PRACTICAL WIRELESS

PW

THE RADIO MAGAZINE

Amateur Radio Repeaters

The Story Behind Your QSO - Featuring Emley Moor TV Tower - Home of Amateur TV Repeater GB3ET

Build

A NiCad Cell Tester

A Universal Repeater Tone Burst

Antenna Constructional

A Magnetic Loop For 50MHz

An Easy-Build 144MHz 'Home-Base' Antenna

Reviews

RN Electronics 28 to 50MHz Transverter

Spectrum Communications 50MHz Power Amplifier Kit

Sky-High ATV - GB3ET At Home In The IBA Emley Moor Tower

FEBRUARY 1991
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Newsdesk '91 - 'Spot The Difference' Competition - 'Packet Panorama' - 'Reflections' - 'Satellite Scene' - 'Backscatter' - Book Reviews & Much More!

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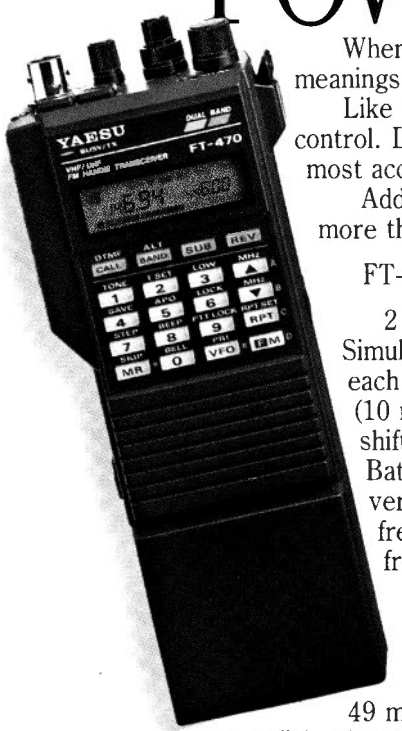

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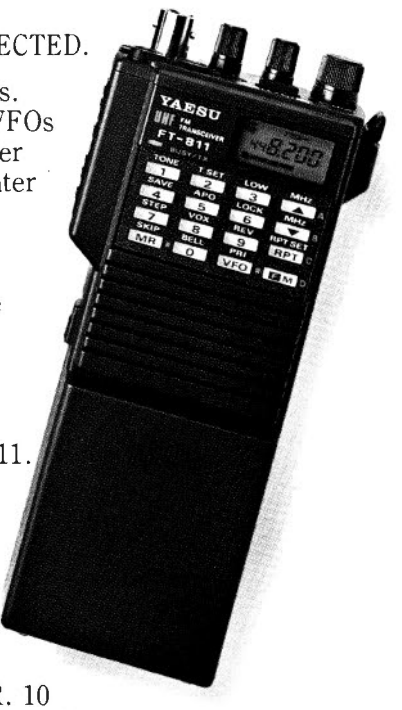

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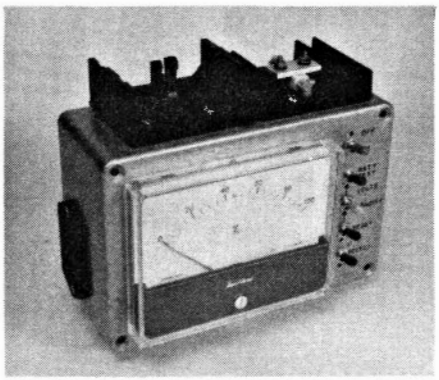

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Front Cover photograph of Emley Moor courtesy of the IBA (ITC from January 1991).

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For more detailed information on the IC-970E Base Station or any other Icom radio equipment contact your local authorised dealer or call Icom (UK) Ltd.

