up to date on the techniques.

Video Streaming

Video 'streaming' is the sending of digitised television footage through the internet, to be watched on computers. However, to get a decent, let alone high quality picture it's necessary to be able to send a lot – and I do mean a lot – of digits. And if that picture is real-time moving television, those lots of digits have to be sent very quickly. Early attempts at 'streaming' via dial-up circuits produced 'freezing' images as computer memory buffers emptied and had to wait while a fresh stream arrived slowly.

Broadband internet connections, of course, enabled a revolution in data speeds and some Amateur TV repeater groups began to introduce their 'repeater streams' via 'Ustream' or 'Canstream', whereby the outputs of their repeaters could be viewed outside the repeater's r.f. coverage area. But these were separate streams from individual repeaters, which also suffered delays and other problems.

So the BATC – and in reality the 'vision' of Chairman Trevor Brown G8CJS, plus the computing skills of **Chris Smith G1FEF**, created a high speed and high capacity dedicated internet 'hub'. Trevor recently announced: "The BATC streaming site www.batc.tv is now operational; it is running from its own hardware located in Telehouse, London Docklands.

"The reason we have our own hardware is to avoid repeating Ustream and Camstream, and increasing the delay they already produce. If cross repeater working is to be successful then this delay must be kept to a minimum."

Calling out to all ATV repeater groups, Trevor continues, "To this end we invite you to stream your repeater via our site. There is no charge involved and there is no reason why you cannot stream to other sites if you wish, but it is our hope that all UK repeater groups will support the club and use us as their primary streaming provider. Our site will be the place to view repeaters with a minimum of delay, because they are streaming directly to us. If your streaming is being repeated on another site, then this can continue we will provide the necessary link."

Concluding, Trevor says there's more to come, "The site is by no means finished, we will be adding a multi viewing panel and more soon. It's also not just about repeater streaming, we have an archive of interesting programmes and more will be added soon. The site also streams live events, and has already streamed the **Sheffield Microwave** weekend and the **AMSAT Colloquium**."

Slow Process!

The BATC's Bienniel General Meeting on Sunday October 5th continues to be prepared, but it's proving to be a slow process as the most common reply to our invitations is no reply! As an 'for instance', I had invited the Civil Aviation Authority (CAA) to send a speaker to explain how CAA radar co-exists with 24cm ATV (or the other way around!) but at the time of writing (early August) I still await a response.

However, we can expect a demonstration of our on-line streaming to be well in evidence and a digital ATV demonstration plus traders' tables. But the 'door is still open' (wedged wide open actually!) for all our ATV Repeater Groups to show everyone their technical expertise (photos will do, but hardware very welcome).

Breaking news: Mike Cox has agreed to give a lecture at the BGM, covering the production hardware needed to stream a small event, provisionally titled *Production Solutions for Steaming*. (Excellent!). Incidentally, the General Meeting itself will take place no later than 3pm.

Graham At The Palace!

Having spent three weeks in a caravan under a transmitter mast at the Crystal Palace site, south London, I had asked one of our committee members, who still does some work for the BBC, if he knew anyone to give a talk on the digital 'Freeview' transmission. The technicalities and the design of the equipment used would have made a good lecture? Unfortunately, the BBC Transmission Department no longer exists as the transmitters were sold off some years ago.

But my request still stands although there would be no fee, I would be looking for an hour (or less) on a Sunday. Despite this any volunteer speaker would be talking to a very receptive and knowledgeable audience. No eggs or tomatoes are provided or available. So, any volunteers please? Contact me if you would like to step forward, before the others step back hi! My E-mail is **g8emx@tiscasli.co.uk**

Anyway, digital streaming and general meetings are all fine and good, but there is still actual transmitted ATV around. This edition may be in time for the IARU International ATV Contest on September 13th, 14th, but if you miss that there is still the BATC Repeater Contest over the weekend of December 6th, 7th.

