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EDITOR'S KEYLINES
Rob Mannion G3XFD welcomes you to Amateur Radio's centenary year

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RADIO - DISCOVER THE BASICS
Rob Mannion G3XFD demonstrates a classic use of single diode rectifier

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AMATEUR RADIO - THE FIRST 100 YEARS
Rob Micklewright G3MYM provides a look back at Amateur Radio over the last 100 years.

THE A41 VHF MANPACK TRANSCEIVER
Ben Nock G4BXD takes a look at a military surplus v.h.f. transmitter-receiver

REVIEW - THE TIMEWAVE DSP-599zx AUDIO FILTER
Rob Mannion G3XFD has found that the Timewave DSP-599zx offers an incredible package and is just what he's looking for!

CARRYING ON THE PRACTICAL WAY
This time George Dobbs G3RIV sets out to describe a 'Super VXO'

ANTENNAS IN ACTION
Tex Swann G1TE3 presents eight action packed pages of antenna and related information.

REVIEW - THE KENWOOD TH-G71E DUAL-BAND HAND-HELD TRANSCEIVER
Richard Newton G0R5N puts the latest offering from the Kenwood 'stables' through its paces.

CANNY CAVITIES
Harry Lythall G4VU says it's easier than you think to make a practical resonant cavity filter - read this to find out how.

84 ADVERTISERS' INDEX
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Practical Wireless, January 1998
The Directors and Staff of PV Publishing Ltd wish all our readers and advertisers a very Merry Christmas and a Prosperous New Year.

Please note that the Editorial and Advertising Offices will be closed from Christmas Eve until Monday 5th of January 1998.
Welcome to 1998 - which is being recognised as the centenary year of 'Amateur Radio'. And throughout 1998 Practical Wireless will be celebrating a century of experimentation, discovery, initiative and expertise by non-professional radio enthusiasts.

Our celebration year starts off - appropriately enough - by the person who first ensured the Editorial team were fully aware of the significance of 1998 - with an article by Rob Micklewright G3MYM. Then throughout the year PW will feature historical features and achievements, specialised projects and reports.

We also plan to keep readers up-to-date with what's happening in the 'vintage & museum department' by publicising events and exhibitions. We've certainly got a lot of 'treas in store for you this year!

And, mindful that we are fast approaching the much vaunted millennium, the Editorial team are very busy preparing state-of-the-art projects and ideas which will take the magazine and its readers into the run-up to the new century. This is because PW is the magazine where the latest technology and vintage style memories, computers, data systems and Morse techniques all co-exist happily together - to everyone's advantage.

It's our versatility and unique approach to the hobby which helps to make PW so special. This is made possible by you the readers. So, keep a look out and don't miss each feature-packed PW!

**Club Visits**

The numerous club visits I undertake each year have become a very important - and integral - part of Practical Wireless itself. This is because your input is so important (don't forget - Ian Poole G3YLX's long series 'Specifications' came about from a club visit - North Ferriby in this instance).

During my holiday I hope to do two important things - explore the old County Donegal narrow gauge railways with the help of my friends in the 'Donegal Gang', operate /P on 3.5Mhz and meet friends old and new at the Donegal club - one of the busiest in EI so I've learned.

Don't have a date for the Donegal club visit yet (possibly 27 or 28th of March) - but if you live in the area keep an ear open and we may meet! I then travel back home on Saturday 4th April to catch up with the rest of the schedule! But at least I'll return to a nice warm home and meal after my travels as my daughters are 'house sitting' for me while I'm away (daughters are great aren't they?).

Tuesday 28th of April is the date I'm visiting the Verulam club in Hertfordshire. Next on the list (after recovering from the Dayton HamVention in the USA!) is the Cheshunt club in Hertfordshire on Wednesday 27th of May.

Wednesday 3rd of June means another welcome visit to the north-east of England when I visit the Great Lumley club in County Durham.

It's off to North Wales on Tuesday 7th of July. This is when I'm visiting the Wrexham club and Friday 7th of August will see me at Cheltenham - not for the races but to visit the Cheltenham Amateur Radio Association!

Monday 24th of August is the day I'm due in Derbyshire to visit the South Normanton and Alfreton club. Next on the list is a trip to visit the Leicester club on Monday 7th September. Later on in September - Friday 18th of September I'm visiting the Mid-Sussex Amateur Radio Society.

Last, but certainly not the least, is my visit to the Oulder Hill Society in Rochdale on Friday 23rd of October, the evening before the Rochdale QRP Convention. You might say it's a case of 'two birds with one Rob' to round off my club visits for 1998!

**Hand-Held Apologies**

I'm afraid that I have to offer my apologies to those readers waiting for the second part of Geoff Pike G10GD's u.h.f. hand-held transmitter project to be published. The problems have been caused by technical production difficulties and I had to take the decision to 'hold over' part 2 from the December issue (a note to that effect was placed on the contents page).

Unfortunately however, due to continuing technical difficulties - made worse by the much shortened Christmas-time publishing schedules - I have decided that it's best to publish the final part of the GDP-430 in our March issue which will appear on the bookshelves on February 12th 1998.

I hope readers will accept my apologies for the delay and realise that the decision is part of my determined policy to ensure the project is completely error-free when it's published. Personally...I think it will be well worth the wait!

**Year Planner**

By the time you've read 'Keylines' you'll have discovered our free Christmas and New Year gift - especially for you. We hope that you'll find the PW 1998 Year Planner useful throughout the very special new year. So, please enjoy using it with our compliments!

Finally, as this issue appears just before Christmas 1997 I'd like to wish you all a happy and peaceful season. Everyone on the Editorial team - Donna Vincent GT7ZB, Zoe Crabb and Tex Swann G1TEX, and of course I also wish you a very happy new year.

Rob Mannion G3X7D
Gratitude To Practical Wireless

Dear Sir

I am writing to thank you for the interesting talk which you gave to the South Manchester Radio Club in Sale on Friday 24th October. It was very interesting for me to hear of the early history of PW and of the recent history too. Needless to say, the breadth of your experience is truly amazing. I had intended to tell you an anecdote about a debt of gratitude which I feel I owe to Practical Wireless, but the question session was so well occupied that I decided I would write to you personally instead.

The story starts in 1942 when I was 13 and I found, at home, three copies of PW, which my older brother had bought in 1937. I started reading them and found articles with "news" about various short wave broadcasting stations and other sections of UK listeners' reports of stations they had heard from all over the world. There were "blueprints" in each copy too, and they were genuinely blue in those days of course!

The idea of being able to listen to distant stations with a receiver which you’d made yourself fascinated me. My parents' radio only covered medium and long, so short wave radio was a field of which I’d had no experience. One of those PW copies also contained an article by a UK listener with a title like 'listening to US amateurs' during the summer nights' in which he listed the call signs of stations he had heard. This introduced me to the idea that there were lots of people who had short wave transmitters and receivers at home which they used to 'talk' (probably by Morse code) to other 'amateurs' - that was an even more fascinating idea of course!

I then discovered that my father had kept a box of radio components, some of which he’d used to build domestic radio sets in the late 1930s or early 1940s, and amongst the components was a rather tattered copy of The Beginner's Guide To Wireless Telegraphy & Telegraphy by Roberts Heys, published by the Saxon Radio Co. of Blackpool, which included a design for a one-valved medium wave receiver.

I built it using a 'dull emitter valve' and I heard the Home and Force programmes with it using a single headphone. Incidentally, a glance at the adverts in your old copies of PW's predecessors brought back memories of the names of component manufacturers with which I had been familiar as a result of 'rooting through' my father's old boxes.

As a result of this new interest, my parents gave me money for my 14th birthday to buy a copy of F. J. Carr's Short Wave Manual (I think it cost 75d), which I'd seen advertised in a new copy of PW, because I'd become a reader by then (I must confess that I ceased to be a regular reader at some stage in the late 1940s when I changed to Wireless World as I couldn't afford both).

My father bought me a second-hand pair of headphones (S. G. Brown no less for 2/-) and I bought myself an HL2 triode so I was equipped for starting on a practical demonstration of short wave radio. I built a one valve receiver from a design in the Short Wave Manual, but I used a Telson 'two band' short wave coil (which was in my father's collection, but which he'd never used) instead of the home-made single band coil wound on a glass test tube as described in the book.

I strung up 30 feet of aerial wire to the bottom of the garden and began learning the technique of gentle reaction control and not moving my hand because of 'hand capacity effects' and I soon began hearing stations like Radio Brazzaville from the Belgian Congo, All India Radio, Japanese broadcasts and US Armed Forces Radio Service programmes from stations like WNBC, WGED, etc. and it was all very exciting for me. Later on I converted my receiver to a 2 valve 'detector + l.f.' version and heard Radio Australia, so I felt I'd really 'heard the world' then!

 Needless to say, by the time I was 15, I 'knew' that I wanted to become a Radio Engineer and staff at school directed me into thinking of a Physics degree course as the way to proceed to become a professional radio engineer. I never did become that, but I spent all my working life in Physics and Electronic Engineering so I was in the right sort of area!

But going back to the s.w.l. area, it was in the latter half of 1944 that, in my after school listening, I came upon stations MCO, MCP and MCP, which were used by the BBC War Correspondents, like Chester Wilmot, Frank Gillard and Richard Dimbleby to send their reports back to BBC London. It meant that I could tell my father what the reports were going to say before the six o'clock news on the Home Service and, more exciting still to the budding amateur, half of 1944 that, in my after school listening, I came upon stations MCO, MCP and MCP, which were used by the BBC War Correspondents, like Chester Wilmot, Frank Gillard and Richard Dimbleby to send their reports back to BBC London. It meant that I could tell my father what the reports were going to say before the six o'clock news on the Home Service and, more exciting still to the budding s.w.l., I also heard the 'programme of the programme' - the seconds stations were used for 'news' about various short wave broadcasting stations...it was, to the best of my memory, the PB279, which incidentally was never motor driven, was first made in 1938.

The first motor-driven automatic-tuning set was, to the best of my memory, the PB288, this had a narrow slider between the two halves of the selection disc fitted to the variable capacitor spindle. Small variations in the final position of the slider were taken care of by automatic frequency control (a.f.c.).

The use of a.f.c. violated the patent held by another radio company and the next year in the new model - the PB289 - I believe it was called, used a different method of frequency control. The motor was now 2 speed, when it stopped, it over-ran the insulating strip and made contact with a small roller. One of two fitted each side of the insulating strip, the motor direction reversed at a slower speed the selection disc inched back to the off position...

So, I am deeply thankful to PW for having started me on that path which helped me into a career and which has also given me nearly 50 years of interest in short wave listening and 47 years of activity as a radio amateur - almost all of the latter on c.w. by the way. Well, that isn't all of my early history in radio, but I'm sure I've consumed enough of your 'spare time' already, so thank you once again and best wishes.

Alan Errock G3HCO
Cheshire

Editor's reply: Thanks for the memories Alan...they were absolutely fascinating! I thoroughly enjoyed my visit to your club...thanks for the hospitality.

Letters Received Via The 'Internet'

Many letters addressed for 'Receiving Your Mail for the Internet'. And although there's no problem in general with E-mail correspondents are forgetting to provide their postal address. 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 don't forget to include your full postal address and colleague along with your E-mail address. Kind Editor

Ecko Service Department

Dear Sir

As a pre-war member of the Ecko Service Department, I was most interested to read the letter entitled "Vintage Vale" and referring in part to the article by Ian Listen-Smith G4JGT in the August issue of your magazine.

New Ekco models were brought out in the early autumn and the last figure of the type number indicated the following year. Thus the PB279, which incidentally was not motor driven, was first made in 1938.

The first motor-driven automatic-tuning set was, to the best of my memory, the PB288, this had a narrow slider between the two halves of the selection disc fitted to the variable capacitor spindle. Small variations in the final position of the slider were taken care of by automatic frequency control (a.f.c.). The use of a.f.c. violated the patent held by another radio company and the next year in the new model - the PB289 - I believe it was called, used a different method of frequency control. The motor was now 2 speed, when it stopped, it over-ran the insulating strip and made contact with a small roller. One of two fitted each side of the insulating strip, the motor direction reversed at a slower speed the selection disc inched back to the off position.

The PB279 was a cheaper simpler model where station switching was simply done by...
selecting a pre-set tuned circuit. After all these years, my memory is dim, but the above principles are basically correct.

Ron Parry G5XV
Berkshire

**PW Sprat Project**

**Dear Sir**

I am writing about the PW Sprat project in July/August 1996 and I wonder how many of your readers have built one, and if so...how have they found the construction and performance of this project? I have built the 3.5MHz version and found that it gives very good results.

I found there were one or two faults with the circuit, one of which the tuning was too coarse, however, this was cured by changing R3 to 2.7kΩ. I have gone on to build a 7MHz version and had quite a number of continental DX QRP QSOs.

I think the design is great and brings a complete c.w. superhet in a single chip and 'phone if anyone has thought of building an s.s.b. transceiver using the design? It is a great portable rig when going 'P' using batteries and if you use the case recommended it fits in the palm of your hand. So, I hope to QSO with other Sprat users and hear more from them on their experiences.

Jim Walker G9WMJ
Lancashire

**Island PCB Technique**

**Dear Sir**

A variant to the cut and glue 'island' technique of construction used for the connections of the r.f. amplifier (October issue) is to isolate the islands required directly on the unetched p.c.b. board. A model maker's electric drill fitted with either a burr cutter (or a small drill with just a small amount of projecting from the chuck) is used to cut a narrow channel through the copper around each island. Then you should test for short circuits, and then if it's okay...solder on the components.

Assuming that a general layout has been planned, one advantage of this method is that the islands may carefully be cut out as work progresses to suit the size of the component. It is also possible to channel the connections to standard dual in line (DIL) integrated circuits (i.e.s) so that they may be soldered in a normal upright position.

However, a better method for more complex circuits especially ones using integrated circuits is to make a sandwich of Veroboard and single-sided p.c.b. material, the latter copper side down as a groundplane and Vero copper tracks up. Initially, the Veroboard is located and fixed on the p.c.b. material by using the corner track holes to drill through the p.c.b. material and insert wire links soldered on both sides. Component ground connections are passed through Vero track holes and ones drilled in the bottom copper then soldered on both sides. All other connections are made to the Vero tracks using them as normal or grouped in islands and removing those not required with a track cutter. Components such as small transformers and inductors may be glued to the Veroboard to achieve stability and external connections made to the Vero tracks as in normal use. This method allows i.e.s to be mounted in the upright position and connections to be made without the interpolation required in the 'upside-down dead bug' method.

Editor's reply: I checked with the RA Provisions & Limitations Booklet BR68, page 12, para 7(3) where it states that /P refers to operating at a temporary location - not portable.

I sometimes work from a temporary location and use callsign /P followed by the postcode, operators coming back to call 'stroke P' often say or key 'stroke portable'. Then I have to explain, which causes some confusion!

2) When operating portable, as I do sometimes. I never use portable in the ensuing QSO, I will say that I am operating portable, but to include it in the callsign appears to be 'out of order'. However, many thanks for such an excellent magazine, I have just been made a present of a year's subscription to PW and I look forward to receiving it with pleasure.

Stan Emmett G0TZT
Isle of Wight

Editor's reply: I checked with the RA on this point Stan and it appears that as I wasn't mobile (although operating from a stationary car) and I was using a temporary antenna, whilst operating temporarily from a lay-by - I was correct in signing 'stroke portable'.

**Working 'Stroke Portable' On HF**

**Dear Sir**

I read with interest your 'Keystones' comment regarding working 'Stroke Portable' (/P) in deepest Wales. Here, I take great pleasure in working /P from isolated locations, mainly from hilltops on 'two metres' and h.f.

Like you, being outside the home QTH brings the magic of amateur radio back into the hobby, no 'phone, no TV or computers, just a radio (in my case a Ten-Tec Scout S55, a battery and a W3EDP long wire strung to the nearest fence-or tree plugs an MFJ random wire tuner). I get a real sense of communication from this set-up and of course the fresh air and in your case, steam, heaven!

It always amazes me when working /P how many people come up to see what's going on. Many cannot believe the distance being worked, even on 3.5MHz inter UK. Who said amateur radio was outdated?

I look forward with great interest to hearing your ideas in print regarding a good portable antenna. In the meantime, thanks for an excellent magazine.

Peter Caldwell G4PAC
Berkshire

Editor's reply: Working h.f. portable is great fun Peter...as we've both 'rediscovered' I hope to publish my /P antenna ideas later in 1998.

**Memories Of 1936**

**Dear Sir**

In reference to your 'olde world radio making' on page 21 PW October issue. This really brought memories flooding back to me when I was 10 years old in 1936. I recall my father making a radio from the PW magazine of the time. Not that I've followed in his footsteps. Unfortunately, he passed away at 35 years two years later. The set I recall was a blessing for entertainment. My father had to wind the coils by hand. The cabinet for the receiver was also hand made too...with 'twisty legs'.

Thinking of the compact radios of today, it was glamorous and enormous! There was a deck inside behind the dials, where everything was laid out, valves, coils, etc.,...grid bias, all in a little rack.

For the tuning knobs, they were mounted on a Bakelite facia panel. Behind the lower doors of the cabinet, there could be found a beautiful glass accumulator and a large high tension battery. The large speaker sat on top of the whole assembly. The aerial was a long wire type and there was a substantial 'earth' connection.

Of course, I also quite often had a trip to the top main road to have the accumulator recharged. Quite some memories eh? And thank you for your memories and congratulations on your 65 years of PW service.

George H. Taylor
Doncaster

Editor's reply: Thanks for your memories too George...and keep the memories coming readers - please!
The Biggest Electronics Catalogue Ever!

Tandy, who say they are "Britain's largest high street electrical retailer" have just launched, what they are claiming to be their "biggest and best catalogue ever". Tandy are part of InterTAN Inc., who are based in Fort Worth, Texas in the USA. InterTAN is an international consumer electronics retailer with over 1,800 retail stores and dealer outlets in the UK, Canada and Australia.

The Tandy stores carry a wide range of both brand and ownlabel consumer electronics including video products, telephones, computers, batteries, accessories and much more. And the new Tandy Electronics Catalogue is no exception, its 500 pages are packed with products including specialist electronic components.

A new feature of Tandy's new catalogue is Tandy 'Unlimited' which is a mail order facility giving customers access to the full range of products including the more unusual and state-of-the-art technology. Orders placed from the Tandy 'Unlimited' range are despatched within 48 hours and are subject to a nominal P&P charge.

Tandy Customers can also benefit from the 'Repair Shop at Tandy' service. Under this service Tandy will repair a range of electrical items whether they come from Tandy or not. Full details of this are given in the catalogue.

The new Tandy Electronics Catalogue is available for only £1! from all Tandy stores and includes £25 worth of vouchers. To find out where your local Tandy store is call (01342) 312024 or alternatively check out their Web page at www.tandyuk.co.uk

Keeping In Touch

The Open Museum at the National Maritime Museum, Greenwich, London, will be running a one day course on Saturday 21 February to look at the subject of how communication on land and at sea has always been vital and essential for safety and security, to Naval and Merchant fleets. The course, entitled 'Keeping In Touch' will explore the early methods used to assist ship-to-ship and ship-to-shore communications and will include flag signalling, the Admiralty Telegraph, the early electrical telegraph and the wireless telegraph.

Speakers on the course will include Dr Allan Chapman (Oxford University), David Brown (Naval Historical Branch), Mary Goodwin (Cable & Wireless PLC) and Jenny Wright (Admiralty Library). The cost of the course is £25 (£15 for concessions).

For a free prospectus or to make a booking please contact Caroline Tilbrook on 0181-312 6747 or look to the National Maritime Museum's Web site at http://www.mnm.ac.uk

ZN414 Chip Supply

As many PW readers are aware the Plessey ZN414 i.c. appears to be in short supply, as we discovered after publication of David Rowland G6UEB's 'Matchbox Midget Receiver' project in the September issue of PW. However, help is at hand if you're trying to locate a supplier.

Mike Dudley of Worldwide Electronic Components (UK) Ltd., has contacted the 'Newsdesk' to say that he has several hundred Plessey ZN414Z's in stock and that he can locate and supply most parts under the Plessey name. However, he would like to point out that his business is fairly small and therefore would appreciate orders for reasonable quantities. Mike can be contacted at 48 Elizabeth Crescent, East Grinstead, West Sussex. RH19 3JD. Tel: (01342) 312024 or FAX: (01342) 312025.