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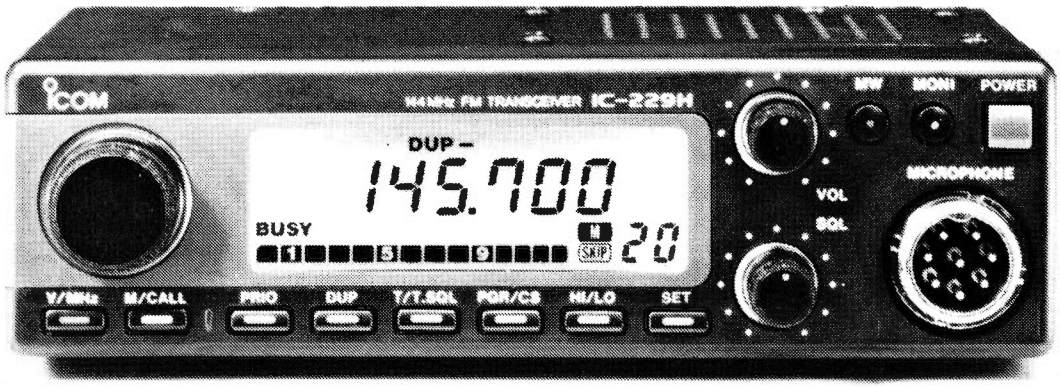
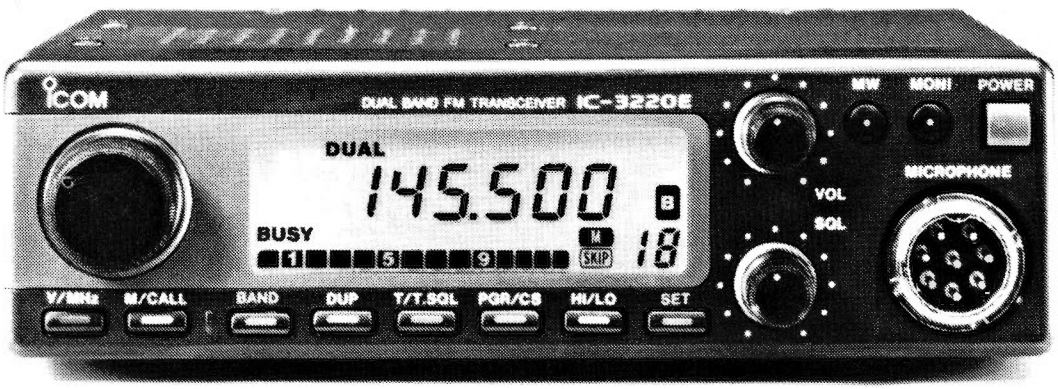


IC-229E/449E
2M, FM Mobiles



IC-3220E
Dual-Band
Mobile

Icom have built a range of ultra compact FM mobile transceivers. Similar in style, easy to operate and perfect for driving safety. Advanced features include a variety of tuning steps, memories, scan functions, adjustable R.F. power, optional pager and tone squelch units for selective calling. All these models include the HM-59 hand microphone with up/down and 1750Hz tone call for repeater operation. The unique simple operation enables each function to be operated with one switch. Illuminated switches and controls give complete night time operation.

IC-229E VHF Mobile. This VHF 25 watt transceiver measure just 140(w) x 40(h) x 105(d) mm. No need to worry about installation, its small enough to fit most vehicles. Also available the IC-229H 50 watt version where extra high power is required.

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Icom (UK) Ltd.
Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 741741 24 Hour. Fax: 0227 360155

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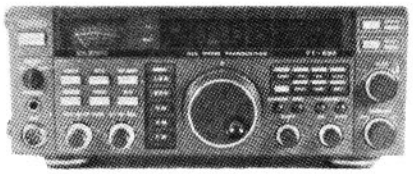

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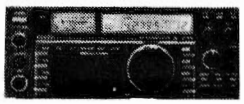

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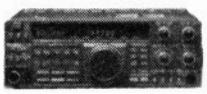