Final Bow

The next issue of *In Vision* will, I hope, be almost entirely devoted to the BATC Exhibition and Bienniel General Meeting and my final bow writing this column after more than ten years.

It is becoming more difficult to find ATV news and I'm not getting any younger! So, that's all for this time – until the last time.

Graham G8EMX.

Carl Mason's

hf highlights

Carl Mason GW0VSW presents readers' reports from the h.f. bands. All reports to Carl by the 15th of the month please.

It has taken me a long time – but I've finally managed to install an antenna in my loft! I've called it a 'crown loop' as that's what it looks like from the side and I'm sure the shape or design has been used before and so make no claim for originality. Squeezing 32m (104 feet) of wire around the loft space was easier than I thought. In one corner above the shack I connected a 4-1 balun and fed 2.5m (8ft) of RG-213 through the ceiling to my QRP Plus.

My Z11 auto tuner matches my new antenna on all bands from 3.5-28MHz and so far results have been pleasing running under 5W. Even though conditions have been poor I've managed QSOs using both c.w. and s.s.b. on the 7, 10, 14 and 18MHz bands. No doubt I can fine tune this set up and only time will tell how efficient it will be and in what directions it will work best! However, I'm back on the bands and enjoying operating again and that's what this hobby is all about!

I must thank **Tom G0HUT**, **Ted G2HKU**, **Colin GW0IRP**, **Wyn GW8AWT**, **Shaun G8VPG** and **Martin 2E0MCA** who all offered suggestions and advice! If anyone has any experience of wire loops or has used something similar I would be interested to hear from you.

Fig. 1: Colin Topping GM6HGW's Maritime Mobile station Boyztoyz.

Fig. 2: The AN5KB QSL from a contact by Martin Addison 2E0MCA on 14MHz s.s.b.

The DX News

Time for this month's DX news now and first to India where the callsigns **AT25MY** and **AT25RG** will be used until October 22nd celebrating the Silver Jubilee of the **National Institute of Amateur Radio** (NIAR) of India. Operations will be on mainly the 14 and 21MHz bands and the QSL will be via **VU2NRO National Institute of Amateur Radio, 6-3-1092/93 Raj Bhawan Road, Somajiguda Hyderabad - 500 082, India**.

By looking at a map of the Caribbean Sea we'll find the Cayman group of islands consisting of Grand Cayman, Cayman Brac and Little Cayman approximately 240km south of Cuba and 268km northwest of Jamaica. These islands were colonised from Jamaica by the British during the 18th and 19th centuries and were administered by Jamaica from 1863.

In 1959, the islands became a territory within the Federation of the West Indies, but when that dissolved in 1962 the Islands chose to remain a British dependency. It is from Grand Cayman NA-016 that **Don Flenner W4YCH** (**ZF2DF**) and **Jim Olsen W4JO** (**ZF2JO**) will participate in the CQ WW RTTY DX Contest, which runs over the weekend of September 27th – 28th as **ZF2DF** from the ZF1A club station. Outside the contest they will be using their own calls on s.s.b. and c.w. All QSLs should go via W4YCH, at **22 Vintage Club Drive, Marietta, GA 30066-3357, USA**.

Italian operator Filippo Vairo is now active as **ZL2/IZ1LBG** from Wellington, New Zealand OC-036 where he is studying until mid-September. Operations will be in his spare time and he will be looking out for European stations as propagation allows. Any QSL cards should go via **Paolo Vairo IW1ARB, Via case Dalpozzo 2, 14010 Cortazzone (AT), Italy** direct or through the bureau. No eQSL accepted!

Hatteras Island NA-067 is one of the longest Islands within the United States, measuring 68 km (42 miles) along a straight line from end to end and lies off the coast of North Carolina in the North Atlantic Ocean. It's part of North Carolina's Outer Banks and in 1953, a 116km (72 miles) stretch of these banks from Nags Head to Ocracoke Island were set aside as the nation's first National Seashore.