'Vintage Visit' For PW Editor

It's quite a few years since I last visited the National Vintage Communications Fair (NVCF) at the National Exhibition Centre near Birmingham. This year however, the Autumn NVCF was on the day following the Rochdale QRP Convention (Sunday 26th October) and I took advantage of the fact that the event was on my way home!

Although the NVCF is certainly not an Amateur Radio event and many of the prices I saw displayed reflected the specialist collector's market - visitors have got to remember that the venue is the NEC! I certainly met many Amateur friends and saw a lot of interesting older equipment.

In fact, I was very pleasantly surprised at the number of interesting items and just missed a bargain, a beautifully made (home-brewed) receiver (£20) incorporating the Eletroniques front-end. A lucky Irish enthusiast had 'bagged' it!

Although I could only stay for a few hours I can certainly recommend anyone to visit the NEC for the NVCF. I didn't buy anything but I wallowed in nostalgia - from valves to early Amateur Radio equipment round to microscopes and even vintage medical equipment!

There's certainly something for everyone and I shall be making an attempt to visit the main event in the Spring of 1998. Perhaps I'll see you there? For further details of the regular NVCF events contact Jonathan Hill on (01392) 411865.

Rob Mannion G3XFD

Jim Fish G4MH well known to PW readers and a long way from his Huddersfield home, had an interesting collection of valves and valved audio equipment for sale.
Procom Electronics of Lancashire have notified the 'Newsdesk' that due to storage problems they have decided to sort out and bundle up a selection of their components into 'lucky' bags and to sell them off. The bags measure approximately 10 x 12in and Richard Swindells G0WCP of Procom says they estimate to have enough components to fill around a thousand bags!

As you can see from the photograph the lucky bags contain a selection of 'bits and bobs' ranging from resistors, displays and other components through to head cleaning cassettes and there's even the odd screwdriver in there too! The bags are available direct from Procom who can be found at 182 Stamford Street, Ashton-under-Lyne, Lancashire OL6 7LR for £7.99 each or by mail order by calling 0161-343 2782. If mail ordering please remember to add £2.50 P&P, all cheques should be made payable to Procom Electronics.

So, if you're looking for some additions to your 'junk box' why not order a lucky bag and you never know you may get hold of that all important component you've been searching for!

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**Student Air Waves**

As reported in last month's 'Newsdesk' the 1997 Radio 1 Student Radio Awards took place on Saturday 1st November 1997 and we are now pleased to announce that University Radio Falmer from the University of Sussex beat strong competition to earn the vote of Best Student Radio Station of '97. The prize for the up and coming broadcasters is an hour of broadcasting on Radio 1 which will give them the chance to broadcast to approximately one million listeners.

Other winners in the other categories included the city of Nottingham whose two universities swept the board by winning five out of seven awards in the remaining categories. These included Best Factual Programme and Best Radio Presenter.

Student radio broadcasting is fast becoming an everyday part of university life and provides an essential grounding for the radio broadcasters and technicians of tomorrow. So, if you're at university and are interested in getting involved with The Student Radio Awards contact Radio One Awards, do NUS Press Office, 461 Holloway Road, London N7 6LJ for more details.

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**PW QRP Contest Presentations**

Despite the delayed publication of the 1997 PW 144MHz QRP Contest results - due to Neill Taylor G4HLX's temporary 'exile' in the USA - the presentation of the winner's trophy, and the 'runner-up' award took place at the last Granby Halls Leicester show event.

Winners of the 1997 Trophy were the North Wales Wafflers (G0HNWR/P) seen accepting their hard won award after several 'near misses' from the Editor Rob Mannion G3XFD deputising for Neill Taylor.

**Alienco Presented - Twice!**

The North Wales Waffler's group also won an Alienco DJ-190 144MHz hand-held transceiver, kindly donated by Mike Devereux G3SED of Nevada.

Communications. As the 'North Wales Wafflers' team all own hand-held transceivers they expressed a wish to donate it to the Radio Amateur's Invalid & Blind Club for use by their disabled members.

The photograph shows the DJ-190 being presented to Shelagh Chambers, Treasurer & Membership Secretary of the RAIBC and wife of Nick Chambers GOIRM who is seen standing (centre) to the left of his wife. Mike Devereux G3SED is standing to Nick's left but perhaps the most important member of the 'Chamber's team' - Clyde. Nick's Guide dog...decided to hide himself from the camera! Gratefully accepting their DJ-190 from the 'Wafflers' Shelagh Chambers said it would be most useful for when RAIBC members were in hospital away from their main rigs. Let's hope there's not too much QRM on the electrocardiographs!

**Solar Power For Runners-Up**

The 1997 144MHz QRP Contest Runners-up - the Oldham Radio Club (G1ORC/P) along with being able to tell of their adventures in appalling weather at their /P 144MHz site - are now the proud owners of a Solar Panel unit kindly donated by Bob Keyses GW4IED of Key Solar Products.

The photograph shows Bob Keyses (second from right) presenting the solar panel units to members of the Oldham RC who have now totally recovered from the effects of bad weather and broken limbs!

**Tennamast Trophy Presented**

Winner of the Tennamast Trophy (In Memoriam to Frank Hall GMSBZX) was again the Cockenzie & Port Seton Amateur Radio Club (C&PSARC). They were presented with the Special Clock Trophy (kindly donated and supported by Norrie Brown GM4VHZ of Tennamast. at the (C&PSARC) 'Junk Night Event' by Beth Hall (widow of Frank) in the late summer.

Shown in the photograph are Beth Hall (left), Bob Glasgow GM4UYZ, Colin Smith GM0CLN, Ron Fraser GM0INTL and Jim Martin MM1BGI.

(Photos courtesy of C&PSARC)
Visit To Portishead Radio

On Saturday 4 October former Merchant Navy Radio Officers, members of the Radio Officers Association of Europe (RAOE), descended on Burnham-on-Sea, Somerset, for a visit, or should one say pilgrimage, to Portishead Radio GKA. The visitors, most of whom hold amateur licences, had travelled considerable distances, from all parts of the UK, Eire and Switzerland.

Many of the delegates had sailed in the Merchant Service during the heyday of Portishead, when it had a staff of 350 and was the mainstay of Burnham-on-Sea's economy in the 1950s and 1960s. Radio Officers would contact GKA to receive all their telegrams or Marconigrams and send messages for onward transmission to the shipping companies and from the passengers or crew to their family.

There was even a facility for sending gifts and flowers from ships. However, it was the first time that some RAOE members had visited the site with which they had been in contact so many times.

Portishead Radio was the major centre of world-wide communications and while a ship might have one or two messages per day to send, GKA would have 50 or 60 ships to contact every four hours, and passenger ships could have 20 or more messages at a time. The workload would be enormous, especially at Christmas.

Perhaps it was coincidence when, early in the visit, the group encountered 'Sparks', the station's aptly named cat, who is on the 'payroll'. The visitors were told that there had always been a cat on the premises, to ensure that the station was mouse free! After all, with over 300 Radio Officers on site, individuals could not all be called 'sparks' as were their counterparts on board ship, so it was a safe name for Portishead's cat!

One reason for the visit was the probability that the station will close in 1999, as modern technology overtakes the need for communications by Morse key. The numbers employed at the station today are substantially fewer and traffic passing through the station infinitesimal compared with days past.

The visiting ROs, nevertheless, were fascinated by the home, and purpose-built modern consoles they saw in operation and the Morse key was seen in use, so rumours of its demise the station today are substantially fewer and traffic passing through the station infinitesimal.

Visit To Portishead Radio

The consoles at Portishead Radio GKA.

A 'net' of Radio Officers swapping stories after a visit to Portishead Radio.

Dewi GW0ABL (left) the retiring Chairman presenting Dan GW3HCL with an inscribed tankard in celebration of this 50 years in Amateur Radio.

50 Years In Amateur Radio

At the Annual General Meeting of the Dragon Amateur Radio Club, held back on the 6th October 1997, Dan Lockyer GW3HCL was congratulated on attaining 50 years in Amateur Radio. The retiring Chairman Dewi Roberts GW0ABL presented Dan, on behalf of the club, with an inscribed tankard.

Dan also held several more other temporary callsigns. Dan, who is a native of the Isle of Wight, has led a varied and interesting career in radio and electronic engineering first in the RAF and then on Government Service in the 'Third World'. At one stage he was the Communications Officer for the Gilbert and Ellice Islands.

‘Sparks’, Portishead’s aptly named cat, who is on the ‘payroll’.

Now retired, he is an active member of the Dragon Club, preferring as a keen c.w. operator to use the key at the special events. Dan was also congratulated by the new Chairman John Parry GW3VVC elected at the AGM. Dan himself was elected as the new Vice Chairman.

21st Anniversary Award

To celebrate its 21st Anniversary, Poole Radio Society is offering an award. To claim the award, stations should send an extract of their log showing contacts worth 30 points. Any station contacted in Poole is worth one point (two points if the station contacted is a Novice station). Any member of Poole Radio Society is worth five points (six points if the station is a Novice). Any contact with the club station G4PRS (P) or GO4PRS (P) is worth ten points.

Contacts can be made using any bands or modes permitted by the applicant’s licence, but must not make use of repeaters. Contacts with Novice stations are worth an extra point. Only one contact with a station on the same band and mode will count. To count towards the award, contacts should be made between 1st November and 31st December 1997. So, get going!

To claim the award, please send a copy of your log and cheque for £1.50 to cover printing, postage and packing, payable to Poole Radio Society, to Brian Haverstock G4WCJ, 28 Kingston Road, Poole, Dorset BH15 2LP.

Please allow 28 days for delivery of your award.

Joining Forces

The Hastings Electronics & Radio Club (HERC) and the Southdown Amateur Radio Society (SARS) have joined forces with the object of encouraging Novices in all aspects of the amateur radio hobby. The first of these activities is a ‘Novice Xmas Party On The Air’ or ‘How To Gain The Devonshire or 1066 Awards’, or both.

Dewi GW0ABL (left) the retiring Chairman presenting Dan GW3HCL with an inscribed tankard in celebration of this 50 years in Amateur Radio.
The activities are being held on December 26, 27 and 28th 1997 at 3 till 4.30pm each day on 70cm (430MHz) only. A special award will be made to the holder of the full 'A' or 'B' licence whose call appears most in the submitted Novice log. Q5Os using repeaters will not count for either awards.

Both these awards can be claimed by 'A' & 'B' licence members, i.e. five HERC members for the 1006 award and/or five SARS members for the Devonshire award. To claim the awards all you have to do is send a copy of your log showing the appropriate contacts to the relevant Awards Manager where they will be checked against the current membership lists. Both awards may be endorsed, QRP, single band, etc.

Contact details are: Devonshire Award, Mr J. Harris G4DRV, 11 Roscawen Close, Eastbourne, East Sussex BN23 6HF or for the 1006 Award, Mr B. Loram G0LJK, 12 The Finches, St Leonards on Sea, East Sussex TN38 9LQ.

Chester's 50th Anniversary

The Chester & District Radio Society will celebrate its 50th anniversary on June 13th 1998. The whole year will see various events to mark this landmark in the Society's history.

Firstly, an award will be made to applicants who work or hear Chester & District Radio Society members, five callsigns qualify for the award. A small charge will be made for the award certificate and postage.

March 21st 1998 will see the Society's 50th Anniversary Dinner and the RSGB President Ian Kyle G8GWX will be the Guest of Honour. Ian Kyle will address the 'congregation' during the course of the evening.

Tickets for the dinner will be available at a cost of £20 each and the venue is the Jarvis Abbots Well Hotel, Christleton, Chester. Further information regarding the award and the 50th Anniversary Dinner are available from Roger Howells G8GWX (Society Chairman), 52 Upton Park, Upton, Chester CH2 1DG. Tel: (01244) 374252.

Yeovil Convention - New Date!

The Yeovil Amateur Radio Club's 14th QRP Convention will be held at the earlier date of 19th April 1998 at the Digby Hall, Pound Street, Sherborne, starting at 9am. The convention VIP will be The Reverend George Dobbs G3RUV, who will also present the afternoon lecture.

The event will also feature trade stands, Bring & Buy, interesting displays ranging from vintage radio to modern techniques, prize draws, plus the ubiquitous 'Constructors Challenge', which will be producing the most efficient 20m (14MHz) QRP transmitter. Morse tests on demand will be available again. Remember too that the historic Abbey town of Sherborne offers a wide range of interest for the XYL and family.

For further details contact Peter G3CQR on (01935) 813054.

Bristol's Club Nights

Dick Elford, committee member of the North Bristol Amateur Radio Club has written in with details of their RAE class and Morse tuition group, both of which run all year. They are held on club nights at the club's QTH at SHE7 Braemar Close, Northville, Bristol. Further details on (01454) 218362 or at G4XAY@AOL.com.

Change Of Venue

The Fylde Amateur Radio Society, as from the first meeting in 1998, will meet at Comed Aviation Club Room, Building 28, Blackpool Airport, Squires Gate Lane, Blackpool. The meetings take place as usual on the 2nd and 4th Thursdays each month, commencing at 7.45pm. New members welcome.

Further information about the Society can be obtained from G4HFH on (01253) 726685 or from G7CUI on (01772) 638464.

Warrington Beware!

Rob Mannion G3XFD is giving a talk about PV past, present and future at the Warrington Amateur Radio Club on the 27th January 1998 at Belline Lane, Grappenhall, Warrington. The talk will start at 8pm. Non-members of the club are very welcome to attend.

For any further details about the club and its activities, why not contact John G0RPG on (01925) 762722.

Exeter ARS

Members of the Exeter Amateur Radio Society meet on the second Monday of each month at the Moose Centre, Spinning Path Lane, Blackboy Road, Exeter at 7.45pm. The third Monday is set aside for projects, on air activity and natter night.

More information about the

The Cockenzie & Port Seton (C&P) Amateur Radio Club, based in the Lothians near Edinburgh, Scotland, have got every right to feel 'cocky' at winning the Practical Wireless and Kenwood 'Club Spotlight' Club Trophy. Presented with the magnificent trophy by Kenwood's Dave Wilkins GSHY, Bob Glasgow GM4UYZ accepted the award on behalf of the club and was accompanied by a strong contingent from their very active members during a ceremony at the Leicester Show in October.

Well known for their fundraising activities on behalf of the British Heart Foundation, the C&P ARC just claims their win - from an excellent selection of other club magazines - by their approach. The judging panel had an extremely difficult job and working in isolation each came to their decision independently with C&P ARC's entry winning 45 points (out of a possible total of 50) with the joint runners-up Hoddersdon RC (the first winners in 1996) and the Warrington ARC scoring 44 points.

And although the C&P magazine is simple in format (stapled A4 sheets) the judging panel were extremely impressed by the general 'feel' and coverage of their entry. The judges' comments ranged from "I did like this one...very readable...how do they do it?", and another commented 'Excellent 'newsy', friendly, lots of features, highly commended'.

Other remarks included 'highly commended, produced without sponsorship, a newsy relevant publication" and from another judge came the final comments " Good couple of newsletters - nice to see colour in December's, liked the recipe idea and events column. Nicely spaced out and easy to read".

So, well done Cockenzie & Port Seton in winning the 1997 award. Our congratulations also go to Hoddersdon and Warrington for their marvellous efforts. Don't forget - this is a friendly competition. The judges have a difficult job to do and are looking for what they consider to be the best 'club' magazine.

There's a good range of opinions on the judging panel and a good chance of winning for all entries. The only advice I can offer for future entrants is "don't try to produce a competition winner. Just try to represent your club and its members interests in the best way you can. In this way you will always 'win' the appreciation of your club and your readers and you may well also win the 1998 'Club Spotlight' Trophy. So, good luck to you all!

Rob Mannion G3XFD

Society can be obtained from Theo G3EQM on (01392) 875498.
BACK ISSUES '93

If you’re missing issues of Practical Wireless from your 1993 collection here’s your chance to make it complete. We’re selling off issues from 1993 for just £1 each including P&P!

So, if you’re missing that all important issue or wish to purchase additional copies check out our list below and then without delay place your order! To order either use the form on page 82 of this issue or call the Credit Card Hotline on (01202) 659930.

January
- Ramsey PK-146 Receiver Kit Review
- Basic QSOs in German (final part)
- Mathematics for the RAE
- Kit Suppliers Showcase
- Hands Electronics RX3 5MHz Kit Review

February
- Allsort DJ-1808B Hand-Held Review
- Build A Valved Active Antenna
- A Receiver Construction Experience
- Tuned CW Filter Project
- Eddystone Radio Tribute

March
- London Amateur Radio Exhibition Show Guide
- Free! Greenfield Catalogue
- Maxon MX-9900 Test Equipment Review
- Modifying the Pye Olympic P Band Transceiver
- Maritime Mobile - Amateur Radio All At Sea

April
- Propagation Logging
- Yaesu FT-530 Dual-Band Hand-Held Review
- Basic QSOs in French - Part 1
- Mentor Scatter - The Basics
- Spreading The Spectrum

May
- Free! 24-Page Computing in Radio Magazine
- Icom IC-775 HF Transceiver Review
- Basic QSOs in French - Part 2
- Build A Noise Bridge
- Yaesu FT-1200 Mobile Transceiver Review

June
- More! Special
- Free! 72-page Nevada Catalogue
- Kenwood TS-520 HF Mobile Transceiver Review
- Simple Printer CW Interface
- MTR-1 Morse Trainer Review

July
- Tiny Tim 3MHz SSB Transceiver Project - Part 1
- Basic QSOs in Spanish - Part 1
- Icom IC-185 SSB Hand-Held Review
- The World Of QRP
- Build The Quecicurt 7MHz Transceiver

August
- Antenna Special
- Icom IC-28 Transceiver Review
- Tiny Tim 3MHz SSB Transceiver Project - Part 2
- Palmer PK-44 Keyer Review
- Radio Personality - Louis Varney QSVV

September
- Test Equipment Special
- Basic QSOs in Spanish - Part 2
- TS1250 Spectrum Analyser Review
- Cable Health Tests
- Robin Frequency Counter Mods

October - SOLD OUT

November
- Tiny Tim 3MHz SSB Transceiver Project - Part 4
- SGC-2000 10P Transceiver Review
- Cables On The Air - G8HCX
- Ameritron AL-808S Linear Amplifier Review
- Bermuda Bound

December
- Free! What Scanner Supplement
- Basic QSOs in Spanish - Part 3
- Arrowwood CW-3305 Heliocronoscope Review
- Setting Up Your Workshop
- New Transformers From Old

All stocks are limited so don’t delay.

We also have available back issues for 1994 and 1995 at a £1 each inc. P&P as well as 1996 and 1997 issues for £2.30 inc. P&P.
LOW PASS FILTERS
Low pass filters are commonly made from thin lightweight materials, assembled with pop rivets, and not even any earth terminals! Their performance is, at the least, poor.

Delta Filters are tough construction, with attenuation slopes available down immediately after transmitting frequency range. Heavily built deep notchting Chebyshev designs, prevent interference from harmonic or spurious emissions - a must for good operating. Low power models use silver -mica capacitors and phenolic connectors. High operating. Low power models use thick teflon TFE insulation.

LOW PASS & BANDPASS FILTERS, COAXIAL EMP SUPPRESSORS

These stabilized, protected power supplies, are top quality and a very compact design. HT1420 £139.95 £10 p&P. Voltage 13.8vDC. Current Rating 20/25A Dimensions 160 x 120 x 280mm HT1520 £159.95 £10 p&P. Voltage 13.8vDC. Current Rating 20/25A Dimensions 160 x 120 x 280mm

WE NEED QUALITY, USED, BOXED AMATEUR RADIO EQUIPMENT BEST PRICES PAID. COLLECTION ARRANGED

Please mention Practical Wireless when replying to advertisements.
Having discussed the generation of alternating current and rectification last time, Rob Manion G3XFD now demonstrates a classic use of a single diode rectifier in a simple receiver.

I hope you've enjoyed the experiments and ideas I've suggested in the series so far. But now that you've learned a little about how we generate current - both in 'direct' and alternating forms - I'd digress a little from the purely theoretical teaching to demonstrate a very simple and practical application of the rectifier and take you back to 'Great Grandad's time' by making a 'crystal set'.

Strictly speaking our 'crystal set' is not a crystal set because it uses a modern rectifier diode rather than a mineral crystal. But, after you've got your 'bogus' crystal set working there's nothing to stop you experimenting and reliving the 1920s era.