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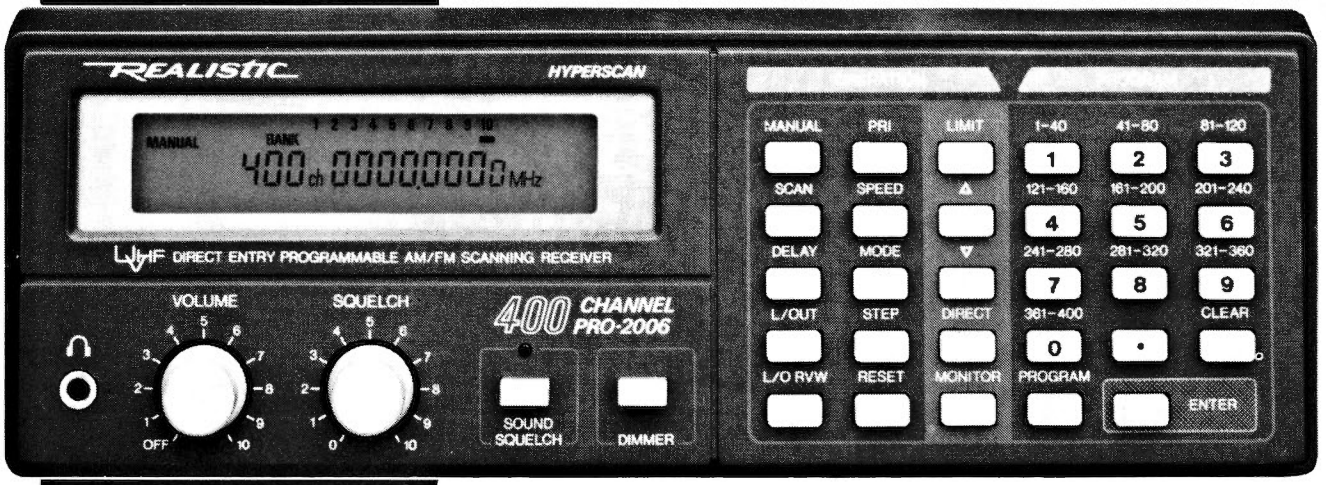

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20-9145

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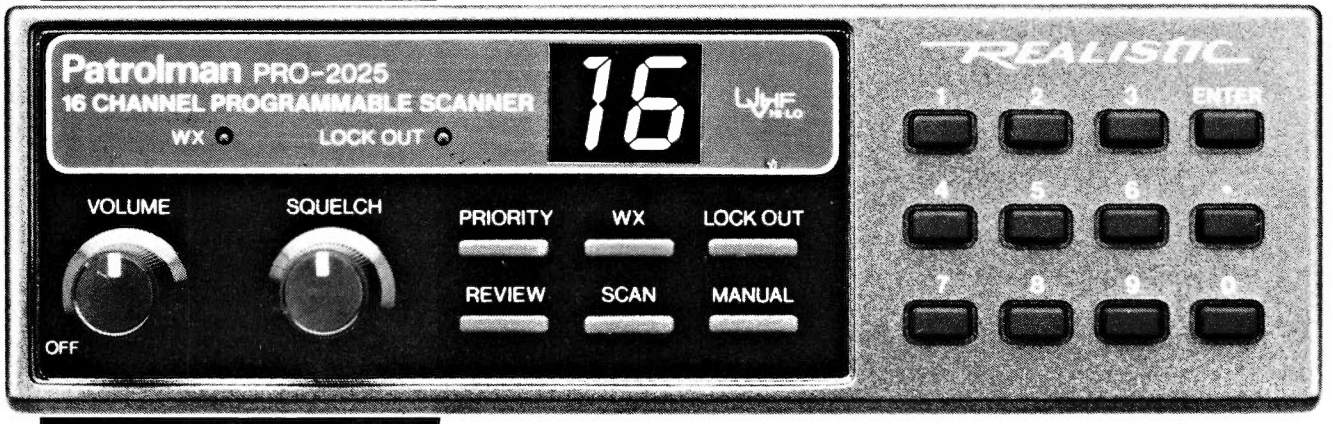
Covers: 66-88, 136-174 MHz And 406-512 MHz



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1991

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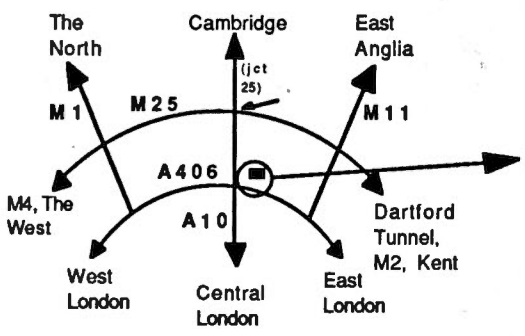