Today most of Hatteras Island remains protected and is one of the country's most visited National Parks

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Fig. 4: Peter Leng G0SVO with his son Kieren in his UK shack.

Fig. 3: The TK5EP QSL received by Ted Trowell G2HKU for a 28MHz c.w. QSO.

and is famous for its world-class sport fishing, surfing, windsurfing and kiteboarding. It's from this island that a team of twelve members of the **Tennessee Valley DX Association** will operate as **W4PL** from the September 27th to the October 4th. They plan to be active on 3.5-28MHz using both s.s.b and c.w. and possibly some PSK and RTTY. All QSLs should be sent via **Tommie Wright K4KWK, 2344 Violette Dr., Soddy Daisy, Tennessee TN 37379, USA** or through the bureau. The association also has has an interesting website at **www.tvdxa.com** which is well worth a look.

Closer to home the Belgian special event station **ON1708M** will be active until the end of the year to commemorate the Battle of Oudenaarde, which was fought on July 11th 1708. It was a key battle in the War of the Spanish succession as it ended with the defeat of the French, under the leadership of the Duke of Vendome, by the English, Dutch and Austrians, led by the Duke of Marlborough and Eugene of Savoy. Operations can be expected on all the h.f. bands and a QSL is available from **Karel Moerman ON5TN, St. Martinusstraat 52, B-9790 Wortegem-Petegem, Belgium.**

Your Reports

On to your reports and the first log is from **Eric Masters G0KRT** in Worcester Park, Surrey who used a Yaesu FT-817, a modified W3EDP antenna and just under 5W to work the 3.5MHz band logging OZ5DX/QRP (Denmark) 2340 and UA1AVA (European Russia) at 2358UTC, even though the band was in "poor" shape. Moving to 7MHz Eric found conditions "slightly better" working GW0NSR in Conwy, Gwynedd at 1052, OK3JA (Czech Republic) 1441, PA0RDT (Netherlands) 1449 and later S5JDX (Slovenia) 2303UTC.

The s.s.b. log of **Martin Addison 2E0MCA** in East Finchley, North London included HB0/EA1DVY (Liechtenstein) 0459, SM7YLS (Sweden) 0555, LX/EA5GVS (Luxembourg) 0705, OE2008MCU (Austria) 1445 and HB2008Z (Switzerland) 1521. Both WERE special calls for the Euro 2008 Football Championships. The equipment was a Yaesu FT-2000 with Heil headset and up to 50W output to his half-sized G5RV.

The 10MHz band found **Ted Trowell G2HKU** on the Isle of Sheppy using his IC-703 with c.w. and just 5W to his G5RV at 2000UTC, working LA/DM2AUJ (Norway), OY/LA6FJA (Faroe Islands) EU-018 and OZ/SQ1DWR (Denmark).

The 14MHz Band

On the 14MHz band Ted G2HKU found ZP6CW (Paraguay), CX5BW (Uruguay) around 1400, A71AN (Qatar) at 1600, HC2SL (Ecuador) and LZ1AF (Bulgaria) at 2000. There were also some 70W contacts with JA7AKH (Japan) in Yurihonjo-City Akita 1000, J28JA (Djibouti), 8P6JD (Barbados) NA-021, TA2/OK1TN (Turkey) and FJ/DL1DA (St Martin) NA-105 around 2000UTC.

Then came YV5DTJ (Venezuela), PY1KN (Brazil), FG/F5OIU (Guadeloupe) NA-102, EA8AY (Canary Islands) AF-004, Victor Abell W9RGB (USA) in West Lafayette, Indiana and William Maxson N4AR in Nicholasville, Kentucky. All were worked at around 2100UTC using a Ten Tex Omni V.