So, to start the project off you will need a small rectifier diode (virtually any type will do), some enamelled wire and several small components, I'll provide a 'shopping list' for the small number of parts needed - and if you're really desperate I'll even let you know how to get hold of what you need for free.

The Circuit

You'll see immediately that the circuit, Fig. 1 is extremely simple. And of course you will recognise the 'half-wave' rectifier circuit I described last time.

However, this time the circuit is being used to rectify or 'detect' (the generally used term for this job) a radio frequency (r.f.) signal. And when you realise that the radio transmissions we use are in fact high frequency alternating currents - it will all begin to make sense.

The coil, L1, is formed by winding 40 turns of enamelled copper wire onto a convenient 'former' is tapped every 10 turns. This can be an empty plastic 35mm film canister or even a 'cotton reel'. One end of the coil should be soldered to point 'A' (same point as the diode 'anode' end and fixed vanes contact of the capacitor). The other end of the coil can be soldered to the 'chassis' of the capacitor, one of the headphone leads and the earth connection.

If you've played around with this type of simple receiver before - you'll realise that with the variable capacitor value shown in Fig. 1, it will not tune to the usual long and medium waves. And in fact, this 'crystal set' is designed to tune the short wave bands.

Just where your receiver tunes on the short wave bands will be down to your coil winding. But as this type of receiver can be extremely effective on short waves (because of the very high field strengths being refracted from the ionosphere) you won't be disappointed - even when a relatively short antenna is used. The vertical bar on the diode symbol (at the 'B' end) represents the cathode and is usually marked with a coloured band on the diode itself.

Important Antenna

The all important antenna is even more important for a crystal detector receiver! This is because the detector can only provide you with what the antenna can 'extract' from the passing electromagnetic waves.

Although I shall be discussing radio waves later on in the series, the diagram in Fig. 2, provides a simplified explanation to help you understand how the 'crystal set' works. Here it's convenient to regard the antenna as being the equivalent of the field windings on the simple alternator, with the passing radio waves playing the part of the moving magnetic (but in this case it's electromagnetic) field. And of course...the diode is rectifying the output.

The antenna should be as long as possible and on the short wave bands you'll find you can hear quite a few broadcasting stations at good headphone level. You'll also notice that stations will often be heard together and sometimes it will be difficult to listen because of the mixture of programmes! This is a fundamental problem of the simple receiver and later in the series I'll show you how you can reduce the problem and improve sensitivity by adding a stage of r.f. amplification.

Home-Brewed 'Crystal'

Once you've got the receiver working...and they can be great fun-working on 'free' energy supplied by the radio signal itself - you can try a home-brewed 'crystal'. The simplest uses the metal oxide rectifier effect and for this you'll need a copper washer (available from hardware shops) and some lemon juice!

Cover the copper washer with lemon juice or vinegar (best done outside!) and leave it for a few days to go green. The resultant green layer is copper oxide and with the sharp pointed contact shown in Fig. 3, touching the surface, and wired up as shown - YOU MAY (depending on signal strength, the oxide surface and your patience!) get a signal.

If you do get a signal - it's a fascinating experience! And if you want to experiment further you can try using pieces of coal, burnt coal (coke if you can find it!) and galena (lead sulphide, the commonest form of lead) crystals. This is one of the original types used in crystal sets and can be obtained from specialised shops providing 'Gem Stones' and lapidary products.

In rounding off this time I have a shopping list and 20 or so single earphones and diodes available for anyone who wants to 'have a go' and doesn't have easy access to a component source. So, if you're keen and fall into this category, write to me enclosing an A5 sized self-addressed strong envelope with a 50p stamp on it and I'll send you an earphone insert and a diode to get you going. Good Luck!

PW

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Fig. 1: Circuit for the diode detector circuit. For best results use an 'air spaced' variable capacitor. The fixed vane contact should be soldered to point A and the moving vanes contact to point C. High impedance headphones are best, but low Z impedance will work but cassette player types are not suitable.

Fig. 2: Simplified diagram illustrating how the antennas intercepts the passing radio waves. In this diagram the antenna wire is horizontal and the view is from above the antenna wire and looking down. For clarity only the electric field of the electromagnetic wave is shown.

Fig. 3: Making your own copper oxide point-contact rectifier. It needs patience to work...but can prove rewarding!
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It was Rob Micklewright G3MYM, who reminded PW that 1998 marked the Centenary of Amateur Radio. So, it's appropriate that Rob starts the 'celebrations' with a 'potted' look at the first 100 years of our scientific, technical and above all - 'fun' hobby.

This year, 1998, the scientific hobby of Amateur Radio has been going for 100 years. And in this context, a Radio Amateur is defined as a person using radio transmission purely as a hobby and not for any commercial, vocational or professional reason.

The first Amateur Radio station in the world was set-up in England in 1898. The station belonged to M.J. C Dennis, who later had the callsign DNX, then EI2B, and who was made a Vice-President of the Radio Society of Great Britain (RSGB) in 1936.

The 100 years of Amateur Radio can be divided into four distinct periods. These are 1898 to 1914, 1920 to 1939, 1946 to 1969 and 1970 to 1998.

The reason for the gaps in the dates from 1914 to 1920 and from 1939 to 1946 is that in Britain Amateur Radio stations were closed down during these periods because of the two World Wars. (The close down dates were different in the USA).

Spark & Detector Era
The period from 1898 to 1914 was the era of the 'spark' transmitter and the detector only receiver. At the beginning of the period, a Radio Amateur would have used a spark transmitter and a coherer receiver and would probably have had a likely transmission distance of about 1 to 3.2km.

Discovery & Development
The years between 1920 to 1939 saw the use of valves in Amateur Radio equipment, the discovery and development by radio amateurs of trans-world short wave radio communications. It also saw the international recognition and organisation of amateur radio.

By 1920 the triode valve had been developed. This valve could be used to amplify weak signals or to generate a radio wave, and before long amateurs soon began to use valves in receivers and transmitters.

In the early 1920s, amateurs were way ahead of the professionals in the discovery and development of trans-world short wave radio communication. For example in December 1921, Amateur Radio signals were transmitted across the Atlantic for the first time. And in November 1923, the first two-way trans-Atlantic amateur contact took place.

In October 1924, Radio Amateurs in Britain and New Zealand made the first contacts between the Antipodes and Europe. All of these contacts were made on wavelengths at the time were considered by the professionals as useless for long distance radio communication. In my view, it was this achievement by Radio Amateurs, which more than anything else has given amateur radio the fame and status that it enjoys today.

In 1924, the International Amateur Radio Union (IARU) was founded. Then at the International Radio Telegraphic Conference held in Washington in
In the period 1946 to 1969, the transistor was invented and Radio Amateurs started to use the S.S.B. mode more making it very popular.

1927, an international agreement was reached about Amateur Radio bands on a world-wide basis.

In 1931, the first British Empire Radio Union (BERU) contest was held and in 1933 the first National Field Day in Britain took place.

Compared with the events in the 1920s, Amateur Radio in the 1930s had settled into a steady routine. All the amateur bands were used during the 1930s, from 'Top Band' (1.8MHz) to v.h.f. using c.w. and a.m. and mainly home-made equipment. This state of affairs continued until amateur radio stations were closed down at the start of the Second World War.

Pioneering Amateurs

In the period 1946 to 1969, the now familiar transistor was invented. Radio Amateurs pioneered the use of single-sideband suppressed carrier (S.S.B.) transmission and the first amateur radio satellite Orbiting Amateur Radio (OSCAR 1) was launched.

Shortly after the end of the Second World War, surplus services equipment was made available to the general public and for many years, such radio equipment, particularly receivers, became part of many amateur stations. At this time however, most Radio Amateurs still built their own transmitters. When information about the transistor became available, radio amateurs were quick to experiment with the use of the transistor for transmitting.

A milestone was reached on 21 February 1954, when the Yeovil Amateur Radio Club made, what is almost without doubt, the first long distance radio contact to be made with a transistor transmitter. This was an unarranged 136km contact made on the 3.5MHz band.

By 1969 s.s.b. had become a popular mode of Amateur Radio telephony. However, because of the complexity of s.s.b. equipment, most radio amateurs chose to buy commercially made equipment rather than build their own. The end result was that the move to s.s.b. transmissions meant that 1946 to 1969 became the last period in which home-made equipment was a major part of amateur radio stations.

Present Day

The period from 1970 to the present day is the era of commercially made Amateur Radio equipment, where the vast majority of radio amateurs use factory produced equipment of ever increasing complexity. The main modes now in use are s.s.b., c.w. and f.m. and data. Despite this, home-made equipment has not disappeared entirely from Amateur Radio and is still being prominently used in areas such as microwaves and lower power (QRP) operations.

As 1998 and the centenary of Amateur Radio progresses, two questions can be posed. The first of these is what has been the significance of 100 years of amateur radio and secondly what will the hobby be like in the first few decades of the new century? Perhaps these two topics and others like them will be the subject of editorials, articles and debates in Amateur Radio magazines such as Practical Wireless.

The purpose of my article has been to give an outline of Amateur Radio over the last 100 years since 1898 and I hope you have found it both interesting and informative. For those of you who want to know more I will be giving a detailed account in my talk at the Yeovil Amateur Radio Club on the 8th January 1998.

(Don't forget that PW will be running further articles to mark the first 100 years of Amateur Radio throughout 1998. Ed)
The A41 VHF Manpack Transceiver

By Ben Nock G4BXD

Stand to attention and 'listen' carefully! Ben Nock G4BXD is now about to take a look at an interesting military surplus v.h.f. transportable transmitter-receiver from the Radio Amateur's viewpoint.

If you look carefully on the surplus market...you'll find that the A41 military transceiver is now cheap to buy. It can also easily be pressed into service as an interesting 50MHz ('six metre') receiver.

The A41 is a v.h.f. f.m. manpack, designed for short range inter-unit communication. It operates in the 38 to 53MHz range.

The A41's cheapness means that a very nice receiver and, what must have been an expensive piece of kit when new, can now easily be obtained. It also makes an interesting general coverage receiver for these frequencies. As the set covers 50MHz it also makes a cheap option for exploring that band.

There appears to be more than one version of the A41. I myself have an A41 set and an A41 No 2. The No. 2 set differs from the original No.1 unit in that it has a squelch control (not fitted on the original) and round handset connectors in place of the oblong connectors on the other set.

Valves & Transistors

The A41 set uses 13 miniature valves, 3 transistors and a few semiconductor diodes. For military use power is supplied from a special multiple voltage battery housed in the lower part of the unit in a detachable compartment much akin to the 31 Set that preceded it.

Supplies of 1.5, 6, 6.75 and 135V d.c. are needed to fully power the set, although the 135V is only required for the transmitter. The basic block diagram of an A41 is shown in Fig. 1.

The receiver uses ten of the valves in a fairly straightforward single conversion superhet design. Two r.f. stages are used, and four i.f. stages to feed the semiconductor discriminator that feeds a valved audio output stage.

Small replaceable units are used to house some of the various stages, some shown in Fig. 2a etc. The unit number referring to each particular stage is detailed in Table 1 along with the remaining valves.

Two Valve Transmitter

Two valves are used in the transmitter strip, a self oscillating p.a. stage and the modulator valve. A six section variable capacitor is used to tune the transmitter oscillator tuned circuit, the p.a. output circuit, the two receiver r.f. amplifiers and the receiver local oscillator.

A variable inductance connected in series with one of the antenna 'options' is also ganged to the same shaft. Three antennas 'options' are provided and they include: a long whip, a short whip or coaxial cable feed suitable for a dipole antenna.

Reactance modulation is applied to the oscillator via V1 and transformer X1. There is no provision to adjust the modulation depth or deviation: So you either have to whisper or shout!

Power Supply

There are two power supply options (well, three if you count buying a new battery of the exact type if a supply could be located!) possible when using the A41. You can either produce all the voltages from a mains source or produce the low tension from batteries with the h.t. being derived from the mains.

In practice the 1.5 and 6V supplies can easily be obtained from standard batteries. However, if you're considering using NiCads, then a little 'jigging pokery' is needed as the NiCad cells usually provide 1.2V.

Several 1.2V batteries could be used in series and would give steps of 1.2/2.4/3.6/4.8/6V. So the 6V option is catered for but the 1.5V supply would need separate cells as the A41 requires a positive ground 6V supply. However, it requires a negative ground 1.5V supply) and due to components in the set this polarity cannot be changed.

So, if I assume you're using 1.2V NiCads for the 1.5V supply, then two in series would give 2.4V. If a series silicon diode is used this drops the supply by 0.6V giving 1.8V to the set, a further germanium diode in series would drop a further 0.3V thus continued on page 26
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Fig. 1: Block diagram of the A41 station.

![Block diagram of the A41 station](image)

giving the required 1.5V.

I have seen 2V rechargeable cells offered by certain suppliers, three of these would provide the 6V supply, and one of them with a series silicon diode would provide the 1.5V supply.

**Main Power Unit**

A suitable mains power supply unit circuit is shown in the diagram, Fig. 3. The actual mains transformer used will depend upon junk box or suppliers stock.

The main h.t. winding needs to be around 50-0-50V otherwise the final voltage will be too high. If receive only is required then the h.t. needs only be 67V or so.

The 1.5V supply can be obtained from a 6.3V a.c. heater (filament) winding. The 6V supply needs around at least 10V a.c.

(2x 6.3V a.c. windings in series or a 12V winding could be used).

Many older mains transformers had 5 and 7V windings for valve rectifier heaters, these in series could be used. But failing this a separate 6-0-6V transformer could be used as a 12V supply.

To provide a regulated supply, I used the LM317T regulator chip, and the pin-out details are shown in Fig. 4. This provides a variable voltage set by the combination of the fixed 240kΩ resistor and the pre-set variable resistor.

The metal heat sink fin of the regulator used for the 6V supply is at output potential and can therefore be bolted directly to ‘ground’. But of course - the 1.5V supply regulator will need insulating of course.

The two variable resistors are adjusted to set the required volts. The pin connections to the set are shown in Fig. 5. (This is shown from the viewpoint looking at the pins, from outside the set).

My circuit shown is quite basic, and extra like fuses and a few indicator lamps or leds can be added. The only important criteria are the 1.5 and 6V levels, it would be wise to get these as accurate as possible, and definitely regulated. The 1.5V rail draws about 350mA, with the 6V rail consuming about 400mA on transmit.

The power supply can be built on a small chassis and mounted in the A41’s original battery box with a small hole drilled near the bottom for the mains cable to exit from.
Fig. 3: Suitable mains power supply circuit (see text).

The A41 sub-assemblies. Main unit in the centre foreground, battery on left with the battery housing unit centre background and the radio housing on the right.

**Choice Of Antenna**

A BNC plug on the front of the set provides for a choice of antennas. The use of a coaxial fed antenna, either a dipole or some form of beam are all possible.

There are some military antenna kits available. These include dipoles of various lengths (complete with guys, insulators, etc.) all contained in a canvas tool kit type bag. They’re often available at rallies and would prove ideal for the A41’s needs.

For military use A41s normally have a telephone type handset with loudspeaker, microphone and push-to-talk (p.t.t.) all in one unit. They’re often available at rallies and would prove ideal for the A41’s needs.

For military use A41s normally have a telephone type handset with loudspeaker, microphone and push-to-talk (p.t.t.) all in one unit. They’re often available at rallies and would prove ideal for the A41’s needs.

**Little Setting-Up**

After construction there’s little in the way of setting-up to do. After checking the voltages are correct, you can then wire the p.s.u. to the A41 and switch on, if all is well then the familiar ‘shush’ of f.m. noise will be your reward!

Attaching the antenna and tuning around should produce the odd signal or two. Listen out on the 50MHz band during ‘lift’ conditions for that rare DX station, or the odd baby alarm around 49MHz!

For the more ambitious type, modification to the set for s.s.b. reception could be an option. Certainly getting a.m. out is quite easy. So, with addition of a small b.f.o., the reception of s.s.b. should be possible, though whether the local oscillator would be stable enough is another thing!

Reception of c.w. is another modification that could be carried over to the transmitter. The possibilities are perhaps endless...but the other ideas are for you to decide on!

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**Power Supply Shopping List**

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<td>Miscellaneous</td>
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**Fig. 4: Pin-out details of the regulator i.e. used in G4BXD’s suggested power supply unit (see text).**

Suffice. (A low impedance loudspeaker can also be used and works well).

Fig. 5: Connection details for the A41’s power supply input and handset/microphone socket details.

Internal view showing the ganged tuning capacitor and the valve p.a. stage (bottom right) held in place with its special screening can/anti-vibration restrainer.

Internal view showing tuning scale drum (centre left) and the separate units housing the various active stages (see text) at the top right.

Practical Wireless, January 1998
An Incredible Package!

By Rob Mannion G3XFD

Ever since the mainstream manufacturers have been incorporating audio digital signal processing (DSP) into equipment, I’ve been left wondering how long it would be before true radio frequency DSP arrived on the Amateur Radio scene. Well, it’s not happened yet and I don’t suppose I’ll be able to afford the equipment when it arrives.

So, I have to make the best of what’s available to fit my wallet so to speak. To that end - to ‘practice what I preach’ in my reviews I’ve got what I consider to be a very good basic transceiver, fitted with narrow band filters as standard and working well under very difficult, busy and noisy band conditions on 3.5 and 7MHz (my favourite bands).

However, having had a great deal of experience in using state-of-the-art transceivers while reviewing them for PW, I’ve come to the conclusion that an add-on audio DSP unit would be a good idea. And after a lot of looking, research and one or two trials and errors on the way, I think I’ve found the ideal unit - the Timewave Technology DSP-599zx audio DSP filter.

The Timewave unit has been around for some while and I must admit that I had used one on a transceiver in the USA while attending the Dayton Hamvention. However, trying something at a show is entirely different to using one at leisure at your own station in conjunction with equipment and working conditions you’re entirely familiar with!

Incredible Package

The Timewave DSP-599zx is an incredible package and packs an enormous amount of technology into a very small, neat and easy-to-use unit. Using it is simplicity itself and literally all you do is connect the unit to the audio output of your receiver and it does the rest for you!

‘The rest’ is in actual fact a great deal indeed. But for the purposes of my review I’m concentrating on the use of the DSP-599zx as an add-on for normal c.w. and s.s.b. operation - despite the fact the unit can do a great deal more.

In appearance, the DSP-599zx is small, neat and very well presented. Its small physical size means that it sits very comfortably underneath my Alinco DX-70 and in appearance (black painted aluminium casing) it matches very well indeed.

The comprehensive back-lit yellow-green dot matrix I.C.D. alpha-numeric display, although small (in keeping with the size of the unit) is also pleasant to the eye. (Further comments on this later).

What’s On Offer?

So, what’s on offer with the DSP-599zx? And to quote directly from the extremely comprehensive (and easy-to-read) manufacturer’s handbook, “The DSP-599zx is an extraordinarily versatile signal processor” and in that I agree wholeheartedly!

Aimed at use in Amateur Radio communications using voice, c.w. and data, the DSP-599zx offers some extremely effective and useful features. These include random noise reduction, adaptive multi-tone and manual noise reduction, bandpass, high-pass and lowpass filtering.

Also included (for the data modes enthusiasts) signal re-generation including RTTY modulation and signal detection and measurement including RTTY demodulation. For the purposes of this review however, I have not considered the data modes as I don’t operate them myself. Instead, I’ve concentrated on my ‘main modes’ - s.s.b. and c.w. operating.

When I first ‘met’ the DSP-599zx in the USA (at the Dayton Hamvention) I was impressed. But it wasn’t until I was loaned one for review at my home that I realised what a truly amazing little package it is. So...with no more to do, read on and see just what I thought it was like on my operating desk.

On The Air

In line with my policy of providing extensive ‘on air’ evaluation I gave the DSP-599zx a really thorough ‘work out’ on the bands. And to help, the 1.8, 3.5 and 7MHz bands provided some really noisy (both QRM and QRN) conditions. I found that on c.w. the unit provided truly exceptional results, with the bandwidth being adjustable from 600Hz right down to 10Hz. I found that the filter’s ‘skirt’ the ‘fuzzy’ that the interfering signals seemed to ‘drop off’ in a very dramatic fashion.

The pleasantly lit green I.C.D. display unit clearly indicates what you’ve chosen on its screen. And although it is very clear - this is the area where I have discovered the only possible problem with the DSP-599zx. The problem I discovered was directly due to the small size of the displayed figures and my eyesight!