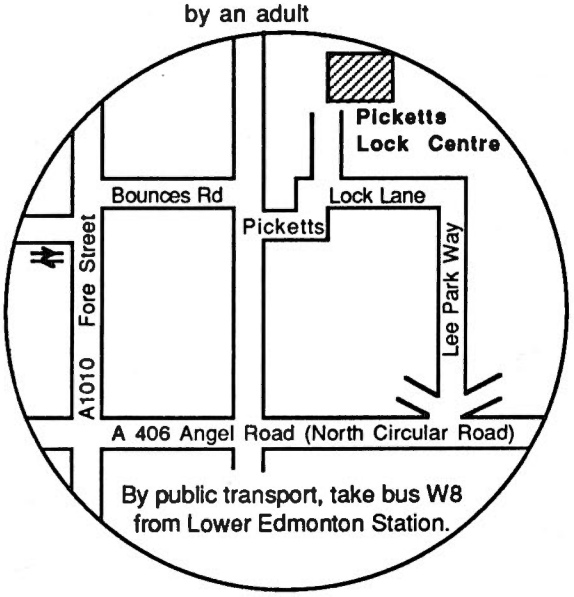

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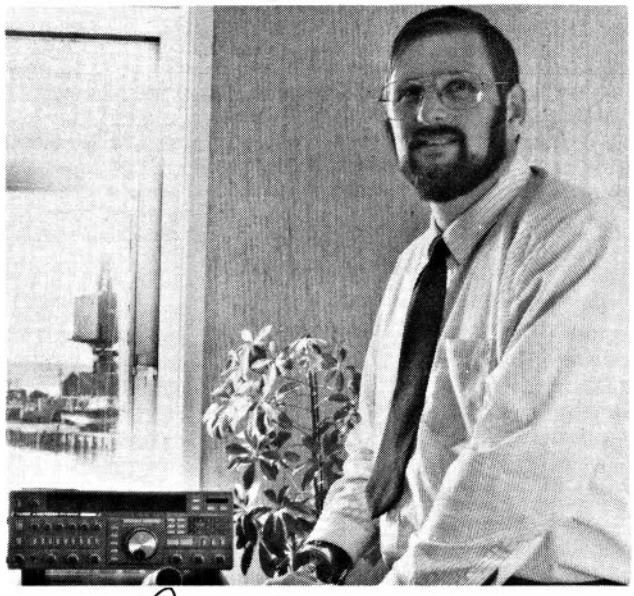
Presented in conjunction with Southgate Amateur Radio Club

Further details from The Secretary, 126 Mount Pleasant Lane, Bricket Wood, Herts, AL2 3XD. Tel 0923 678770

Keylines



Rob Mannion G3XFD

The editorial staff at *PW Publishing* are mostly experienced radio amateurs. We've all been licenced for some time and when we added our years as transmitting amateurs together - we were surprised to see that the total reached over 60 years!

In a way that figure is rather appropriate, as *PW* is approaching its 'diamond jubilee'. So, you'll realise that we (and our readers) regard that *PW* - we've been referred to as the 'traditional radio press' - reflects the proven way forward in our hobby in a very positive way.

As many of you will know, *PW* can trace its **DIRECT** and true ancestry back to 1922. Since appearing under its present name from 1932, the magazine has 'spawned' well known journals such as *Practical Television* (now *Television*), *Practical Electronics* and *Everyday Electronics*. What greater compliment could have been paid to *Practical Wireless*?

Back in 'the old days' - and I'm talking about 25 years ago! - we usually met on 1.8MHz 'top band' nets on a.m. transmitters built from *PW* designs. Although I'm not going to become complacent - I've always considered that this magazine rewarded loyal readers by providing good reading, interesting projects and ideas.

Finally, as the *PW* office is manned by a permanent staff - readers can 'phone us (and many of you take that opportunity!) and even come into the office. We also enjoying meeting readers at the many rallies and events during the year. So, don't forget that you count for a great deal as far as we are concerned.

This magazine is run by radio amateurs for radio amateurs, and the many aspects of amateur radio. We're not a one-man band! As the full-time editor, I'm only one member of the (full-time) team. Teamwork is the only way to produce a good, well-balanced magazine. Readers are an essential part of that team, and we never lose sight of the fact that many readers also become part of our widespread band of authors too!