The yacht *Boyztoyz* (callsign **MHJT8**) was the home for the portable station of **Colin Topping GM6HGW** who says, "My yacht was being used as a committee boat during the St. Andrews Sailing Club open regatta in July. While sitting on the anchor in St. Andrews Bay, I rigged up my 7MHz whip and SGC-2020 and worked DJ9XO (Germany) 0605 with reports of 5 and 9 and 5 and 5 being exchanged. A short while later 5/9 station DL5CX was worked at 1610 and this time my report was better at 5 and 7. Just after 0630 the band went dead almost as if a switch had been thrown!

"Fortunately, I had taken my whip for 14MHz and set that up only to hear just one station, HB9CCL (Switzerland) at 0705 who was a good 5 and 7 with me. My received report was 5 and 5, which I know is nothing spectacular, but was good going for 20W and a whip antenna mounted at the stern and a ground connected to the bilge keels via the hull keel bolts. I finally closed down at 0730 as I'd been up since 0430 to lock out on high water and there was not much other activity."

Note: Colin hopes to be more active over the next few months on both the 7 and 14MHz bands using s.s.b. so keep a look out for his /MM call.

Also on the band was **Martin**

2E0MCA who had a large s.s.b. log finding the band in "fairly good shape" for European QSOs. The list of stations included HB2008BA (Switzerland) 1110, EG1SP (Spain) a special call 'Fiesta de San Pedro' at 1122 QSL via EA1URG, IB0CW (Italy) on Ventotene Island EU-045 at 1421.

Then came OH0B (Aland Island) EU-002 at 1438, HA801CW (Hungary) celebrating 80 years of the Hungarian Radio Society at 1720,. Next worked ON8AM/P (Belgium) 1856, YT5RA (Serbia) 1917, SY75NW (Greece) active from Meg Emvolo lighthouse (Thermaikos Gulf) QSL via SV2HPP at 1923. Then came EM0ITU (Ukraine) a call for the International Telecommunications Union, QSL via UT3UZ at 1926, PA1CC (Netherlands) 1955, UE1OTA/P (European Russia) on Morshovets Island EU-119 at 2048, CN8PA (Morocco) 2048 and finally AN5KB (Spain) 2056, please QSL via EA5KB.

The 18, 21 & 28MHz Bands

On 18MHz Eric G0KRT used c.w to have a 5W QSO with K1ZM (USA) in Hopewell Junction, New York at 2138. Moving up to 21MHz Ted G2HKU worked just one station using 5W, – PY3AY (Brazil) at 1900. The s.s.b. of Martin 2E0MCA was tried on 28MHz working YU8EW (Serbia) 1644 and slightly later AO5FL (Spain) QSL via EA5FL at 1809.

Ted also tried this band running 70W c.w. and managed TK5EP (Corsica) EU-014 and IS0GSQ (Sardinia) EU-024 at 1600. Meanwhile, back in Worcester Park, Eric G0KRT was pleased to log two-way QRP contacts with c.w. stations OE5ARN (Austria) at 1405 and IK2RGV (Italy) at 1421UTC

Signing Off

Another month flies by – and once again conditions have been very poor! The lower bands have activity on them but it has mostly been restricted to inter-UK or European calls.
I monitored several DX stations on the 7MHz band from the West around 0100UTC. Most of these were from Brazil and the USA, working into Eastern Europe with reasonable signals at 559 to 579 including K1ZZI in Georgia but I was unable to work them.

Openings have occurred on the higher bands but these have been few and far between with best condition in the late afternoon. Let us hope that the bands are more forgiving over the coming months!

Fig. 5: The V25V and HB100JAM QSLs recently received by Martin Addison 2E0MCA for 14MHz s.s.b QSOs

Before I close, I must mention reader and reporter **Peter Leng G0SVO** who lived in Gosberton, Spalding. I had a long conversation with Peter on the telephone just before he packed all his gear and went QRT. He's heading south, emigrating to New Zealand so it will be a short while before Peter is back on the h.f. bands as he settles into his new home and job. He has already obtained the callsign **ZL4TE** and **ZL1PETE,** which he hopes to use as an EchoLink node once his station is up and running.