And although my eyesight is a personal problem, I feel I must mention that the display on the DSP-599zx is small and may cause problems for other operators who are at the ‘bifocal’ spectacle stage of life as I am! However, having mentioned that the display is small...it is of course fully in keeping with the small physical size of the unit.

Additionally, in practice - unless you want to see what the settings are it’s perfectly possible to use the filter without referring to the display much at all. So, once set-up I think even a partially sighted or blind operator could take full advantage of the filter.

Most of my c.w. operating is done on 3.5 and 7MHz and the DSP-599zx consistently out-performed any add-on DSP unit I’ve tried in the past. Its performance and the ‘roll off’ provided by the very sharp audio filter has to be fully appreciated. And as the operator can adjust the ‘high’ and low pass filtering to suit in a very easy fashion - it’s a joy to use.

Regular readers will have read my often repeated comments regarding the difficulties faced by anyone listening on the Internationally Co-ordinated beacon frequency of 14.000MHz. The QRM from adjacent channel packet radio transmissions (recently I’ve noticed they can sometimes be found on 14.1MHz itself!) can make reception of the low power timed beacons extremely difficult. That’s where I found the DSP-599zx to be truly excellent!

By attenuating the r.f. input to my Alinco receiver (to reduce the chance of QRM from transmitters on nearby frequencies), I found I could hear incredibly weak signals. In this way not only did I reduce the QRM but I found...
with the very narrow bandwidth I could hear beacons I've not heard before. Very effective indeed!

The manual notch on c.w. was very effective and easy to use and I found myself using the 'CW Tone Pitch Shift' facility. This changes the beat note tone instantly without the operator worrying about going off frequency to do so. It's hard with transceivers that don't have immediate front panel adjustments for f.f.o. pitch control or require a break in concentration to consult a menu facility. Very useful!

Using the DSP-599zx on s.s.b. proved equally as effective as on c.w. and I found myself adjusting the bandwidth of the received audio to suit my own hearing. And although I have already stated that the unit 'comes into its own' on c.w. - the results on s.s.b. were also truly amazing.

The continually adjustable bandwidth enabled me to adjust the filter during a QSO as QRM conditions varied. And of course, the Random Noise filter was particularly useful and extremely effective against static, general random noise and thermostat QRM. Personally, I also found the fact that I could control the 'aggressiveness' of the Random Noise filter very useful to 'attack' the incoming problems in a very positive way.

The automatic multiple tone filter removes interfering 'beat notes' almost completely. When selected I found that when deliberate interference is being created by someone transmitting in an effort to disrupt a QSO - the effect is very positive indeed, the interfering heterodyne disappears and there seems to be minimal reduction in the 'wanted' signal.

During one QSO I tried 'interfering' with my own QSO by introducing signals on the same frequency as I listened to the other station. The transmissions - courtesy of two 'grid dip' meters and the local oscillator of another receiver - were arranged to couple closely into my receiving antenna. The result was a chaotic noise on the QSO channel - until I switched in the auto tone reduction. The result - magic! A clean frequency!

Many Features

There are very many features on the DSP-599zx that in a review of the type I'm attempting (evaluation for use on air for a c.w. and s.s.b. operator) that I don't have time to mention. Despite this, those features must be mentioned because they really do offer many extremely useful functions. So, although I don't like providing lists - I'll do so in this case.

Included in the many features of the DSP-599zx are filters for RTTY, AMTOR, PACTOR, G.TOR, h.f. packet radio, CLOVER, SSTV and WeFAX. There's also a useful RTTY MODEM provided within the unit.

Another - extremely useful facility for many operators - will be provided by the 'Test Instrument' mode. The built-in audio generator covers from 20Hz to 10kHz, providing two-tone (fixed) 700Hz and 1.9kHz signals. The built-in audio millivoltmeter provides (true) RMS values from 4mV to 2V from 20Hz to 10kHz.

Encoding for CTCSS is provided, with the tone frequencies of between 76Hz to 254.1Hz being displayed. And at the same time CTCSS squelch is provided. All from one very small unit. Quite a package!

In My Shack?

If you're now wondering whether or not you're now going to find a Timewave DSP-599zx in my shack - the answer is certainly yes! I'm so impressed at the quality, performance and 'user friendliness' of the unit that I have decided that it's a must for my shack!

Bearing in mind my comment on the small size of the i.c.d. screen and lettering, I still find that the DSP-599zx offers absolutely superb performance and facilities. Another bonus is that it sits very nicely underneath my Alinco DX-70 and matches in very well and at the same time helps to provide much enhanced reception conditions.

Finally, it's often been said that in recent years American-made equipment has not come up to the standards set by the Japanese manufacturers for both quality control, general reliability and design 'flair'. However, this comment certainly does not apply to the Timewave products I've come across. They've certainly proved to me that to me that innovation and quality are very alive and well in the USA!

My thanks for the loan of the review unit go to Mike Devereux G3SED of Nevada Communications. The Timewave DSP-599zx costs £349 inc. VAT and is available from Nevada at 189 London Road, North End, Portsmouth, Hampshire PO2 9AE. Tel: (01705) 662145, FAX: (01705) 690626.

Abridged Manufacturer's Specifications

(The specifications below are a condensed list from the very comprehensive full specifications in the user's manual and omit data modes and test instrument mode information)

Audio input (A&B) Impedance: 20kΩ or 25Ω (jumper selectable)
In put signal range for full output: 1W into BI @ 13.5V (both channels operating)
Audio output (A & B) 1.5W into 4Ω @ 13.5V d.c. both channels operating
Speaker output: 0dB level referenced to input level, (not controlled by gain control)
Headphone output: 0.25mV into circuit (jack), < than 1% @ rated output
Noise reduction filters Random noise Heterodyne eliminators
Up to 20dB atten. max delay 5ms
Up to 50dB atten. max delay 5ms
(The random noise reduction, tone notch and high pass bandpass filter can also operate simultaneously)

CW Filters
Bandwidth: 5Hz to 50kHz (10Hz steps)
Attenuation: 50dB at 50Hz outside passband 64ms max delay.

Voice Filters
Highpass: 100Hz to 1kHz (10Hz steps) up to 60dB atten. max
Lowpass: 1 to 5kHz (10Hz steps) up to 60dB atten. max

Automatic Gain Control
Voice mode: 36dB dynamic range
Data & c.w. modes: 18dB dynamic range

Signal Processing
A/D & D/A Converter: 16 bit, 27ns Analogue Devices ADSP-2181 with 880K of memory

Memory Information
Memories: 5x (all configurations can be stored and recalled except volume control setting)

Display Details
Type: 2 x 16 alphanumeric, dot matrix yellow-green back-lit LIc.d. characters
Dimensions: 193 x 216 x 48mm
Weight: 1.5kg
Power: 12-16V d.c. @ 1A

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The wish to get radio frequency oscillators to cover a wide range of frequencies is one close to the heart of the radio constructor. Oscillators are used in every application in radio.

However, oscillators have two endemic problems - stability and frequency range. It's as if they know the Biblical words of Job, "Hitherto and no further"!

A free running variable frequency oscillator (VFO) can be a difficult brute to tame. And much has been written about the best types of circuit and how to build them.

My experience has shown that most of the common oscillator circuits do work and are capable of stable operation. But the stability often relies on the method of construction as much as the choice of circuit.

For example: an oscillator built to be dropped from 30,000 feet is likely to be a stable oscillator. Mechanical rigidity is essential to the good high frequency oscillator!

Unusual Magazine

Many years ago I came across an unusual magazine produced in Japan. It was called the Fancy Crazy Zippy. It was a home construction and QRP related publication produced by JHIFCZ (hence the 'Fancy Crazy Zippy' title).

The magazine was full of little circuits all surrounded by Japanese script which I couldn't understand. However, circuits are circuits in any language and I enjoyed browsing though the range of circuit ideas without reference to the text.

Many of the circuits in the Fancy Crazy Zippy (FCZ) came from Mr. Shimizu JA0AS. And of course, some readers will recognise the name Shimizu. There are several products including a semi-kit QRP Transceiver that carried his name in the late 1970s.

The August 1980 issue of FCZ carried a wide range Variable Crystal Oscillator (VXO) circuit from JA0AS. And it's this project which is shown in Fig. 1.

Crystal Oscillator

The circuit shown in Fig. 1 is a crystal oscillator based upon the well-known Colpitts configuration. And in such a circuit the crystal works on its fundamental frequency.

In the diagram C1 and C2 are feedback capacitors that allow some of the signal generated in the transistor to be fed back to the input thus maintaining oscillation. Generally, the values of these capacitors are kept as low as possible to help stability. (They are frequently the same value).

A variable frequency Colpitts Oscillator would usually have a tuned circuit between the base of the transistor and ground. The frequency of the oscillator is determined by the value of the tuned circuit. In this case the...
frequency is determined by a crystal, or rather two crystals. Quartz crystal oscillators are by their very nature more stable that free running inductance and capacitance tuned oscillators. The problem is that the crystal has a specific single frequency. Fortunately however, it's possible to shift the oscillator a little either side of the crystal frequency by use of added capacitance or inductance, or both. The oscillator is then called a Variable Frequency Crystal Oscillator (VXO).

Unfortunately though...the VXO technique has limitations because a crystal wants to oscillate on its resonant frequency. You only have to move it a little in frequency before it becomes unstable or even refuses to oscillate.

Inductance & Capacitance

The circuit in Fig. 1 uses both inductance, which tends to lower the frequency and capacitance, which tends to increase the frequency. This is an old ploy beloved of QRP operators to get a crystal oscillator to yield a wider range of frequency coverage.

The limitation of the VXO idea is what can be achieved in the frequency movement of a crystal. Some constructors make grand claims but in general it is only in the range of a few kilohertz. The smaller the crystal, the greater it will move frequency-wise in a VXO. So high frequency crystals move the most as they are usually physically smaller.

The novelty of the Super VXO is that two crystals are used. Both are on the same frequency. The claim is that using the two crystals means that a greater degree of frequency shift is available before the crystals either go unstable or refuse to oscillate.

So, the circuit in Fig. 1 offers the possibility of far more useful VXO applications on the amateur bands. Why this is so is not clear, but it may be that the extra amount of quartz in two crystals allows greater range and stability.

Building the Project

Let's now look at building the project. The diagram, Fig. 2, shows the circuit that I used to test the Super VXO.

The transistor Tr1 is a Colpitts Oscillator using two crystals with L1 and C1 providing the frequency shift. The values of C2 and C3 depend upon the frequency of oscillation and are chosen to be the lowest values that will maintain oscillation over the whole frequency range. Inductor L1 is chosen to obtain a reasonable frequency shift without instability. The variable capacitor, C1, is in the range 20 to 50pF.

The signal from Tr1 is coupled to a buffer stage, Tr2. This is a pnp transistor. The output from a Colpitts oscillator is small and Tr2 not only provides a buffer between the oscillator and other circuits, but also provides some magnification of the signal. (The output is taken from the emitter follower output of Tr2).

My prototype worked first time and I tested it with two 14MHz band crystals which I happened to have. Both crystals had a nominal frequency of 14.050MHz. My values for C2 and C3 were 220pF and L1 was a 15µH moulded inductor and C1 was 30pF.

Using only one crystal, C1 shifted the frequency from 14.029 to 14.060MHz. But would the second crystal achieve a greater frequency shift? I soon found the answer: when the second crystal was added, the range increased from 13.989 to 14.065MHz!

Very Useful Increase

So, the circuit provides a very useful increase in range: the whole of the useful c.w. portion of the 14MHz band from one crystal! The stability was good through the whole range and (when monitored on a receiver) I found the note was 'clean'.

My findings were similar to other claimed results with the Super VXO. For example: Mikoto Minowa 7N3WVM, who features the Super VXO on his webpage, uses it for a VXO 30 metre (10MHz band) transceiver. He used two 10.15MHz crystals, a 15µH inductor and a 20pF variable capacitor to obtain a 10.10 to 10.15MHz range.

The Super VXO offers a simple way to build a stable VXO QRP transmitter or direct conversion transceiver. The builder does require two crystals on the required frequency but the advantages are obvious for the builder of simple equipment.

PW

See you next time.
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Three Legged Haydon
If you have one of the eight and 12m masts from Haydon Communications then you will be interested in the new tripod base to turn them into free standing antenna supports. The tripod, simple to erect and fold away in seconds, is made to a high specification and is easily carried. Just the thing for the field day - the feet even have holes allowing ground pegs to be fitted. The tripod is now available at a cost of £84.95 (£10 P&P) from Haydon Communications, 132 High Street Edgeware, Middlesex HA8 7EL. Tel: 0181-951 5781/2, FAX: 0181-951 5782.

Poled High
Fancy going portable, and you’re looking for a support pole? I think I’ve found the ideal solution at the Leicester show recently, where I found a telescopic 10m glass fibre pole on sale. The small corner stall of Walter Spieth DK9SQ, was visible from anywhere in the hall, because he had several of these poles sprouting like Pampas-grass (and selling like hot cakes) with antennas at the top.

Looking like a short dumpty ‘Roach-pole’ fishing rod in its carrying bag, the ‘Telescopic Tower’ is quick to erect. It takes just about 30 seconds to raise it up to its full height. With the addition of two extra cross arms and a matching box feeding a 20m circumference loop (their Vertical Loop Antenna 10-40m) you could have loop antenna covering 7-28MHz up and working within two minutes.

For more details of prices and availability contact Walter Spieth DK9SQ at Tiergartenweg 26, D-73061, Ebersbach, Germany. Tel: & FAX: 0049 7163 5968, or E-Mail to spieth.dk9sq@t-online.de

Santa Michael
I’ve asked Michael, who runs the PW Bookstore, to play ‘Santa’ and look in his sack to come up with some book offers just in time for Christmas and New Year. So, ignoring all the gnomes and elves getting underfoot, the titles he has come up with are:

Build Your Own Shortwave Antennas (Second edition) by Andrew Yoder and costing £15.95, the ever popular W1F8's Antenna Notebook from the late Doug DeMaw W1F8 priced at £7.50, More Out Of Thin Air, priced £6.95 contains many ideas for antennas distilled from Practical Wireless. Finally there are two Babani Books, Antennas for VHF and UHF (BP278) by H. Wright priced at £3.50. The offer is, that if you order two or more of the above books before January 21 then they come Post Free within the UK. To order use the form on page 82 of this issue.

Welcome to AiA!
Welcome to the first ‘Antennas in Action’ for 1998, and thank you for all of you who took time to complete and send in the questionnaire. I have to write this in advance of knowing what your likes really are, but it seems that we are getting it generally right. I also haven’t drawn the three lucky winners yet either, but whoever they are they should receive the antenna, book or subscription to PW soon! I’ve also managed to give away more that just a copy of More Out Of Thin Air in ‘Tex Topics’ this month (even though it’s still only mid-November as I write this).

As I don’t have a Christmas issue for A-i-A, I’ve not really had time to wish you the season’s greetings. But I’d like to take this chance in the first issue of 1998 to wish you all the very best in the forthcoming year, and I look forward to meeting many of you at rallies during the year.

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Antenna Workshop

David Butler G4ASR, our v.h.f. columnist, takes a look at how to make use of surplus satellite dishes and ancillaries, to create a feed system for the 10GHz band.

The important detail to note is, that a parabolic reflector is inherently broadband. That is to say it can be used over a very wide frequency range. It simply is a function of the driven element or feed system that limits its useful frequency range. Thus a dish can be used on many different microwave bands by simply changing the feed system.

Some microwave enthusiasts do change over the feeder system, but it can be inconvenient adjusting the antenna feed when you want to change bands. Therefore a number of feed systems have been developed that can work effectively on three or more microwave bands at the same time. However, these are normally never as efficient as a single-band feed system.

The fundamental factor governing the design of a dish feed is the ratio of the focal length (f) of the dish to its diameter (D). The focal length is calculated from the formula $f = \frac{D^2}{16\pi}$ where $D$ is the dish diameter and $c$ is the speed of light.

Fig. 1: The cross section of a front fed parabolic reflector and the formula for calculating the prime focus (focal point) distance.

Fig. 2: The cross-section of an offset fed parabolic reflector.

Fig. 3: Peter Day's 10GHz portable microwave station (G3PHO/P). (Photo by G3PHO)
The popular rectangular horn feed or a dual-mode feed horn, suitable for use in planes) has difficulty in producing a dipole feed (with asymmetrical E and H positioned at the focus of the dish. The phase centre of the feed exactly larger f/D is better it is still vital to have. Dishes with a low f/D ratio are very difficult to achieve. A 6mm results in a ldB loss of gain when quite difficult to achieve.

A feed beamwidth of 180° which is difficult to fully illuminate. For example with a low f/D ratio are increasingly specific beamwidth dictated by the VD (radiation beyond the reflector rim) the feed must have a figure into the formula gives a focal length (f) of 300mm. The resultant f/D ratio in this case is therefore 30/60 = 0.5.

Spillover Effects

To overcome 'spillover' effects (radiation beyond the reflector rim) the optimum illumination is considered to occur when power at the reflector edge is 10dB less than that at the centre. Furthermore to fully illuminate the reflector surface the feed must have a specific beamwidth dictated by the f/D ratio of the dish.

An f/D ratio lying between 0.4 to 0.6 is considered ideal for maximum antenna efficiency. It only requires a simple feed possessing a 10dB beamwidth of somewhere between 88-130° (dependant on the f/D ratio). Dishes with a low f/D ratio are increasingly difficult to fully illuminate. For example a dish with an f/D ratio of 0.25 requires a feed beamwidth of 180° which is quite difficult to achieve.

One parameter often overlooked is the focal point accuracy. Experiments have shown that at 10GHz an error of only 6mm results in a 1dB loss of gain when using a 600mm dish of 0.39 f/D. Dishes with a low f/D ratio are very critical in this respect. Although a larger f/D is better it is still vital to have the phase centre of the feed exactly positioned at the focus of the dish.

The popular rectangular horn feed or dipole feed (with asymmetrical E and H planes) has difficulty in producing a common phase centre and equal radiation in both planes. Consequently a dual-mode feed horn, suitable for use with surplus off-set led dishes of f/D around 0.5 to 0.6, was developed by W2MU.

The dual-mode horn has a very 'clean' feed in that side and rear radiation is reduced to a low level and it produces a very symmetrical radiation pattern in both the E and H field planes. (By the way dual-mode in this context refers to the ability of the feed horn to support two waveguide propagation modes.)

The dual-mode feed horn that I'm going to describe has been designed by Peter Day G3PHO for use on the 10GHz band with a surplus 600mm Amstrad off-set fed satellite dish. When Peter changed from a 460mm dish (using a 'penny' feed system) to an 600mm Amstrad dish a few years ago he found a tremendous improvement on his 10GHz narrow-band performance. A circular dual-mode feed horn taken from a Marconi 'Blue Cap' low noise block-converter (l.n.b.) was pressed into service as the dish feed and this is shown in the photograph, Fig. 3.

Marconi Horn

The Marconi horn worked reasonably well considering that the transition from rectangular WG16 waveguide to the circular horn was simply achieved by butting the end of the guide against the circular port on the horn! However the horn was not correctly dimensioned for the 10GHz band and it possessed a bad vertical beam pattern and had a poor s.w.r. match.

The optimised horn design by G3PHO is shown in the diagram Fig. 4, and is simplicity itself as it uses copper water pipe and couplers available from most plumbing suppliers. It may surprise you that water pipe can be used as circular waveguide but 22mm pipe is in fact very efficient as a 10GHz feeder and it's very cheap as well! The feed horn consists of three components, a straight 42mm Delrop coupler, a 42mm to 22mm Yorkshire reducer and a length of 22mm copper water pipe.

You should be able to get plenty of 22mm pipe from any local d.i.y. store, but you'll probably need to go to a specialist plumber to obtain the coupler and reducer. It's important to obtain solderless fittings as any solder inside the feed horn will cause unacceptable losses. Note also that the couplers are measured internally while normal piping is measured externally.

Before soldering the components together thoroughly degrease all items. Adjust the coupler/reducer length to 64mm as shown in diagram Fig. 4 and solder around the outside of the joint ensuring that no solder enters inside the coupler. To facilitate the sliding adjustment the narrow end of the reducer can be slotted and fitted with a hose clamp. The 22mm copper pipe used as circular waveguide can be as long as you wish but bends or kinks must be avoided.

The sliding adjustment is best made using a directional coupler (a microwave equivalent of an s.w.r. meter) to obtain the lowest s.w.r. match. Adjustments could also be made using a local beacon or more appropriately a low power source located 30m or so from the dish and mounted at the same height. Or you could just set it for an insertion of 11mm as this has been confirmed as the optimum setting by a number of operators.