Peter has promised to send in some reports and will welcome skeds with readers when conditions allow. Updates can be found on his web page at **QRZ.com** and I'm sure we all wish Peter and his family well!

Finally, my thanks to all those who sent in their reports this month and to **Mauro Pregliasco I1JQJ/KB2TJM** editor of the *425 DX Newsletter* for all the DX information. Until next time I wish you all good DX.

73, Carl GW0VSW

If you require any Autumnal reading, please take a look at our radio bookstore on pages 76-79 of this issue of *Practical Wireless*

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The equipment for sale on this page is secondhand or ex-demonstration

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Icom IC-R72 100kHz-30MHz AM,CW,SSB Base Communications Receiver mains or 12V.....£299
Kenwood TH-42E 70cm FM H/Held Transceiver.£49
MFJ MFJ-956 Shortwave Preselector.....£39
Netset Pro-44 68-88,108-174,380-512MHz AM,FM Hand Held Receiver 50Ch.....£49
Icom IC-E90 6m,2m,70cm FM + DTMF keypad CTCSS & wide RX.....£149
Yaesu FP-30U 13.5V 22A (max) Internal PSU for FT-897 110-240V AC.....£119
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Albrecht AE-485S 10m 28-29.7MHz All Mode Mobile Transceiver 25W 12V.....£89
Kenwood TS-570D HF All Mode Base Transceiver with Gen. Cov. + ATU & DSP filter 100W 12V.....£569
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Icom IC-PCR1000 500kHz-1300MHz All Mode PC Controlled Receiver 12V + psu.....£199
Icom IC-A22E Airband H/Held + NAV/COM.....£199
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Yaesu FT-990 HF Base Transceiver with Gen.Cov. 12V.....£499
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Diamond GSV-3000 12V variable 30A (max) Regulated PSU with meters & cigar socket.....£69

RADIOWORLD

01922 414796

Yaesu FT DX9000 D Transceiver.....£5,495.00
Yaesu VL-1000 QUADRA 1kW HF + 6m Linear Amplifier.....£2,499.00
Yaesu FT-2000D 200watts.....£1,800.00
IC-756PRO-MKIII Icom HF + 6m Trx.....£1,599.00
Icom IC-775DSP HF Base Transceiver.....£1,499.00
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Yaesu FT-1000 "CLASSIC" HF Transceiver.....£1,399.00
Yaesu FL-7000 HF Linear Amplifier.....£1,299.00
Yaesu FT-2000 IN STOCK 100W with internal power supp.....£1,299
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Yaesu FT-1000MP Mark -V Field.....£1,199
OptoElectronics X Sweeper.....£1,199
NEUMANN U 87 Ai condenser microphone.....£1,100
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Icom IC-756ProII HF / 6m Transceiver.....£999
Kenwood TS-2000 All Mode Multibander Transceiver.....£999
Yaesu FT-920AF HF / 6M Base.....£899
Kenwood TS-950SD HF Transceiver.....£899
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IC-7400 HF, 6m & 2m transceiver.....£899
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Yaesu FT-736R Multi- Band Transceiver+ 6m+23cms.....£899
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Icom IC-751 HF Transceiver.....£400
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Icom IC-R72 Receiver.....£399
JRC NRD-525 HF Receiver.....£399
Icom IC-740 HF Transceiver.....£389
Yaesu FT-857D Multi-band Mobile.....£389
Yaesu VR-5000 Scanning Receiver.....£389
Icom IC-703 HF / 6m.....£379
Alinco DX-77E HF Transceiver.....£379
Alinco DX-77E HF Transceiver.....£379
Alinco DX-70TH HF & 6m transceiver.....£375
Icom IC-718 HF Transceiver.....£359
IC-R71E HF Receiver.....£349
AOR AR-8600MK1 Wide Band Receiver.....£349
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A3S Cushcraft 3-Element Tribander.....£300
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Kenwood TS-140S HF Transceiver.....£299
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ICOM IC-706MK1 HF-6M-2M.....£299
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Classified Ads

To advertise on this page see the booking form below.

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Aerials

GAREX ELECTRONICS VHF/UHF accessories and aerials, PMR equipment and spares. www.garex.co.uk Tel: 0771 4198 374 PO Box 52, Exeter EX4 5FD.

G2DYM/G4CFY AERIALS Custom made low noise, low TVI dipoles and trap dipoles. PVC covered stranded wire and 75 ohm feeder properly made-off. Epoxy potted traps. Centre piece and dog-bone insulators included. Spectrum Communications. Tel 01305 262 250. www.spectrumcomms.co.uk

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Qtz x-tals 455kHz to 150MHz Std 10.106, 10.245, 10.7, 11.155MHz £1.00/unit. Callg 3.56, 7.030, 21.06, 28.06 £1.00/unit. 1.4MHz fltrs £14.00. 10.7MHz 10kHz fltrs £3.25 P&P £1.00 + VAT.
IQ Electo 0208 391 0545. vincent@jakomin.fsnet.co.uk

Valves

VALVES:- OVER 50000 STOCKED Ham, Vintage, Military, Audio. SAE for FREE list to: Wilson Valves, (Jim Fish G4MH), 28 Banks Ave., Golcar, Huddersfield, West Yorks HD7 4LZ. Tel: 01484 654650/649380/650725. Mobile:- 07733 283084. E-mail: wilsonv@zoo.co.uk Visa etc. Fast & personal service.

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Whilst prices of goods shown in advertisements are correct at the time of going to press, readers are advised to check both prices and availability of goods with the advertiser before ordering from non-current issues of the magazine.

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Please insert this advertisement in the ..... **issue of** *Practical Wireless* (if you do not specify an issue we will insert it in the next available issue of *PW*) for ..... insertion/s. I enclose Cheque/P.O. for £.....(42p per word, 12 minimum, please add 17.5% VAT to total).

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Send your advert to **Bargain Basement, Practical Wireless, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW** or E-mail your advert to **peter@pwpublishing.ltd.uk** (If you don't want to include your credit card details on your E-mail, just 'phone us on **0845 803 1979**.

Please help us to help you by preparing your advert carefully. Any advert which contains **??** marks indicates that the advertiseing dept. could not read/interpret the wording.

Please avoid FAXing your advert - it could delay publication.

Advertisements from traders or for equipment that it is illegal to possess, use or which cannot be licensed in the UK, will not be accepted. **No responsibility will be taken for errors and no correspondence will be entered into on any decision taken by the Editor on any of these conditions.**

You should state clearly in your advert whether equipment is professionally built, home-brewed or modified.

The Publishers of *Practical Wireless* also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

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ICOM IC-703 HF and 50MHz. QRP rig, £200. Tel: Dave Logan 01457 768799 (Cheshire).

ICOM IC-7400 mint, boxed, £550. Icom IC-735 VGC, £225. Icom IC-765 VGC, £400. Vectron VC-300DLP ATU, £65. Watson 25 Amp PSU, £40. Exchange pro receiver. WHY, no time wasters, please. Tel: 01279 815020 (Essex).

YAESU FT-1500 boxed, 2 metre (144MHz) compact transceiver, £70. Tel: Andrew 01262 488779 after 6pm (Yorkshire).

YAESU FT-817 SPEECH PROCESSOR Built-in mic. Tokyo HL 50B amplifier. MFJ-971 portable a.t.u. 80m Hustler mobile resonator plus base whip section. AT Walkabout antenna 80m. Price £500. Contact Keith G4EJH on 01275 843897 (Bristol Area).

WANTED

ALINCO DJ-191 hand-held VHF/FM transceiver. Tel: Andrew 01262 488779 after 6pm (Yorkshire).