The adjustment can be made permanently by soldering on the exterior of the horn or by tightening the hose clamp if using that method. However, don't be over enthusiastic in tightening the clamp as you can easily deform the tube. If you're going to solder the horn onto the pipe place a dampened cloth around the original soldered coupler to prevent that joint from becoming loose.

Completed Assembly

The completed feed horn assembly can now be mounted onto the original Amstrad feed clamp as shown in the diagram Fig. 5 and photograph Fig. 6. The outer, wider, section of the horn will just rest against the clamp if all dimensions have been followed accurately. With some Amstrad dishes you may need to file the plastic clamp to make it slightly wider to enable the horn to fit securely.
antenna workshop

The focal point on a genuine 600mm Amstrad antenna is 360mm from the centre line of the dish. For fixed station operation, the position of the feed horn so that the centre of the open end of the horn is correctly positioned. Other off-set dishes may not have the same mounting arm and clamp arrangement as the Amstrad dish.

If yours isn't an Amstrad dish, then set up the horn so that the open end is initially in the same position as the original satellite television l.n.b. horn. This will put you in the right ball park. By adjusting the position of the feed horn by a few millimetres to provide optimum results. But before using the antenna for the first time you will need to take into account the dish off-set angle. The Amstrad (and other off-set fed dishes developed for the UK market) have an off-set from the vertical of some 22°.

What this means in practice is that the dish needs to be tilted down by this amount to produce a beam pattern that is exactly horizontal.

For portable operation you can use a pan and tilt mechanism as shown in the photograph Fig. 3. For fixed station operation you could mount the dish 'sideways' so that the off-set is in the horizontal plane rather than in the vertical plane. It would then only be necessary to position the dish 22° out of line from your other antennas to ensure that they are all beaming in the same direction.

When completed you will possess an antenna with a very good beam pattern and a gain well in excess of 30dB. Although it's optimised for the s.s.b./c.w. sub-band around 10.368GHz it has an excellent performance throughout the entire band.

Fig. 6: A close-up shot of the waterpipe feed horn on the offset arm. (Photo by G3PHO)

ALLAN WIGHTMAN CLIMBS INTO THE LOFT TO POINT OUT SOME COMMON PROBLEMS ASSOCIATED WITH DISTRIBUTION AMPLIFIERS.

Up the Ladder - Again

Recently I've been assisting a particularly awkward customer with his TVI problems. Well, to be honest - it's not the customer who is awkward - it's just his TVI problem that's being a nuisance. Oh, by the way - the customer is Rob Munro who I understand is perhaps better known to you as G3XFD.

Rob is an active Radio 'Ham' and operates a great deal on the lower frequency 'Ham' bands. But unfortunately for him he's interfering with a near neighbour's TV distribution system although he doesn't cause TVI on his own TV receiver. So, bearing in mind that Rob is an experienced chap and knows what to do to try and prevent interference from his transmissions, I'm writing up from my notebook just how I tackled the first stage of the problem.

Broadband System

From his 'ham' station Rob usually runs his transmitter at power levels of around 75W or so on speech. I understand that this level is quite usual when you're on single sideband speech (s.s.b.). But when he's using Morse (c.w.) he often uses power levels of less than 5W. When the interference to his neighbour's TV first came to his attention Rob checked his own TV first. And when using the TV by itself (not permanently set to operate via the video recorder as most people normally do) the picture was 'clean'. However, when transmitting on the 14MHz band - and with the video recorder in circuit - Rob's transmitted speech could be seen to interfere with the received TV picture. Vertical 'wavy' lines (moving in relationship to his voice) could be seen on all channels. The problem persisted on all channels (the receives the Rowridge transmitter transmitter No. 108, broadcasting on the Group A channels of 21, 24, 27 and 31 from the Isle of Wight on Band IV) despite a low pass filter in the output of his transmitter.

It was then obvious that the broadband amplifier/splitter unit in the video recorder was being overloaded by the high 'out of band' signal levels. So, I then fitted an AKD 'in line' high-pass filter and the picture cleared immediately. However, the problem with the neighbour's TVI wasn't so easy to cure...although it was caused by exactly the same type of broadband amplifier not coping very well with strong 'out of band' signals.

Broadband Problems

Although broadband distribution systems can make the TV and radio engineer's job much simpler (we can literally 'bung' everything up the same cable!) the very fact that the system accepts a wide range of frequencies can cause problems. Add this to the DIY approach of 'over the counter' sales of relatively complex equipment to people unaware of radio frequency techniques - and trouble can start!

I've lived with sorting out d.i.y. mast-
head problems for years. For example, I went to the aid of a customer who installed (quite unnecessarily - as all he originally needed was a better Band II antenna rather than an amplifier) a combined Band II (commonly referred to as a 'v.h.f., f.m.') radio and Band IV/V masthead amplifier. He then couldn't understand why he was receiving unwanted aircraft transmissions on his 'f.m.' radio and local taxi transmissions were coming over his TV set!

The broadband nature of the combined TV-radio masthead unit covered 50MHz to almost 1GHz (you could equate the broadband nature of the amplifier as being rather un-selective in receiver terms) was overloaded itself. It then also helped to overload the TV and radios connected to the circuit.

My customer was disappointed that it was his own handwork that had caused the problem. But at least his reception problems were overcome and he didn't get someone asking for landing permission, or where the passenger from 'number 24 wanted to be taken to' mixed in with his favourite music!

**Back To Basics**

Having substantially reduced the TVI problem it was obvious to Rob and I that it was a question of going 'back to the basics' and replacing the neighbour's original distribution amplifier. This had to be the route to TVI free reception because it's obviously the amplifier that's causing the problem. But at least his reception problems were overcome and he didn't get someone asking for landing permission, or where the passenger from 'number 24 wanted to be taken to' mixed in with his favourite music!

**Back Next Door**

But back to Rob's neighbour next door, where the problem turned out to be essentially what I'd expected: a wide band unit. It was hidden up in the roof and although I was unable to see it in situ, I found out it covered from around 50MHz right up to the top of the Band V TV allocation (well past 860MHz).

With up to six combined v.h.f. (for radio of course) and u.h.f. outlets the unit was obviously a candidate for overloaded caused by the close-by (physically speaking) transmissions from Rob's antenna. So, again using an AKD high-pass filter I got the house-owner to place the filter in-line between the u.h.f.

antenna and the distribution amplifier. Once in place the filter did its job very well indeed and the TVI disappeared on the neighbour's main TV in their lounge immediately.

The set in question was a large, modern and well designed receiver which was designed to comply with the latest EMC standards. But the same couldn't be said for the 'transportable' colour set used in the kitchen - this still had interference on some channels.

**Back To Square One**

Ideally I would like to get Rob's neighbour to go 'back to square one' to re-install the TV distribution system. But obviously this is not an option and we are going to have to compromise. Rob wants to continue his short wave radio reception. So, we've decided on another approach - by replacing the main amplifier unit.

Replacing the amplifier unit with a 'grouped' unit (in other words a more selective unit which is tuned to work only on the v.h.f. (for radio) and u.h.f. channels required that's designed to cope with the EMC levels required today will help immensely. Of course, the results will be used in 'Up The Ladder' to help you overcome similar difficulties and I hope to write them up for Antennas in Action next time. Until then, enjoy yourself on the air and I hope you enjoy watching interference free TV too!

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**Fig. 1: Stevenage-based AKD have many years of experience in producing in-line filters suitable for helping to eliminate TVI. Allan Wightman used one to tackle problems experienced by G3XFD.**

Interference by responding to the 'out of band' signals amplifying them and superimposing the resultant pattern over the wanted programmes on the older 'budget priced' colour portable set still having problems, installation! And even newly installed house systems - even well planned versions - can have difficulties caused by lack of knowledge involving r.f. For example, I recently had to attend a brand new house (a six bedroom job) with a very high quality distribution system which was also generally well planned. Unfortunately though - the electrician who had been left to install the cabling had 'taken a short cut'.

The 'short cut' involved an awkward coaxial cable junction, where instead of using a resistive or inductive (I prefer inductive types) two-way 'splitter'. He'd just linked the cables together, and the result was a classic 'ghost' (delayed image) on all the channels received on that 'leg' of the system. Of course, it was caused by the un-terminated 'leg' reflecting the r.f. energy (the TV signals) back on to the main system.

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Some time ago Brian Williams GW0GHF wrote to me and asked if I could find an article in PW about the 'Bob-Tail' antenna. So I had a quick 'trundle' through the archives and failed to find it, even though I thought I could remember such an article. But in the end, I had to resort to the ARRL Antenna Handbook and memory in my answer to him.

However, in the rush to answer, I inadvertently gave the wrong dimensions for the elements. The dimensions he had calculated, along with more details of his feeder system, which is shown in the drawing of Fig. 1. For his 'Bob-Tail' he used 5mm brazing rod for the elements and a 450mm length of 300Ω ribbon feeder as a matching line. The lowest s.w.r. occurred with the coaxial feed some 25mm from the closed end, and with the inner connected to the open circuit side of the line.

Brian was kind enough to tell me about the dimensions he had calculated, along with more details of his feeder system, which is shown in the drawing of Fig. 1. For his 'Bob-Tail' he used 5mm brazing rod for the elements and a 450mm length of 300Ω ribbon feeder as a matching line. The lowest s.w.r. occurred with the coaxial feed some 25mm from the closed end, and with the inner connected to the open circuit side of the line.

Brian says "The aerial is right up in the loft under the ridge timber, held up by string! The 'top' part may be looked upon as the 'transmission line' feeding the three vertical 1/4 radiators, which because of the equal (hopefully) and opposite phasing of the centre 1/4 produces a squashed bi-directional pattern".

Brian also reported that the gain quoted is supposed to be around 6.8dBi (in the directions at right angles to the paper as it's shown). Although he thought that 5dBd was nearer the truth. "The lobes are rather sharp and mine seems to have a 'squint' (no doubt due to some irregularities in my measurements). But on the whole, it's easy to make and handy for a simple '/P' aerial in a pole. I hope you can encourage some of your readers to try it out".

So, why not have a go yourselves at a 'Bob-Tail' antenna? The dimensions shown are for a 144MHz version, but with a little maths you could make one for any other band. When it comes to calculating the length of the 300Ω 1/4 matching stub, use a figure of 6.5/f (in metres, where f is the centre frequency of the band of interest). And as to the position of the matching point use a proportional distance from the closed end.

**Invisible Antenna**

From Peterborough, Noel Muncey G7VPA, has come up with a useful tip to go with the 'invisible' antenna that John Heys G3BDQ described for 'Antenna Workshop' in the November 1997 issue of A-i-A. In that issue John described an antenna that was simple, cheap and easy to make from aluminium foil, and because of this, it could be hidden behind wall covering or curtains.

In a letter that starts "It brought to mind the time I was working for an alarm company. We used an 'Aluminium foil windows tape' and 'foil terminations'. Then G7VPA went on to say that by using this self adhesive tape which is 9mm wide, and the terminations, a similar antenna could be put up much quicker that by using John's method. At the connector end, the tape is folded back underneath itself to give extra strength when being clamped into the terminal block adapter Fig. 2. However, creating the corners with the somewhat flimsy tape (it is designed to rupture quite easily) is an art, but it is quickly learned as long as care is taken when forming the corners. I've had a go at producing some connections and corners so you can see the technique in photographs Fig. 3 and 4. To make the 'hospital-

![Fig. 1: The 'Bob-Tail' Antenna for 144MHz.](image1)

![Fig. 2: The 'stick-on' connectors used in alarm systems.](image2)

![Fig. 3: Making 'hospital-bed' corners is easy with a little care and practice.](image3)

![Fig. 4: Making 'hospital-bed' corners is easy with a little care and practice.](image4)
bed' corners that G7VPA provided, needs a special technique as outlined in the annotated examples he produced on paper. When making corners, the first fold is made in the opposite direction to the desired one. This brings the sticky side uppermost and at right angles to the stuck-down run (Fig. 3). Then carefully hold the tape and fold it back on itself (the fold becomes like the gnomon of a sundial). Tidy the fold up by pressing it

Fig. 5: Making a 'double' corner allows the tape width to be effectively increased.

Fig. 6: Duncan head had some problems with his N-type plugs (see text for more details).

down, and continue in the desired direction with the tape. You may have to practice a few times before it looks as good as the samples sent in the post to me, especially like the double bend example shown in Fig. 5.

Another alternative tape that I've seen, although it's more expensive, is to use the copper foil tape that can be found in many of the handicraft shops. Using the copper tape and the same technique as outlined by Noel, a marginally more efficient antenna could be made. This last comment applies especially when trying to make a double width track, as the tracks could be solder 'tacked' together, reducing the chances of your 'double-width' element really being seen as a 'folded' element.

Antenna Alarm

Still staying on the subject of 'hidden' antennas, John Biggood has sent in a nice idea in a letter that started "With reference to hidden antennas, one item which is 'springing-up' in most areas is the wall mounted alarm box. I have an active one on my house, but as an experiment I will obtain a dummy box and fit a small 114/430MHz mobile antenna and use a metal plate as a ground plane". Sounds like a good idea to me John, but instead of using a large metal plate for a ground-plane at 144MHz it would need to be quite big to be effective! You might like to investigate using 1/4 stubs for each band running down at an angle from the feedpoint inside the box. Perhaps two stubs for each band and a small helical wound (rubber duck) dual-band portable antenna would be ideal.

If anyone else has ideas along the lines discussed, please let me know so I can share them. Using a 'fake' alarm box to weatherproof a remotely controlled millimetre section of the inner insulation cut from a length of RG8 coaxial cable (another use for those short lengths that get left over) inside the plug, as shown in Fig. 7. Instead of trimming the inner insulation of the thin cable about 3mm from the turned back screen, trim it at 4mm from the screen in future.

Take a one millimetre 'slice' of the RG8 insulation and gently make the centre hole large enough to pass over the inner insulation of the thinner coaxial cable. If this is done before the section is sliced off then it's easier. Pull the inner conductor out of a length of RG8 inner and using a twist drill of slightly larger size open out the hole left by pulling out the centre conductor.

At this point you may as well make several of the 'rings' so, taking great care and a craft knife with a stiff blade, slice off several 1mm rings and put them safe in your toolbox for future use. This may be difficult to do but would be worth the effort all at once because you'd have a supply of the rings. Perhaps an amateur, who is also a butcher, would like to contemplate a rather unusual uses for his bacon-slicer at this point!

I think that's your idea is great Rod, simple, but a cure for a problem that plagues most of us at some time or other. Although putting another piece of dielectric material inside a coaxial cavity alters the characteristic impedance at that point, I don't see that this is a problem under any circumstance. The PL259 doesn't have a constant impedance anyhow, and most definitely should not be used at any frequency where such a small change of impedance is going to cause a problem.

Design Found

In the November 1997 'Tex Topics' column Brian Lowe VE3JTE asked for help with finding the original article for an antenna design that I sketched out in the column. I've had several letters pointing out that the design (even though the sketch wasn't a very good one) was most probably 'The Steeple', an antenna designed and described by John Heys G3BDQ. And of course the first letter was from John himself giving...
TEX TOPICS CONTINUED FROM PAGE 45

Bostik.

Tack a blue putty-like substance from holding it in place with blobs of 'Blu-Run' when assembling PL259 plugs (see text for more details). By pushing pieces of 'Blu-Tack', large enough to make a bridge on top of the coaxial cable of about 10mm long, every 200mm, the cable is held firmly in place without fear of marking the paint on the vehicle. The second tip from G3NQX concerns making an effective centre piece for wire antennas. Have a look at the sketch of Fig. 8, where I've shown the basics. Two slots, melt glue, or of a bathroom sealant, would improve the grip in slightly oversized slots. This method has proved very successful at the QTH of G3NQX, where there's been no failure noted in many years.

**Tacks On Two**

My final letter this month concerns the effect that using tacks on antennas designed for 144MHz. From George Ross G4IEI comes a tale of warning. "I thought you might be interested in my experiences in construction of a 'Slim Jim' for 144MHz in accordance with G2BCX's instructions". (Sadly Fred Judd G2BCX, who so ably ran the PW 'Antenna Clinic for so long, became a silent key in 1992. 'Tex').

George continues the description of his 'Slim Jim', "I used 18g (1.25mm) copper wire mounted on a wooden batten, the wire was not holding tight so I fixed it with a few tacks. The test on receive was very good but on transmit the s.w.r. was dangerously high in spite of adjusting the feed point". George wondered if the tacks, about a dozen of 'blued' types, might be having the disastrous effect on the s.w.r. So, he removed the tacks and taped the antenna to the batten instead.

**Signing-Off**

Well that just about rounds it off for another "Tex Topics". I'd like to thank all those who wrote in and shared ideas and information with us. As I haven't had time to give your returned questionnaires more than just a swift glance - but thank you all the same. I'll do my best to bring you a resume of your opinions in the next A-i-A as we include your wishes into the 'look and feel' of my magazine section.

The only other task I still have to perform is to donate a copy of More Out Of Thin Air to the best tip of the issue. This has turned out to be a very difficult choice this month as each of the tips is a useful one. So in the end, much as I'd like to give all who write in something, I decided that George G4IEI will get the Book and Rod Short Z21AF would get a voucher to be used the next time he orders something from the PW Book Service.

See you all next time in 'Antennas in Action', and next month when I've been given a new column called 'Electronics in Action'.

Best regards and a Merry Christmas to you all.
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Practical Wireless, January 1998
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<td>L3.6m</td>
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Practical Wireless, January 1998
GPS FROM SMC

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LAST MINUTE STOCKING FILLERS

There's no doubt about it - crystal sets and their very simplicity fascinate some people! There's a lot to be said for what must be the simplest receiver - both as a teaching aid and as a 'serious' interest itself. So, with this in mind the PW team have compiled some interesting books on crystal sets as possible Christmas presents and - quite by chance - Rob Mannion G3XFD covers the same subject in his beginner's series 'Radio Discover The Basics' this month too!

The Xtal Set Society Newsletter - Volume IV

This specialist society, based in St. Louis, Missouri in the USA promotes and keeps alive a great deal of interest in the good old crystal set. When you read this collection of newsletters on the subject of crystal receivers - you're in for a real surprise because there's an amazing variety of receivers 'on the same theme'!

One of the most interesting crystal set memories tells of a 'Foxhole' receiver built by an American soldier in the Second World War - using a rusty razor blade 'detector'. It worked!

Packed with coil information, anecdotes, projects, techniques and ideas this little booklet provides a good read. Good Reading costing just £6.50.

Crystal Radio: History, Fundamentals, And Design

Xtal Set Society

Want to know all about 'Grandfather's Crystal set' - the history, how they worked and how you can build one? Well, this fascinating little book provides a great deal of information in a friendly, informative and practical style. Along the way it provides a very interesting look at the history of radio reception - quite appropriate in the Centenary year of Amateur Radio. Recommended reading at £6.50.

The Crystal Set Handbook

& Volume III of the XTAL Set Society Newsletter

Again, this little book provides a great deal of information, covering historical and modern reception techniques using 'crystal receivers'. The historical aspect alone is well worth reading and provides a good insight into the (often slightly hazardous!) early techniques. The technical information will certainly help the reader to become an expert at winding home-made tuning coils! Good reading. The Crystal Set Handbook costs £6.50

Crystal Set

Xtal Set Society Newsletter Volume V

If you think portable receivers are new - you should see the article on page 50 of this collection of news, topical items/letters/articles from the society members. Fascinating reading and at just £6.50 it's affordable too! Particular historical interest.

Volume One - The Xtal Set Society Newsletter

(July 1991 to May 1992)

This spirally bound, photocopied style collection of newsletters includes topics such as: A complete set of plans for a modern day crystal set including p.c.b. layouts and audio amplification, Why did the sets of the 1920s work anyway?, Crystal Sets & Wireless 1905-1928, A Barebones Crystal Set, Listening to h.f. broadcasting, a toroidal crystal set - compact!, Matching your antenna for maximum signal reception. Interesting, informative and informal reading. Priced at £6.50.

Volume Two - The Xtal Set Society Newsletter

(July 1992-May 1993)

This spirally bound, photocopied style collection of newsletters contains a lot to interest 'crystal set' fan. Topics included are: The Lead Pencil Detector, Detector biasing, double-tuned crystal sets, FM Crystal sets?, Electrolytic detectors, the coherer revisited and a galena detector from Italy. Interesting and informal technical reading at £6.50.