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OLD HALF INCH FERRITE RODS must be half inch, 12.7mm, in diameter and be six inches long or more. Will pay very good money for the rods. Tel: Peter Tankard 0114 2316321 between 9am and 9pm (Sheffield).

OSMOR COILS any but especially SWQ1 and SWQ2. Also, 1970's IC MFC 4000P, thank you. Tel: 01438 871975 (Hertfordshire).

VHF AIRBAND RECEIVER scanner DR-600 made in early 1980s by Swinburn Aviation, Birmingham, in good working order. Tel: George 01443 437345 (Mid-Galmorgan).

YAESU FT-50R KEY PAD or faulty FT-50R so I can remove the key pad. Tel: (01458) 445763 or e-mail g4j6w@oagbs.co.uk (Street).

Please make any cheques for Bargain Basement adverts made payable to PW Publishing Ltd.

Bargain Basement order form

Please insert this advertisement in the next available issue of Practical Wireless.

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PLEASE NOTE: as a security measure, you must include your house number and postcode.

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PLEASE WRITE IN BLOCK CAPITALS

CARD NUMBER

VISA SWITCH AMERICAN EXPRESS MasterCard

Signature..... Security number

LAST THREE DIGITS ON THE BACK OF THE CARD

Switch issue number (if on card) .....

Start date of card..... Expiry date of card.....

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B.B. Oct '08

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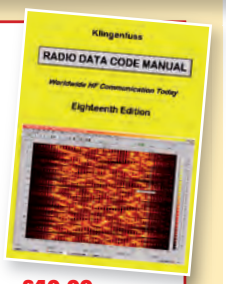

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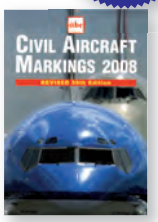

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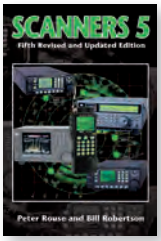

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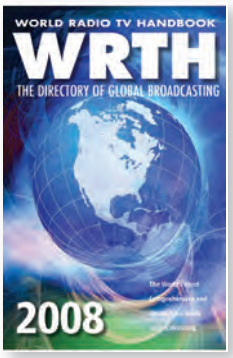

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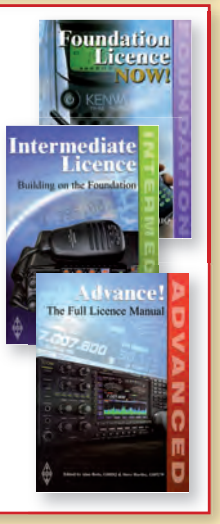

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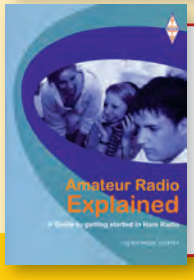

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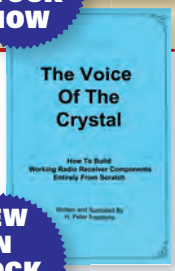

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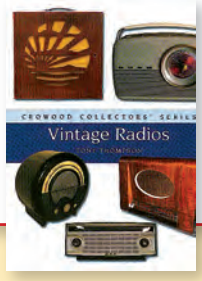

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Rob Mannion's

topical talk

Rob Mannion G3XFD discusses topics ranging from reception to lightning and GB75PW QSL cards.

The letters pages this month is full of interesting correspondence. The letter from **Charles Ivermee** in Southampton regarding the formation of the UKQRM group (the acronym adequately describes their goal) is timely, as the Amateur Radio bands, along with the rest of the short wave, spectrum are now badly affected by interference from switch-mode power supplies, etc.

Personally, I think any efforts to help reduce the 'pollution' – **it surely is pollution** – of the radio frequency spectrum must be to the benefit of anyone, whether they are listeners or Amateurs.

Unfortunately however, any group that attempts to achieve the worthy goal of even trying to reduce interference levels away from Band II broadcast and television or official communication frequencies are unlikely to get much support from the UK Government or its Ofcom agency. I suggest this because although there may be some sympathy by individuals in the Government and perhaps Ofcom, action to assist is unlikely because, apart from the official communication frequencies (aviation, military, etc.) there's no money available for any parts of the spectrum that do not generate significant money in licence revenue.

In other words, I think that we can only hope to help UKQRM to achieve its published goals by ensuring the equipment we buy and use doesn't cause interference. We can also help by spreading the word via our hobby.

I wish UKQRM well with their efforts. However, we must all work together by choosing equipment carefully, warning users of electronic and electrical equipment of the problems caused by poorly designed – and equally poorly made – mains operated appliances.

The GB75PW QSL Cards

The letter from **Stuart Davies M1FWD** came about due to a long series of E-mails between us, which began when he contacted me about his missing GB75PW QSL card. From that correspondence a friendship has developed because of our common interest in the much loved Lynton & Barnstaple railway, which closed in 1935 but is slowly being rebuilt.

Over the past year I've cleared as many GB75PW cards as possible and those coming via the bureau are being dealt with whenever I have the time. So, if, like Stuart's, your (sent direct) card appears to have gone astray, please let me know.

Lightning Strikes

It was good to hear from **Kevin Jackson AA3XV/G4NJE** when he responded to the published letter from **Peter Leybourne MM5PSL** in Shetland. Kevin only writes occasionaly as he thinks I'm too busy to be receiving any more E-mails from him! (You're not the problem Kevin – but I wish we could convince the spam merchants to stop clogging the Internet!).

Kevin's advice regarding protection against lightning strikes or the consequences of nearby lightning, offers a great deal of common sense and electrical engineering expertise. It's also very interesting to me that all the damage he reported was the result of a nearby overhead cloud-to-cloud lightning!

Fortunately, I've never experienced a direct lightning strike on any of my Amateur Radio installations. Even the mountain top located private TV receiving stations I helped to design and construct in the Scottish Highlands were never – to my knowledge – affected by direct strikes. Unfortunately though, the extremely high static charges that can develop in 'thundery' weather could – and often did – destroy masthead and cascaded Band IV and V channel amplifiers.

Mountain top protection for sensitive equipment was difficult. Even u.h.f. Yagi arrays could develop a static charge high enough to totally destroy several amplifiers.

On occasions I've also noticed static charges causing 'flash overs' on disconnected Amateur Radio dipoles. So, my own advice is that whenever there's the possibility of thunderstorms nearby, always remove antenna connections or ensure they're earthed to avoid the extensive damage that can occur through static discharges without the presence of lightning. Better safe than sorry!

Rob Mannion G3XFD/EI5IW

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The radio... YAESU

Choice of the World's top DX'ers℠

The Evolution of the FT DX 9000 Series
The Powerful New FT-2000

- Strong receiver front end includes VRF (Variable RF Tuning) preselector and optional external High-Q Tuning for the 1.8 - 14 MHz bands
- First IF Roofing Filters of 3 kHz, 6 kHz and 15 kHz included (Main VFO-A)
- Strong receiver design provides wide dynamic range and high 3rd order intercept point
- Wide array of IF-DSP interference-rejection filters (Main VFO-A)
- External display port for viewing a wide range of information including RF and Audio Scopes (Optional DMU-2000 Data Management Unit and monitor are required)

HF/50 MHz Transceiver

FT-2000

- FT-2000D 200 W with External Power Supply
- FT-2000 100 W with Internal Power Supply

Shown with after-market keyer paddle, keyboard, and monitor (not supplied). Optional Data Management Unit (DMU-2000) and monitor are required for viewing of Aud o Scope and other display features.

Specifications subject to change without notice. Some accessories and/or options may be standard in certain areas. Frequency coverage may d ffer n some countries. Check with your local Yaesu Dealer for specific details.

FT-2000 Available in Europe - October 2006

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