If you order any three from the selection on this page we'll pay the postage (UK only, overseas please add £2 P&P per book).
If you’re thinking about or in the process of studying for the Radio Amateurs’ Examination then you’d be well advised to add the following to your last minute Christmas list!

Written & Published by Ray Petri G0OAT

Ray Petri’s book is now so long established it has become a ‘minor classic’. This ‘heavyweight’ paper-backed textbook is packed throughout with theory, RAE questions, the background information and answers. In effect, Ray’s book provides a comprehensive course. Many RAE course instructors use his book as the course textbook and it’s just as useful for the student working alone. Highly recommended at £13.95.

**Basic Radio & Electronic Calculations - Using The Casio Scientific Calculator**
Written & Published by Ray Petri G0OAT

This book, unique in its approach, is proof that mathematics can be fun! Ray Petri undertook a very difficult task when he decided to write this book, but his hard work has produced an extremely useful handbook and electronics textbook.

Anyone contemplating buying the book should also consider buying the Casio FX-115s calculator too, as together they provide a powerful working tool. The author carefully leads the reader through the techniques involved in using the mathematics and provides the information on the necessary keystrokes for the scientific calculator. Anyone undertaking the RAE will find the book to be helpful - particularly because of Ray Petri’s detailed attention to ‘working through’ the calculations. The short answers are extremely useful and in themselves act as a useful memory aid. As usual this publication is to Ray Petri’s high standards and in the new format is easier to hold and use comfortably. Highly Recommended at £13.95.

**The Radio Amateurs Examination - End Of Course Test Papers (With Answers)**
Ray Petri G0OAT

Ray Petri’s books have become well known over the last few years and many RAE students have successfully used his numerous books to help them through the course. Ray, busy as ever, has now produced a natural ‘follow-up’ with this new book - which as the title suggests is a collection of test papers with answers and in doing so he’s broken new ground in the size (A4) and style of presentation.

**Practical Wireless, January 1998**

51
An Extremely Impressive Transceiver!

By Richard Newton G0RSN

The TH-G71E is the new hand-held dual-band transceiver from the Kenwood stables. It has been hailed as the successor to the TH-79E. The TH-G71E covers the 144-146 and 430-439 MHz amateur bands and is supplied with a PB38 battery pack, a charger, belt hook, helical antenna, hand strap and instruction manual.

The instruction manual is up to the high standard I would expect of Kenwood. It is written in good English and has lots of diagrams and examples.

The charger I was supplied with the review model had 'shaver type' prongs and was of the type that the whole unit plugs into the wall for mainland Europe. But the UK model will have the required 13A plug fitted.

The PB38 battery pack is of the 6V 650mAh type which gives 2.5W out on high power on v.h.f. and 2.2W out on high power on u.h.f. It would appear from reading the manual that some markets have this radio supplied with the PB39 9.6V600mAh battery pack, this would give 5W out on high power on both bands. Never mind, at least ours lasts longer! The TH-G71E will give an impressive 6W (v.h.f.) and 5.5W (u.h.f.) out on high power when supplied with 13.8V.

The TH-G71E transceiver is small, it fits nicely into a palm and is of a good operating size. It is a very good-looking package and its ergonomic design is excellent.

The main control on the unit is a dual rotary control on the top of the radio. The inner knob clicks around and tunes the v.f.o. range in that mode and the memories when in that mode. This also gives access to the different user programmable settings such as Auto Power Off, Scan Resume Method and Variable Offset to mention but a few!

The outer ring on the rotary control is the volume control. This is a fully variable control having a smooth, continuous action.

Easy To Use

The TH-G71E is easy to use, the controls are large and well labelled. The unit has a very good back light that really does back light the keypad as well as the display.

The belt clip on the transceiver is a good idea, it's made from plastic and slips into a clip on the rear of the radio. You can unclip it and slide it off without having to worry about fixing screws.

The only problem I had was every time I pulled the radio off my belt - the belt clip came off too and fell to the floor. In practice I found that you had to ease the clip off your belt.

The TH-G71E can be configured by the user and has all the Functions you would expect to see on a modern hand-held radio. These included full CTCSS encode and decode and DTMF. The user can either take full advantage of being able to personalise the radio using the set up menu or you can just simply use it as factory-configured.

Kenwood's TH-G71E has 200 memories, these are easily programmed and can contain all the normal offsets and other information. They can be given an Alpha-Numeric 'name'.

Despite being a dual-band transceiver the TH-G71E only displays one band at a time. Both the TH-79E and its predecessor the TH-78E have a proper dual v.f.o. and monitor both bands at the same time.

I own a TH-78E and my father-in-law Terry G7VJJ owns a TH-79E. And, we both find the dual v.f.o. very useful as both can be used independently, also you can scan the v.h.f. bands while keeping a constant watch, on the local u.h.f. 'chat' frequency. The TH-G71E scans the memories on both bands together.

A colleague of mine Bob G60ZM was once the owner of a Standard CS50 which was one of the very first dual-band hand-helds. This, like the TH-G71E, could only monitor one band at a time.

Bob tells me that he found this 'one band' monitoring very restricting. Although he could scan memories on both bands together, once a busy u.h.f. memory had been found you could no longer listen for a call on the v.h.f. bands.

Bob effectively replaced his CS50 with a TH-78E. (The grandparent to the new TH-G71E). I wonder why Kenwood have decided to revert to this style of monitoring, one v.f.o. at a time?

Channel Spacing

The thing on everyone's lips at the moment is 12.5kHz channel spacing. So, not having any expensive test equipment I had to think of a way in which I could test the TH-G71E.

I live about 6.4km away from the local 145MHz repeater. GB3SC. So, I tuned to the repeater frequency and was pleased to receive GB3SC as a good 5 and 7. This is an usually good signal for my location.

I then tuned 12.5kHz up and there was nothing, alas 12.5kHz.

Continued on page 55.
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KENWOOD
TH-G71E Dual-Band Hand-Held
Continued from page 52.

---

down I could still plainly hear the conversation in progress on 'SC although slightly distorted and very much reduced in signal strength. Some tests with my TH-78E at home on Extra Low power using a small helical antenna seemed to support this finding. My first QSO using the TH-G71E was almost a mistake. I was listening to attach an external antenna, intending to check the radio on my base station antenna and in the car on a mobile whip. To my utter amazement I found that in a hole (that was large enough to have a BNC fitting) there was an SMA antenna fitting. Steve armed himself with his hand-held to hand-held contact, and the TH-G71E worked very well indeed. Steve had no problems and the TH-G71E seemed to support this finding. I would not normally expect to hear such a good signal from Frank's area. It is not far away but the terrain does not normally allow a contact, especially when using a hand-held running just over 2W.

---

Not having placed an order for an antenna plug adapter and undeterred I decided to try talking to someone using the standard helical antenna supplied with the TH-G71E. This was Frank GIYNY for the hand-held to hand-held text. After a very pleasant Sunday lunch, Steve and his wife took my family for a walk around their neighbourhood while I sat in the warmth and comfort of Steve's front room in the name of science and writing a review.

Steve armed himself with his TH-78E and I with the TH-G71E. It was a hand-held to hand-held contact, and the TH-G71E worked very well indeed. Steve had no problems receiving me even on the Extra Low power setting of 50mW! The TH-G71E proved itself to have an extremely impressive receiver. I wonder if that's why Kenwood are trying to discourage the use of an external antenna?

I drove past the local Pager "nest" and the TH-G71E suffered no ill effects. The radio is sitting next to me now on top of the computer as I type, monitoring S20 and again it's suffering no ill effects whatsoever.

---

Critical Aspects

I know I have been critical about certain aspects of the Kenwood TH-G71E. However, these are mostly personal preferences that you, the reader, are either going to share or dismiss.

---

Manufacturer’s Abridged Specifications

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>144 to 146MHz</td>
</tr>
<tr>
<td>Mode</td>
<td>F3E</td>
</tr>
<tr>
<td>Usable temp range</td>
<td>20°C to -50°C</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>External Supply</td>
</tr>
<tr>
<td>Weight (with battery/antenna)</td>
<td>Approx. 330g</td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
</tr>
<tr>
<td>Circuit</td>
<td>Double conversion superheterodyne</td>
</tr>
<tr>
<td>1st intermediate frequency</td>
<td>38.3MHz</td>
</tr>
<tr>
<td>2nd intermediate frequency</td>
<td>450kHz</td>
</tr>
</tbody>
</table>

---

The fact remains that the Kenwood TH-G71E is a well built, professional looking radio packed full of excellent features and in my opinion does its job as a hand-held radio extremely well indeed. My thanks go to Kenwood Electronics UK Ltd. of Kenwood House, Dwight Road, Watford, Herts WD1 8EB. Tel: (01923) 816444, FAX: (01923) 212477 for the loan of the TH-G71E for review, which is available from all Kenwood approved dealers for the recommended price of £279.95.

---

After seeing a copy of GORSN's review Dave Wilkins G5HY of Kenwood Electronics UK sent us the following comments:

As far as the point raised about the NiCad battery was concerned I can confirm that yes in some markets the radio is supplied as standard with a high-power NiCad. However, there is also a version available overseas with no NiCad or charger at all, just an empty dry-cell case! UK hand-held radios from all manufacturers are normally supplied as standard to the generally accepted UK level of specification, which is with a NiCad giving around 2.5W output and with a 'power cube' wall charger included in the basic price.

Secondly I do understand GORSN's comments about the way in which the two bands are accessed and the fact that the TH-78/79E models were more flexible, however the TH-G71E retails at £279 and the TH-75E cost £479! This is an incredible drop in price which far outweighs the actual reductions in the new radio's facilities and functions.

The reality is that the majority (although not all) customers of the major manufacturers have moved away from paying high prices for very high specification hand-helds towards simpler, cheaper radios so we must react accordingly and produce what people actually want to buy.

Finally, the TH-G71E does indeed have a new form of antenna socket, which is of a much higher standard than the old BNC type and already quite common on professional radios. This was used to improve the long term reliability of the connection and certainly not to "discourage the use of an external antenna".

Since as you mentioned in the review, adapters are readily available from several sources. You will probably know that BNC fittings suffer from wear of pins - as these pins are on the radio rather than the antenna, replacement is expensive and we feel that the advantages of the new connector are well worthwhile.

I am glad that Richard seemed to enjoy his time with the TH-G71E, even when it was up against the family's previous Kenwood models!
By Harry Lythall G4VVJ

A few years ago I found myself living in close proximity to another Radio Amateur who was also active on the 144MHz band. If I went on air when he was on, I suffered from his r.f. field (and I'm sure he suffered from mine).

I eventually hit upon the idea of using a narrow-band resonant cavity filter to solve the problem. The filter allowed me to operate at the opposite end of the 144MHz band without any problems, and the interference and receiver de-sensing were effectively eliminated.

The filter is a tuned circuit made in a metal container, with loops to couple radio frequency energy with very low losses, see Fig. 1. The low losses involved, and the way the tuned circuit is made, results in a very high Q and thus a very narrow bandwidth.

Since Bandwidth = F/Q, as the Q increases, the bandwidth decreases. The bandwidth of a resonant cavity is therefore much more narrow than that of conventional inductor/capacitor tuned circuits due to the higher Q that can be obtained.

My workshop facilities were limited and funds short, so a large (1.5kg) coffee tin was pressed into service to make the cavity filter. The whole project was thrown together in just over an hour, but, I would say that tools this time could be dramatically reduced.

A two-port resonant cavity filter placed in the antenna circuit of a receiver, Fig. 2, will effectively pass only the narrow band of frequencies to which it is tuned. A single-port cavity may also be placed in the receiver antenna lead, Fig. 3, in such a manner that it rejects (by absorbing) a narrow band of r.f. signals.

Absorption will only occur at the frequency to which the cavity is tuned. By a combination of band-pass and band-stop filters a nearby transmitter can effectively be 'switched off'.

The band-pass filter can only be used over a limited frequency range without adjustment, so they are normally only found on fixed frequency stations such as repeaters.

The repeater system would use several cavity filters to allow transmitter power to reach the antenna, without desensing the receiver. The layout of Fig. 4 shows the way duplex operation is possible using a single antenna.

A resonant cavity band-pass filter (at say 100MHz) with a Q of 1000 would have a bandwidth of 100kHz. Cascading two or more filters would give an even narrower bandwidth.

Some Dimensions

Some dimensions for the construction of amateur band basic cavity filters are given in Table I. From the drawing of Fig. 1, you'll see the construction is self-explanatory, but I'll give assembly tips as I describe each component.

For the centre conductor almost any household plumbing copper pipe or tubing is ideal. I've found tubing with 15-37mm diameters in the local d.i.y. outlets.

The copper tube should, ideally, have an outside diameter of 15-20% of the inside diameter of the metal container used. The smaller diameter pipes are easier to work with, but the overall performance of the filter may suffer a little if it is too small.

As an example let's design a stub for 400MHz (it's easier!). The free space wavelength at 400MHz is 750mm. So, 1/4 is therefore 187.5mm. Now, take 85% of this value, for the copper tube, which is about 160mm in length.

The frequency coverage of a
cavity with this length of copper tube will be about 220 to 420MHz; the upper frequency limit being determined by the length of copper tube. The lower frequency limit is governed by the maximum tuning capacitance provided by the tuning screw.

**Large Tins**

You might have to find some (very) large tins for use at lower v.h.f. Some commercially available cavity filters even use aluminium beer-barrels! I have successfully used large tins from coffee or other food products. Whatever the source of the tin, it's most important that the lid fits tightly, forming a good seal, otherwise the overall performance of the filter will suffer.

The container must be a little longer than the copper tube, but this can be made up using two (or more) tins soldered together. Prior to soldering, remove the top from one tin and the base of the second (and subsequent) tin.

Then, using an abrasive, carefully clean the new edges well. The tins may be accurately positioned using masking tape which is then removed as the junction is progressively soldered.

Solder and other metal spikes must be avoided. Soldering the copper tube to the cavity lid may be performed by cleaning and pre-tinning both parts well using plenty of solder. The two components may then be mated together whilst the solder is molten, with the copper tube in a vertical position.

Heating is best achieved with a blow-torch, but a gas-cooker has always worked well for me. Allow the joint to cool naturally without movement and a nice uniform joint should be the result. A final cleaning with wire-wool will remove all traces of flux and any other minor irregularities.

**Adjustment Screw**

The adjustment screw must be long enough to reach about 20% of the length of the copper tube. Make the hole in the base of the tin before soldering the retaining nut, but take care not to get any solder on the threads of the nut.

For frequencies below 100MHz, the tuning may be carried out with a variable capacitor in order to add the greater capacitance required. The capacitor is connected between the end of the copper pipe and the bottom inside surface of the tin.

Single hole fixing trimmer capacitors are available which will retain the container's r.f. seal. Using this method I've made a small treacle tin to operate at 144MHz with a very short copper inductor. But the Q wasn't as good as a full sized cavity.

**Plastic Tube**

The plastic tube has two uses. It helps prevent the copper tube moving about which would alter the resonant frequency of the filter. (The plastic tube must be a tight fit inside the copper tube).

For the plastic tube's other use, it must also be a very slightly 'friction fit' on the adjustment screw. A tube which does not quite bind the adjustment screw thread may be touched on the inside with a soldering iron tip. This will raise small ridges which will bind in the screw threads, and which also aids frequency stability.

Dents in the side of the tin will have little effect upon the operating frequency of the filter, but the top and bottom of the tin must not be allowed to move. If the screw binds on the tin or plastic tube, then the pressure distorts the tin which modifies the tuning point.

**Warning:** do not use black plastic plumbing pipes as some types can be quite conductive at radio frequencies. The inadvertent use of conductive plastic would introduce massive losses that would render the cavity useless.

**Loops In-Out**

For input and output purposes, small coupling loops are used. These loops are formed from 2mm (16s.w.g.) or thicker copper wire (preferably silver plated). The size of the loop is fairly important, but not critical.

Small loops will increase the insertion loss of the cavity filter. Loops that are too big will lower the Q of the filter, as well as allowing the filter frequency to be 'pulled' by an external circuit.

Above 200MHz the loops will normally be about 15% of the length of the copper tube, and about 7.5% of the width. So at 400MHz this is about 25x12mm. Both loops must be identical if the filter input and output impedances are to be equal.

The loops should be positioned 2-3mm from the copper tube resonator as shown.

Table 1, gives the important dimensions of the copper tube centre conductor and the input/output loop sizes. As I've said before the dimensions may vary a little without altering the overall qualities of the filter very much. But, below 50MHz some lengths become a little too large to be practical.

**Centre Frequency**

To carry out the alignment of the centre frequency of the filters, couple a low power transmitter of the correct frequency, through the filter to a power meter. Then adjust the frequency adjustment screw for maximum power. But, be sure to use a low power as the filter will cause a very high reflected power until it is correctly aligned.

Personally, I only construct two-port filters, even when used in a single port configuration. This allows alignment as for band-pass and band-stop (absorption) with the other port unterminated.

**Insertion Loss**

The filter, as described, will have an insertion loss of about 2dB, and a Q of several hundred. But both parameters may be improved with a little care and attention to detail. (The filter must be mechanically symmetrical with positioning and size of the various components).

Losses can be further reduced by silver plating all metal surfaces within the container. However, I have found this to be an unnecessary luxury; I have always achieved the required bandwidth without silver plating.

The cavity described is so cheap...
and quick to construct. To obtain a filter Q factors of thousands, two or more cavities may be placed in series. If you are going to construct a repeater, you may use all-copper or brass construction with internal silver plating. These steps will make the cavity more robust, as well as minimising losses, increasing the Q and aiding long-term stability.

**Unusual Uses**

There are some unusual uses for the project! For example: A diode detector on the output of the filter will recover a.m. signals. If the filter is tuned slightly off-frequency f.m. signals are detected due to "slope detection".

A simple audio frequency amplifier and speaker connected to the diode detector will reproduce sufficiently strong audio. This could form the basis of a simple a.m./f.m. transmitter monitor or even a local repeater monitor, if you should live sufficiently close to a repeater.

Do not try to fit an f.t. pre-amplifier inside the cavity unless you want to create an oscillator! But you can create a relatively stable signal on the v.h.f. and u.h.f. wavebands. There's plenty of metalwork to dissipate heat, so moderate powers can be obtained without undue frequency drifting.

**Galvanised Dustbin**

I've also employed a galvanised steel dustbin and variable capacitor to obtain a filter for 28.05MHz. This enabled me to operate on the c.w. segment of 28MHz and eliminate interference from a close neighbour who was, I think, using a little more than the regulation 4W on Citizens Band!

In the case of impractical sizes, the copper tube inner may be much thinner and coiled into the space available. But I'm not going to go into that now... perhaps another article some time?

So go on then open up a tin or two and make yourself a 'Canny Cavity' filter. It's easier than you think!

---

**Radio Diary**

**Compiled by Zoe Crabb**

If you wish to have your Rally featured in Radio Diary, all you have to do is to put together as much information about the Rally as possible, ie. date, location, time, who to contact, etc., and send it to Zoe Crabb at the PW Editorial Office.

**Practical Wireless & SWM in attendance**

*December 14: The Leeds & District Xmas Radio & Computer Rally is to be held at the Pudsey Civic Centre (Dawsom Corner), All the usual traders will be there, there will also be a talk-in, a licensed bar and disabled facilities, etc. Further information from John Mortimer on (01943) 874690 (Bookings Manager). Gordon Ryder on 0131-235 0626 (Rally Manager) or from Malcolm Robertson on 0131-225 3379 (Club Secretary).*

*December 14: The Venutian Amateur Radio Club Rally is to be held at the Watford Leisure Centre, Horseshoe Lane, Watford, Hertfordshire, from 1000 to 1600. The Leisure Centre is located off the A405 near junctions 6 of the M1 and junction 21A of the M25. Attraction details will be:- Band 11, a licensed bar and disabled facilities, etc. Further information from John Mortimer on (01943) 874690 (Bookings Manager). Gordon Ryder on 0131-235 0626 (Rally Manager) or from Malcolm Robertson on 0131-225 3379 (Club Secretary).*

*January 25: The Lancastrian Rally is to take place at the Lancaster University. Please note that this Rally is now under new management and will be run under the auspices of the Central Lancashire Amateur Radio Club. There will be the usual traders, Band 11, and we expect to have a large car parking space available on the campus. Admission is £1.50 and should you require further information, contact Jim GOGVA on (01772) 261954.*

**Table 1**

<table>
<thead>
<tr>
<th>Frequency Band(MHz)</th>
<th>Inner Length (mm)</th>
<th>Loop Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200 - 1300</td>
<td>51 - 55</td>
<td>10 x 5</td>
</tr>
<tr>
<td>420 - 450</td>
<td>120 - 130</td>
<td>5 x 12</td>
</tr>
<tr>
<td>140 - 150</td>
<td>350 - 390</td>
<td>60 x 30</td>
</tr>
<tr>
<td>70 - 75</td>
<td>700 - 780</td>
<td>100 x 50</td>
</tr>
<tr>
<td>50 - 53</td>
<td>1500</td>
<td>120 x 60</td>
</tr>
</tbody>
</table>

**To antenna**

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**March 8: The Wythall Radio Club are holding their 13th Annual Radio Club Rally at Wythall Park, Silver Street, Wythall, near Birmingham on the A432, just two miles from junction 3 of the M42. Doors open from 10am to 4pm and admission is just £1. There will be the usual traders in three halls, and a large marquee, bar and refreshment facilities on site plus a Band 11 and Wythall stand. Talk-in on S22, Contact Chris G0RXE on 0121-246 7267 evenings and weekends, FAX on 0121-247 7268 or E-mail at g0rx@compuserve.com**

---

**March 15:** The ‘North’ Amateur Radio, Electronics and Computing Exhibition by the Northern Amateur Radio Societies Association is to be held at Wolverhampton Castle Hotel, Exhibition Centre, Queens Promenade, North Shore, Blackpool. Doors open at 1100 (disabled access from 1035). There will be over 100 trade stands, clubs, stands, Band 11, RSGB stand and book stall, construction competition: amateur computer stands and free car parking at the hotel, but from extra cars there. It also will have access to all the exhibition stands. Radio talk-in on S22. Admission is £2. OAPS £1 and under 14s free. Peter Denton G0GCP on 0151-430 7890.

**March 29:** The Penrith & District Amateur Radio Society Component Fair is to be held at Carlton High School. The venue is 300 yards from the Carlton Community Centre. Car parking will be available at the school as usual. The venue will be signposted from the major roads. There will be a talk-in on 2m. For unlicensed visitors. Nigel Ferguson G0BBK can be contacted on 0900 to 1400 on (mobile) (0411) 420409 for directions. Doors to the fair open at 1000 (disabled visitors will be admitted at 1030). Once again all traders will be on the ground floor. The bar and tea room (tea room open for early visitors) will be on the first floor. Morse tests will be conducted. Admission will be by prior programme: Contact Nigel G0BBK on (01977) 616935 in the evening or on (01977) 606345 during the day. E-mail at g0bbk@uol.com. Traders please contact Colin G0NQF on (01977) 777086.
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Please mention Practical Wireless when replying to advertisements.
The warm smell of valved radios, wax polish, and the presence of shiny cabinets and Ebonite panels tells us it's Charles Miller's turn to look after PW vintage 'shop'. And this month Charles continues the fascinating story of Doctor Loewe's special valves.

Good day to you my friends and 'customers' and welcome to 'Valve & Vintage'. Last time we met in the 'shop' I looked at Dr. Loewe's fascinating multiple valves of the late 1920s. This time I'm delving a little deeper!

Although the 'multiple valves' might not have been such a runaway success as he'd hoped. However, the good doctor persisted and carried on making further examples right through the 1930s.

The later efforts had 4V heaters for use in mains powered sets. But, initially at least, they weren't otherwise very different from his originals.

In three valve types he repeated the idea of having three triodes with all the coupling components built in. But after this he began quietly to drop the idea.

Dr. Loewe's next effort, a double tetrode, had only a grid feed condenser to one section. This had to be connected up externally, plus a decoupling condenser from the anode of the other section to its cathode.

For his next trick, Dr. Loewe produced a type with two tetrodes and a diode, for use in superhet receivers. They contained only the decoupling condenser for one of the tetrode's anode.

The good Doctor attained the pinnacle of his multiple-valve career - and also ended it - with a double-pentode-triode type. This was again for use in superhets and contained no internal components at all.

The Loewe Company itself used the valves in some very stylish receivers. But no-one else was particularly interested and by the end of the 1930s Loewe multiple valves were more or less a memory.

Would the lack of interest mean the end of the multiple valve as we knew it? Not likely! This was because the principle (in modified form) had now been taken up by most other valve manufacturers.

Back To 1927

To find out the 'whys and wherefores' I'll have first to turn the clock back to 1927 and the introduction of the screen grid valve. And as I mentioned in an earlier episode, prior to this the only way you could amplify high frequency radio signals was to use triodes, which were unstable and gave only low gain.

However, Edwin A. Armstrong had found a way around the instability with his then new-fangled superhet. Here most of the amplification was carried out at the fairly low frequencies more suited to triodes, but even then the stage gain per valve barely attained double figures.

To obtain anything like a decent performance those early superhets used anything up to eight triodes, which put them way out of the reach of the average listener. Not only that, they were tricky to operate and likely to cause interference with neighbouring sets.

The arrival of the highly sensitive screen grid, with its stage gain of 500 or more, made possible simple, stable three or four-valves. These could easily outperform the superhets and thus knocked them out virtually overnight.

Five years on, new factors had arisen in the broadcasting scene which reversed the situation and brought back the users were hard-put to distinguish between the services.

There had also been an enormous increase of broadcasting stations (many of them high-powered) in Europe as a whole. This when combined with the Regional scheme had created a situation where high selectivity in a receiver had suddenly become essential.

The only way to achieve higher selectivity was to increase the number of tuned circuits in a receiver, which could most easily (and most controllably) be obtained in the superhet. Not that this saw off the screen grid valve though! For the moment it was still the only effective means of handling high frequencies and it was pressed into service to do work not previously expected of it.

In a superhet all incoming radio frequencies have to be converted to a single intermediate frequency. This was achieved by 'beating' (heterodyning or 'mixing') them with frequencies produced by a local oscillator.

Set designers found that the screen grid valve could be persuaded to operate as a self-oscillating frequency-changer. And although it was far from ideal, it proved sufficiently effective to allow them to put superhets into production and into the shops.

No one was kidding themselves, however, that using a screen-grid valve could be anything more than a temporary solution. An alternative method was to use a separate triode as local oscillator with a screen grid valve as mixer, so why not incorporate the two into one 'bottle'? But in fact, something better came about!

Big Defect

Ever since it had been introduced, set designers had known that the screen grid valve, for all its good performance, did have a big defect. It showed up when the anode voltage moved outside certain limits (up or down) so that some of the electrons drawn to it travelled too fast for safety; in fact some of them bounced right back again and hit the screen grid.

The effect is called 'secondary emission' and the screen grid objects to the mis-treatment and shows its displeasure by drawing excess high tension (h.t.) current. This in turn upset the anode and causes it promptly to go 'on strike' and refuse to draw any current at all. The result? No sound from the set.

To get over the secondary emission problem another grid was added between
the screen grid and the anode. This was designed to act as a shield between them and to suppress the secondary emission electrodes by bouncing them back whence they came.

By one of those occasional strokes of genius which illuminated the valve scene this new grid was given the title the 'suppressor grid'. Following on the usual method of borrowing from the Greek for numbering the total of electrodes in a valve, this new type with five was called the pentode.

You might not think that the term pentode could cause dissent. But Mullard, which introduced the pentode in 1929, considered it had a monopoly of the name!

Old habits die hard, and once again the law courts witnessed high-powered and highly paid - lawyers arguing the issue in front of a judge. He must have wondered what all the fuss was about!

Meanwhile, other valve manufacturers couldn't make pentodes - they could only make five electrode valves. After about three years of this the word went forth that anyone could make a pentode.

How much all the nonsense cost Mullard is a matter of guesswork. But it's noticeable that Mullard's later introduction of six electrode (hexode), seven electrode (heptode) and even eight electrode (octode) valves did not prompt any more legal actions.

Another Improvement

Whilst all the 'in fighting' was going on yet another improvement was being made to both the screen grid and - (er...mustn't use the word pentode!) - five electrode valves.

The sensitivity of the screen grid sometimes was a mixed blessing. It was fine when the listener wanted to hear weak, far-off stations but it could be a problem on 'locals' because it was very difficult to control its gain.

The amount of negative grid bias could be increased a little to make a tiny amount of difference but beyond a certain well-defined point the anode current cut off altogether, again silencing the set. Touchy things, these screen grids!

Eventually it was discovered that if the control grid was wound, not nice and symmetrically but a bit 'higgledy-piggledy' it would react sensibly to changes in negative bias by varying the amplification factor of the valve in sympathy.

Again the Greeks had a word for it, the amplification factor that is, which was only one letter, 'mu'. Not surprisingly valves with the new type of control grid were called variable-mu types. With the variable mu types it became possible for the first time to have really effective gain controls in domestic receivers.

Pentodes, too, could be made to have variable-mu characteristics and its superiority over the screen-grid led to the first real frequency-changer valve. This was made by Mazda, consisting of a triode and a pentode in one envelope. Called the AC/TP (guess why?), this valve needed more electrode connections than any used so far and a special nine-pin base plus top-cap was developed for it.

Once introduced the AC/TP was an immediate success. Other valve manufacturers hastened to emulate it or even to improve upon the idea. The method of mixing the local oscillations with the incoming r.f. signals in the triode-pentode was to use common grid or cathode coupling. Neither of these ideas was entirely satisfactory, and a better method was to fit yet another grid in the mixer section, making it a hexode.

In practice the new 'injector' grid was coupled internally to the grid of the triode section and thus no external coupling was required. Oddly enough, with all the extra bits and pieces, the triode-hexode could be mounted on only a standard 7-pin base.

Revival Of Diode

The superhet also brought about the revival of the very first type of valve - the diode. The large amount of amplification possible in the new sets was simply too much for the usual triode grid leak or anode-head detectors of the day to handle without the risk of distortion, so back came the faithful old diode.

Suitably dolled-up in early 1930s 'clothes', the diode was still basically the same as when Fleming had patented it 30 years before. It seemed a pity to have to devote an entire valve base just to so simple a device so Mullard decided to incorporate it into the same envelope as a screen grid valve.

Mullard made the one type of valve capable of i.f. amplification and detection. This, the SD4, was not a success because being a non-variable-mu type it was obsolete almost as soon as it appeared, but it had at least pointed the way forward.

High Sensitivity Problems

By now the high sensitivity of the superhet had shown itself to be causing new problems. Receivers were now capable of bringing in a wide variety of stations of varying signal strength, and the listener could find themselves alternately straining their ears and then being blasted by sound as they tuned along the dial. The notion of having automatic volume control (a.v.c.) to keep the sound output of the set reasonably constant whatever the strength of the station was not new. In fact it had been tried back in the mid 1920s but had failed because the valves available then simply were not suitable.

Now however, the variable-mu valves overcame the previous problems and set designers hastened to incorporate a.v.c. systems. In these a portion of the i.f. signal - which varied with the strength of the incoming signal - was rectified and turned into grid bias for the first two or three valves.

The a.v.c. system called for the services of another diode and the obvious answer seemed to be to put it in the grid and the detector diode together into one envelope. In the event, hardly had double-diodes started to appear when someone came up with an even better idea!

Since the normal practice was to follow the detector with a triode amplifier, why not bring the latter into the same 'bottle' as well? So the double-diode-triode was born, and it was a type that continued, with the triode-hexode, to be made right up until the end of the valve era. For a short while a triple-diode-triode was produced for more sophisticated a.v.c. systems but this fizzled out quite quickly.

Output Valves

Meanwhile, valve designers had been turning their attention to output valves types as well. The early pentodes, although capable of giving a good amount of sound output, were not particularly sensitive and needed to be preceded by an a.f. amplifier (usually the triode section of the double-diode-triode I've just mentioned).

The technical way of quoting the sensitivity of a valve is by using a mutual conductance figure. Simply speaking, this refers to the amount of change in milliamperes of the anode current for a change of one volt in the grid bias, usually abbreviated to 'milliampers per volt' or just MuV.

A typical low-sensitivity output pentode such as the Mazda AC/TPen had an MuV figure of 2.5. Another expression of the period was to call this a 'low slope' valve.

By the middle 1930s valve designers had been able to develop output pentodes with MuV figures as high as 10. Called 'high slope' valves, these were sensitive enough to be able to work straight from the output of a diode detector without the need for a triode in between.

The high slope types enabled valve makers, to produce double-diode-pentodes in which all the jobs, of detection, output and a.v.c. rectification could be carried out by one 'bottle'. This in turn made it possible to produce what were called 'short' superhets.

The 'short' sets which, apart from an h.f. rectifier, needed only three valves. These included a triode-pentode or triode-hexode frequency changer, a pentode i.f. amplifier, and a double-diode-pentode detector cum output cum a.v.c. valve.

The idea was taken up enthusiastically by cost-conscious radio manufacturers and one in particular, Ultra Electric, made the short superhet its staple design for the next 20 years. Multiple valves were here to stay.

Something Wrong?

At this stage a new reader might be pardoned for thinking that there's something wrong here. If multiple valves meant that fewer were needed in receivers, weren't the valve makers cutting the ground from under their own feet?

Well...the reply I've got to say no! Those of you who have been following this little saga from its beginning will be aware that right from the start commercial advantage had driven valve research and manufacture forward and you may be sure that this underlying principle had not changed.

The profit margins on the valves the manufacturers did sell amply enabled them to live in the style to which they had become accustomed. And in my next epistle I'll turn the spotlight on the means used by manufacturers in the sacred cause of keeping up retail prices!

Until then...cheerio...Happy Christmas and New Year!

Cheerio from Charles, see you in April.
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October has been a month of surprises, both weather-wise, and radio-wise. We've been enjoying both fine weather, and some exceptional propagation conditions of late, with all h.f. bands indicating signs of vast improvement.

The bands above 21MHz have rapidly improved over the last few weeks. And even 20MHz has been providing contacts to the Americas and even Australia and Japan.

As winter approaches, the DX on the broadcast bands is to be used even more interesting for our readers. So let's hope that the cold weather doesn't affect your antennas!

I've received a telephone call this month asking for some help. It was from Peter Wilkinson G0VXN who requires QSL details of P20DC. Can any of our readers help Peter? He is QTHR, or can be called on Preston (01772 677462).

Spratly Island

Some news now directly from Don Field G3XFDX/TNTK/1K1G regarding the Chiltern DX Club's expedition to the Spratly Islands next February. The Spratly Islands are a small group of islands situated between Vietnam, and the Philippines, and they have been a favourite location for a number of DXpeditions, due to their remote nature and have also been claimed by Malaysia, Vietnam, China, the Philippines and other countries!

Nevertheless, the Chiltern lads (and lasses!) are a hardy and adventurous bunch. They plan to be enjoying both fine weather, and radio-wise. We've been consulting Mr. Leighton G0WOLBI, and he tells us that the 11th day of the 11th month (November 11th 11th) marks the anniversary of the 1918 Armistice, and is a day of remembrance of those who have fallen in battle.

Leighton Smart G0WOLBI presents his compilation of your h.f. band activities.

And with conditions improving Leighton suggests you could 'miss the action' if you don't switch on!

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Fig. 1: Jim Russell G3OKQ's station with AP2JZB all bands.
Please note that I've just changed-Internet offering, so those of you that use E-mail and my Web site need to make a note of the new details. I will be running both the new and old sites in parallel for a while, but I expect the Pipex site to shut down in February. I'm not changing because of a problem with Pipex, it's just I can get a better price from the BT offering. In fact the Pipex service has been really good with excellent network availability and good transfer speeds. Let's hope I don't regret the change!

Software Radio Library

With the dark winter nights now upon us it's the time of year that many amateurs retreat to the shack to do some serious hobbying. If you're into computing it's now that you want to play around with a few new programs and maybe try your hand at some of the more sophisticated aspects of our hobby: Telemics (E.T)

While the Internet is a great source of information and software there are always problems with slow downloads, and with families complaining they can't use the telephone and the size of the 'phone bills themselves. Fortunately there is a solution where you can browse through hundreds of megabytes of radio related software and information with download speeds of 200k/s and greater without any 'phone bills!

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Recently I reported that a panel of solar experts have made a prediction that solar cycle-23 (the new cycle which we are just entering) should be a large cycle. What they are predicting is that the solar flux (and consequent sunspot numbers) should be very high around the peak of the cycle.

The solar cycle is an annual event, and solar activity has a direct effect on certain propagation modes such as F2-layer, trans-equatorial propagation (t.e.p.) and aurora. Whether or not the peak will be very high or not is difficult to conjecture at this time but there is some 'folk lore' regarding solar cycles that may give us a clue.

The first 'clue' is that the odd numbered cycles are always higher than the previous even numbered cycle. The second is that the shorter and the steeper the rise from sunspot minimum to maximum, the higher the peak.

It's still a bit too early to compare the rise of cycle-23 with other cycles but the indications are looking favourable for a high maximum. On the other cycles but the indications are looking favourable for a high maximum.

During October the maximum was reached. On October 2 the main period of activity occurred on October 12-19. During these days of openings were recorded in a 17-day period. According to your reports Sp-E contacts during October were reported with stations located between the UK and Iceland (CN, CT, EH, EH6, EH8, ES, F, I, IS, JT, OK, SP, SS, YU, 9A and 9H. As you can see these countries are located predominantly to the south and south-east of the UK.

Six minutes later the station of K1OT was heard calling CQ, signals being very weak around 53 with much fading, but lasting for over two minutes. Unfortunately he wasn't able to copy the complete K10MXX callsign and no contact was made.

The propagation mode was probably some form of E-layer backscatter as K10MXX was beaming towards South America (240°) with his 4 x 9-element Yagi array. On switching to his smaller (I) 4 x 4-element Yagi system directed to northern America all signals completely disappeared.

During October the maximum usable frequency (m.u.f.) reached 100MHz on at least four occasions but didn't quite make it up to the 144MHz band in the UK. However, there was a Sp-E opening on this band between Switzerland (HB9) and Italy (I) to Portugal (CT) and Spain (EA) on December 13.

The opening was a very rare event as it is normally expected that all traces of Sp-E propagation on the 144MHz band would have disappeared by early August. Certainly I have never heard an opening in Europe so late in the year.

The first reported contact took place at 1342UTC between 14JED (JS54) and CT6D (IM) with a TS-790E transceiver and 4 x 10-element DJ3BV Yagis reported working CT1DNF (IN50), CT2GK (IN59) and EB1RFF (IN52). In Switzerland Chris HB1RFF (JN37) was surprised to hear EB4EUB Peak 59 but couldn't attract his attention.

Recently I reported that a panel of solar experts has made a prediction that solar cycle-23 (the new cycle which we are just entering) should be a large cycle. What they are predicting is that the solar flux (and consequent sunspot numbers) should be very high around the peak of the cycle.
the Brazilian station PY5CC but no contact was made. By the way, all this took place on the day that the unusual Sp-E opening also took place on the 144MHz band.

I've only mentioned the UK openings but of course there were other events within the continent and t.e.p. events were also witnessed to the Europe-Africa path. All around the world similar paths were opening up such as Australia to Japan and the Caribbean to South America. And it was all on the 50MHz band. So, here's very a small taster of what was happening in other areas of the globe. On October 1 the station of WP4D (Puerto Rico) was heard by LU1OMA (Argentina) on 144.200MHz.

The 50MHz station of VY4DYJ and VY5MM (Venezuela) on October 2 was expected to be active very early in the morning and support the event? And if you have any news, views, comments or photographs please forward them to reach me no later than Sunday December 25.

My address is Yew Tree Cottage, Lower Maesgau, Herefordshire HR2 8HP. You can also contact me via Packet radio @ GB7MAD, the UK DX Cluster @ GB7DXC or E-mail via davebu@mdIhrtagw.ht.co.uk

Practical Wireless, January 1998 69

End
As you might expect, the v.h.f. and u.h.f. bands in the USA are bigger than those in Europe! So, Americans don't normally have to look far for a frequency to chat on. In most of America, a similar situation exists in towns, where there are plenty of repeaters.

Outside towns you may have to search for contacts. There are exceptions, but check locally if you are visiting with a hand-held and wish to make contacts.

**Band Allocation**

Look at Fig. 1a to see the US allocations on the v.h.f. and u.h.f. bands. The six lowest frequency bands are in diagram form, and the higher bands are listed in the table, Fig. 1b.

It's interesting to note that the only bands where there are statutory mode restrictions are 50 and 144MHz. The bottom 100kHz of each band is reserved for Morse only, and the rest may be used for any mode. The power limit is 1500W p.e.p., with a lower restriction onNovice Licensees.

You will see from the diagram that all licence classes except Novice are allowed on all v.h.f./u.h.f. bands, which (I think) creates rather a strange situation. Anyone not concerned with h.f. working only needs a Technician licence (which is not a very high technical standard).

In fact, significant parts of the syllabus for the higher classes (General, Advanced and Extra) contain material which is very relevant to a v.h.f. or u.h.f. operator. But there is no incentive for Technicians to try for a higher licence, unless they become interested in the h.f. bands.

Let's visit the bands in ascending order. I'll start with 50MHz which a useful 4MHz wide instead of 2MHz. This is an exclusive allocation in North America.

Although TV is still broadcast on v.h.f., Channel 1 was never used, so 50MHz is a band of long standing. There's room for all modes, with repeaters, beacons and Packet, as well as the usual s.s.b. and c.w.

A fascinating aspect of 50MHz, which it shares with the 28MHz band to some extent, is that it exhibits characteristics of both h.f. and v.h.f. Many types of propagation can be experienced, sometimes in combination.

Amateurs in Europe can look forward to many transatlantic contacts on 50MHz as we move into the new sunspot cycle. This should be a good opportunity for Class B licensees, and their equivalents elsewhere, to start preparing equipment and antennas, and start making 'ham' radio friends abroad!

The 50MHz band is a favourite with US amateurs chasing the v.h.f./u.h.f. Century Club award (VUCC), which is run by the US national society, the Amateur Radio Relay League (ARRL). This calls for a certain number of contacts with different four-digit locator squares (or 'grids' as they are usually called in the USA).

On the 50 and 144MHz bands, 100 grids are required. Since there are over 300 American grids, this may not seem too difficult. However, remember the size of the USA, some 5000km wide, and the fact that many of the grids have no amateurs living in them whatsoever. Earning this award is not as easy as it seems!

**Double Sized Band**

The 70MHz band is a British invention, and does not exist in North America. So, let's get straight on to 144MHz and what a joy it is! With a bandwidth of 4MHz, there's room for lots of repeaters, Packet, f.m. and s.s.b.

Just imagine how much difference another 2MHz of bandwidth would make in Europe. There are still so many bottle-necks in large US cities, but it's usually no problem to find a frequency.

About half of the 144MHz band is allocated to repeaters, in three separate sections. The offset between input and output frequencies is usually 600kHz, as elsewhere, but the output may be higher or lower than the input frequency. This depends on which part of the band is being used, and the proximity of other repeaters.

The system was originally set up regionally, so spacing between channels varies from state to state. Most areas started using 30kHz, but this has in some cases been reduced to 15 or 20kHz.

Because there are many repeaters, amateurs will generally check before operating in a new part of the USA. This can be done by consulting the ARRL's Repeater Directory or visiting one of the Web sites showing repeater locations and frequencies.

For the USA repeater listings, check www.arrl.org/repdir. For Canada, www.rac.ca/repeater.htm These would be good places to gather information before operating on the v.h.f. or u.h.f. with a Reciprocal Licence.

In the UK, you are accustomed to tight control of repeaters and their channel assignments. In the USA, any licensee (except a Novice) may

---

**Fig. 1a:** The American v.h.f. and u.h.f. band allocations.

**Fig. 1b:** Table of frequency bands and their allocations.
set up a repeater without formality. As a result of this lack of official control, most cities have dozens of repeaters, with wide coverage. Many are available without tone access, and the use of a tone-burst to open a repeater has never been required.

There are a few repeaters which are 'closed', that is, they are only available to certain individuals or club members. Some allow 'phone-patch', where access to the telephone system is available. My advice is to consult the locals before trying to use them!

Since there is no official control, any bizarre combination of frequencies could theoretically be used. This doesn't happen, because regional co-ordinators oversee the usage of frequencies.

In a dispute, a 'co-ordinated' repeater will be given legal preference over one which is 'non-co-ordinated'. Practically speaking, amateurs normally conform to the rules, as they do with the voluntary-band plans.

Bands Across The Sea

There are a couple of bands which are only available in Region 2 (North and South America). These are at 222MHz (one-and-a-quarter metres) and 902MHz (33cm).

Unfortunately, occupancy on 222 and 902MHz is rather low, and these parts of the spectrum must be top of the list for commercial concerns looking for more space. The 222MHz band used to be 5MHz wide, but the US government reallocated 2MHz of this to other users. The under utilisation of 222MHz meant that amateurs couldn't readily argue they needed a large band.

The usage of 222MHz is comparable to the 144MHz band. There are allocations in the band plan for c.w., weak signals, s.s.b. and f.m. including repeaters.

The Packet system uses the band both for end-to-end access, and also for network interconnection. On 902MHz, the band is shared with other services, and there are geographical prohibitions which discourage widespread use.

Let's now consider the 420MHz (7cm) band, which is quite popular, as it is in the UK. It's shared with government and other services, and there are restrictions on certain sections in some parts of the country (sounds familiar!)

Given that the natural reaction of new Technician licensees is to buy a hand-held, perhaps for 144 and 420MHz, there are usually several repeater conversations to be found at any time. There is amateur television on 420MHz, with many areas having cross-band repeaters, using 1240MHz (or sometimes 902MHz) for the other channel.

As you will see, most of the u.h.f. bands are similar to those in Europe. However, I would say that 420MHz is the highest frequency band at which you might normally expect to get a reply to a weekend CQ in most parts of the USA. Above 420MHz, activity is low, and experimenters have lots of room to play. There are pockets of activity abandoned by amateurs. Some are in radio frequency prime locations just waiting to be properly utilised, such as the portion of 222MHz already lost.

Added to this, the US government (among others) has a policy of auctioning parts of the radio spectrum to the highest bidder. Naturally, commercial concerns have plenty of money to further their cause, and they bid against each other for the most useful frequencies. These supplements to tax revenue are well-liked by the administration, after all, they are virtually getting something for nothing! American amateurs are learning to become vigilant, although panic is not appropriate at the moment.

A recent scare about the Low-capacity, Low-Earth Orbit satellites (Little LEGs) seems to have been averted, but you can see why the ARRL is concerned, when you learn that the satellites already use 137-138MHz and 148-149.9MHz, plus some space in the 400MHz band. Paradoxically, European amateurs may be in a better position for a while. Because the continent is divided between many nations, there is less likelihood of a takeover of our frequencies by commercial entities.

Organisations such as satellite operators are usually interested in covering large land areas, and are discouraged by having to negotiate with many governments. Still, many organisations would be happy with bits and pieces of amateur bands in different countries, so there is no room for complacency. The ARRL is on constant watch for hostile moves, and European societies would be well advised to emulate this.

Moonbounce Activity

One area where activity is increasing is moonbounce. American amateurs are becoming much more interested in making contacts by bouncing signals off the moon.

Often called Earth-Moon-Earth (e.m.e.), moonbounce would seem to present insuperable difficulties. After all, the round-trip distance is three-quarters of a million km, which is a roundabout way of making a contact at perhaps 8000km!

However, technology is advancing to the state where components can be fairly easily obtained, and a skilled amateur can make up an e.m.e. station at reasonable cost.

The most popular bands for moonbounce activity in the USA are 144 and 420MHz. On these bands, the path loss, representing the amount of attenuation a signal suffers on its long trip, is going to be at least 2500dB. This sounds daunting, but it can be overcome.

As you would expect, high effective radiated power (e.r.p.) must be used. This dictates the need for an amplifier of several hundred watts plus a multi-element beam.

A major advantage of e.m.e. work is that antenna height has little effect on results. You have enough room to clear the ground, and preferably the surrounding buildings when the moon is low in the sky.

It's possible to achieve good results from a suburban location which is important to radio amateurs everywhere, not just in the USA. Since antennas are quite low, they are easier to put up and work. Check Fig. 2 where Jay KOGU is standing on the boom of his e.m.e. array.

Of course, the antenna has to be rotated so two directions (elevation and azimuth) must be set as well as being able to scan the horizon in the traditional way.

The calculations needed to track the moon have been incorporated into several computer programs, and some operators couple their two rotators to the computer output. Most make adjustments to elevation manually every ten minutes or so, which is quite adequate.

There is a surprising amount of e.m.e. activity in contests. When I talked to Bill KORZ here in Colorado, he told me he had worked 57 moonbounce stations on 420MHz in one weekend. Most of these were Europeans, who have historically been more active in e.m.e. But Americans are clearly planning to catch up!

There is also interest in using 10GHz, which has extra challenges as far as path loss is concerned, but where dish antennas have enormous gain and can be relatively small.

My thanks go to Doug Allen WOAH, Jay Keeterson KOGU and Bill McCaa KORZ for their help with this "Scene USA". That's all for now so, 73, 'Happy Christmas and New Year' and keep writing to me Ed Taylor NOED, PO Box 261304, Denver, Colorado 80226, USA or E-mail at EdTaylor@comsureve.com The deadline for April is the middle of January.

END
Due to the fast turn around of popular secondhand items, readers should check on availability of advertised stock. In other words—if you spot something you fancy—don’t delay or you could miss it!

**YOUR GUIDE TO SECOND-HAND EQUIPMENT**

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**PLEASE MENTION TRADERS’ TABLE WHEN ENQUIRING ABOUT ANY ITEMS ON THESE PAGES!**
In his bi-monthly column Roger Cooke G3LDI rounds up the latest in data mode news.

**Good news** - DATACOM wins National Club Section of PW magazine competition! The British Amateur Teledata Group’s (BARTG) magazine DATACOM has won the Practical Wireless (National Club Section) Club Spotlight Magazine Competition. DATACOM scored 43 points out of a possible 50 making it the highest scoring national society magazine.

The DATACOM magazine is published four times a year and contains information and articles of interest to all amateur data communication enthusiasts. The

**Popular BBCs**

The ubiquitous BBC B is really still a very popular computer for data comms. I have had several letters in response to the publicity given in previous columns, and it would seem to be a good idea to attend car boot sales as a possible source of these machines.

I was recently told that three BBC B machines, with monitors and disk drives all sold for £1, an unbelievable bargain! I don't think it possible to better this as a starting price introduction into Data, but if you can better it, let me know!

The amateur I have chosen to write about in conjunction with the BBC B is Stan Casperd G3XON. Stan is shown in Fig. 2, sitting on a memorial seat to G2NM. Yet another

**Beacon Frequency QRM**

Packet has been on h.f. for years now, trying to live with RTTY, Amtor, and all data modes in a very small segment. There has long existed a need for an adequate band-plan to take into account all the data modes and bring in some form of regulation.

Relying on self-regulation is not enough, and this is manifest in the amount of QRM to be found on the beacon frequency of 14.100MHz. Stations are operating within 1kHz of this frequency and sometimes it is totally impossible to hear any beacons at all. I don't think ignorance can be used as an excuse, as it's a globally accepted beacon frequency and has been for some years.

Separating the various data modes would also be a good idea. Allowing Packet to mix it with RTTY and Amtor with Pactor is making tempers shorter and not allowing the beacons to be used for propagation studies, which was their original intention. However, it would be a brave soul who tried to rectify the situation now, after so many years of a free-for-all!

That's all for this time so, 'Happy Packeting' from me Roger G3LDI. Keep your news coming to me QTHR, Tel: (01508) 570278 or via E-mail to mtaylor@uk.mdis.com.

Fig. 1.

BARTG held its annual rally at Sandown Park in September. This year, as a new feature, Datastream 97 was introduced.

Datastream 97 was a series of lectures which were all very well attended. They included Data Comms for the Beginner by Steve Jelly G0WSJ, Advanced Data Comms by Chris Lorek G4HCL and Satellite Data Comms by Richard Limebear G3WVL.

There was also a question and answer session with BARTG, and the DCC represented on the panel, during which some very interesting topics were discussed. If you were there, look at Fig. 1 and you may be able to pick yourself out of the audience. This was taken at one of the lectures.

For more information about BARTG please contact Bill McGill G0DWB who is QTHR. He may also be contacted at G0DWB@GB7WRC, by E-mail at Members@bartg.demon.co.uk or by visiting the BARTG web site at http://www.bartg.demon.co.uk

Fig. 2.

'Beeb Babe' is Bill Douglas G0DWW. Bill also says there has been a lot of interest shown in the BBC B, and he uses a variety of programs, including TNCV304, TNC3M4, PK232, Kangaterm and one called Enigma.

Bill also uses his BBC for music, graphics and other data modes and is acquiring a Versaterm terminal unit. He has added a blue background to relieve eye-strain.

Bill says that there is often a BBC B available from Chris Richardson, of 8-Bit Software, at a reasonable sum. Bill is pictured in Fig. 3, and his station is shown in Fig. 4. Both Stan and Bill can be reached at GB7GFD.#42.GBR.EU.

Another of the original Beeb Babes has re-surfaced! It's David GI3MMG, of Bangor and his full hierarchical address is GI3MMG @ GB7TEG.#63.GBR.EU. David runs AMRAC 3.03M Software on his BBC B.

Fig. 3.

Fig. 4.
This month Peter Shore has more from the world of broadcasting, with reports of lots of station schedules to get you listening.

I find that there is little better in life than settling down on a long, cold winter evening and scouring the bands to see what’s on the air. Particular for Europeans is the prospect of hearing stations on medium wave that during the summer become far less easy to hear.

Many frequency engineers take advantage of the better night-time propagation that winter provides, and you’ll find that there are more frequencies to choose from and more transmissions to catch.

Voice Of Russia

Take the Voice of Russia, for example. It is currently using no fewer than four medium wave frequencies during the evening period, with three of those on simultaneously during a peak one hour block mid-evening.

The complete Voice of Russia English schedule for Europe with English at: 0400-0600 on 693kHz medium wave (m.w.); 0630-0700 on 5.84 and 6.165MHz; 0600-1000 on 5.84 and 6.165MHz; 0515 on 7.465, 9.435 and 6.165MHz.

Station Activity

Back to the short wave bands now, and Kol Israel, the Voice of Israel, is on the air with English at: 0900-0915 on 7.465, 9.435 and 17.545MHz, 1130-1135 on 15.64 and 15.65MHz, 1500-1530 on 9.365 and 12.081MHz; 1645-1655 on 9.435 and 11.805MHz and 2000-2025 on 7.465, 9.365, 9.435 and 15.64MHz.

Current recommendations from Nigel Holmes, the Frequency Manager at Radio Australia, for listeners in Europe to the Melbourne station’s English service are now down to just two frequencies. Try 1330-1700UTC on 11.66MHz and from 2130-2300UTC on 11.65MHz. Both these transmissions are directed towards Asia and are from the station’s 100kW short wave transmitter.

The Voice of Turkey’s TRT service is on the air with English at: 0400-0500 on 7.30, 9.685 and 17.705MHz; 1330-1430 on 9.63 and 15.29MHz; 1930-2030 on 9.56 and 17.545 MHz; 1130-1135 on 12.085MHz; 1500-1530 on 9.72 and 12.085MHz; 1500-1530 on 9.72 and 12.085MHz. Both these transmissions are directed towards Asia and are from the station’s 100kW short wave transmitter.

Awaiting Result

Swiss Radio International (SRI) is currently awaiting the result of a government-sponsored inquiry into its effectiveness. The Berna Ministry of Communications has asked a research consultancy to investigate whether SRI broadcasts are reaching the right audience by the right means. The report is expected to be published in early 1998, and is likely to affect the station’s transmission strategy from the start of the summer period.

The SRI station can be heard from the world of broadcasting via the short and medium wave bands. Until the same place in PW next month, enjoy your listening and have a Merry Christmas and Happy New Year!
Advertisements from traders or for equipment that is illegal to possess, and the advertisers' names and addresses are not located in the UK, will not be accepted. No responsibility will be taken for errors.

You should state clearly in your advertisement if the equipment offered 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.

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19 Set MULTI p.s.a., control box, headband, cables, vehicle mounting pack, fully working, no mods. £25. Canford remote control unit for 19 Set. £25. Edystone 35NX, original p.s.a. and e.s.o desk in sets. £35. On offer 01327 420416.

Altimeters

Altimeter hand-held 320 timex (144MHz/360MHz) TXR/80 wide-band scanner, case, etc. m/c, mic, mount, ear slot, £10. Collin MINI valve, remote, new, £10. DMK model 150-XH in o/w & x.m., l.a., x.m., m/c, £40. On offer 01138 475757.

Altimeter DMR770 no modifications offered for purchase. Please write clearly in BLOCK CAPITALS up to a maximum of 41 lines. £400. VHF (01138) 823338.


McDonald, £15. Micheil, £15. Most are sailed working order. Tel: 01 (332) 706085.

Octosources Collins model 3518. Solution CT41 type 13A 105/30 all valve, in superb condition. Tel: 01966 823338.

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Steve NO1, Yorks. Tel: 01709 117659.

SOLD

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B&B

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Now’s your chance to send in a photograph of your equipment (a good idea if it’s really unusual) in exchange for your name and a postal address. Please note that all photos are published at the editor’s discretion.

When sending in your ad, please describe your equipment briefly, i.e. what you have and what it is capable of doing. Also mention your name, address and phone number. Please use the order form provided.

Advertisement Bristol, 0191 2754 6320.

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CASH FOR VALVES. ECC32 £10. ECC33/35 £6. ECC83/EF86 £3.50. KT66 £40. KT88 £65. EL34 £20. EL37 £18. PX4 £70. PX25 £130. GZ34 £8. GZ32 £8. DA100 £150. EL34, EL37, CV4004, ECC83. Valves must be Mullard/GEC, West European to achieve this price. Ask for free wanted list. Prompt and courteous service. Visitors please phone for an appointment (we are a very busy Export Warehouse).

VALVES:- OVER 50000 STOCKED Ham, Vintage, Military, Audio. SAE for FREE list to: Wilson Valves, (Jim Fish G4MH), 28 Banks Ave., Golcor, Huddersfield, West Yorks HD7 4LZ. Tel: 01484 654650. Fax: 01484 655699. E-mail: Wilsonvalves@surflink.co.uk Visa etc. Fast & personal service.

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The prepaid rate for classified advertisements is 42 pence per word (minimum 12 words), box number 70p extra. Semi-display setting £13.90 per single column centimetre (minimum 3cm). Please add 17.5% VAT to the total. All cheques, postal orders, etc., to be made payable to PW Publishing Ltd. Advertisements, together with remittance, should be sent to the Classified Advertisement Dept., Practical Wireless, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW. Tel: (01202) 559920, Fax: (01202) 559950

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**MARTIN LYNCH & Son**

The Amateur Radio Exchange Centre

**NEWSFLASH**

Watch out for our super 4-day Christmas sale in the shop - 27th, 29th, 30th & 31st December 1997

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Practical Wireless, January 1998
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- £32 (Rest of World Airsaver)
- £37 (Rest of World Airmail)

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The *UK Scanning Directory* would normally sell for £18.50 plus £1 P&P. However, if you order this month we’ll pay the postage for you! (*UK orders only, Overseas readers please add £2 to cover the P&P cost.)

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New Series!
* Two pages every other month of electronics related hints and tips in our Electronics in Action series!

Reviewed!
* Roger Cooke G3LDf reviews the Kachina 505DSP Computer Controlled HF Transceiver.

Battery-less Calculators!
* Ray Fautley G3ASG asks the question 'What About Slide Rules'?

Build!
* Richard Marris G2BZQ shares his design for a ferrite frame loop antenna for 73 kHz working.

Plus all your regular favourites and much more!

Coming up in the January issue - On sale 23rd December

What About Standing Wave Ratio?
by Joe Carr K4IVP.

Alan Roberts writes about a little known radio service whose signals travel far - Radio Neige.

A Testing Year
by John Wilson G3PCY.

Chris Lorek reviews the Standard AX-700 Base Scanner.

Wage War On Whistles - Peter Rycraft looks at an useful add-on unit to enhance reception of c.w. signals.

Indoor Ionosphere - the late Fred Judd G2BCX explains some of his experiments on ionospheric propagation.
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- AM Aircraft/Public Safety Receive
- CTCSS Encode/Decode
- DCS Encode/Decode
- CTCSS/DCS Tone Search
- Dual Watch
- SmartSearch™
- Auto Range Transpond System™ (ARTS™)
- Priority Channel Alarm
- ADMS-1D Windows™ Programmable
- 1 Watt External Power Supply
- 80 Minute Rapid Charger
- Flexible Antenna, Belt Clip, Hand Strap
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