Join The Club

Many readers show what they think of *PW* by becoming postal subscribers. Our subscription list is steadily growing and we're particularly pleased to see how many subscribers are based abroad.

Our new '***PW* Subscription Club**' reflects (there's that word again!) how much we appreciate the support of readers in this way. There'll be special offers and many other advantages coming the way of readers who decide to 'join the club'. Not only are they assured of being able to get their magazine, they'll also receive it earlier. So, don't delay - take a look at our special offer **NOW**, and join the ***PW* Subscription Club** today!

Young Designers Competion

The Young Electronic Designers Award scheme has been supported - since it started a few years back - with the full backing of Texas Instruments Ltd. Now, I'm very pleased to report - they have been joined by Mercury Communications to take the initiative boldly forward with a massive annual £100 000 funding package.

Many of our readers are involved in education in some way, whether it be schools, colleges or universities. The YEDA scheme aims to encourage electronic design innovation from young people in full-time education. The initiative has the full support from *PW* and I can only say to anyone interested - student or tutor - that they should be fully aware of the potential provided by the scheme.

All schools, colleges and universities will be receiving an information pack on YEDA and - hopefully - many more entrants will be accepting the challenge for 1991.

Along with our sister publication *Short Wave Magazine*, *PW* was invited - as long established members of the 'traditional radio press' - to their recent 'media' conference in London. It was at this conference that YEDA launched its newly refunded search for innovation by young electronic designers from anywhere in the UK and full details can be found in this month's 'Newsdesk '91'.

I'm pleased to say that - bearing in mind that some schools either can't or won't support such initiatives for various reasons - that YEDA will also consider applications from un-supported entrants on an individual basis. So, don't despair if you have an idea that could win an award - enter for the YEDA scheme, you never know, **your** school or college could relent. Entering the competition could be your way forward to a new career!

On Course For Success

Early autumn can prove a harrowing time for prospective RAE candidates. In years past, literally every large town either had an RAE course running in a local school or college or had one nearby.

Nowadays, with the financial constraints placed on local authorities and the emphasis placed on 'stand alone' non-subsidised subjects, the potential radio amateur often has problems. In the last few months I've received several requests for help from candidates who've found their courses cancelled. However, I'm pleased to say that suitable courses were found for most of them.

Bearing in mind the considerable contraction of the 'public service' element of further education, it's good to see a remarkable initiative from a large company (and a foreign one at that!) which plans to start an RAE course in January (details in 'Newsdesk '91', January issue).

Sony Broadcast Ltd., an associated division of the well-known Japanese company, are planning to run a course, the tutors being drawn from their Hampshire headquarters in Basingstoke. This initiative will hopefully encourage other manufacturers in the electronic and associated industries to follow suit.

Texas Instruments, Mercury Communications and Sony Broadcast have ulterior motives of course! They know, that there is a good chance that people drawn into electronics - whether it be via amateur radio or by trying to win an award as an electronic designer - could either end up as their customers or even first-class employees of the future!

All efforts to this end from industry must be congratulated, along with the continuing efforts of others in further education. Our classified advertisement section carries information on various commercial and privately run correspondence courses. While on the subject, I must mention the unique video RAE course currently on offer by Peter Thornhill G3AKQ.

Peter's course - he's had many years of RAE tutoring experience - is a marvellous idea. Although he's not a professional 'video' man, Peter wrote, filmed, produced and edited the course himself. I've watched the result myself, and with 'one-man' efforts like G3AKQ's - amateur radio will survive and thrive!

73 DE Rob Mannion G3XFD

Receiving You...

Send your letters to the Editorial Offices in Poole, the address is on our contents page. Writer of the Star Letter each month will receive a voucher worth £10 to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.
Letters must be original, and not duplicated to any other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.

Dear Sir

Please have you any information and advice on Custom & Excise duty of the import of radio parts to the UK?

A friend in the USA sent me an Eimac 8873 tube for my SB230 linear amplifier. He marked it as a gift of no commercial value but the customs charged £54 duty. I don't know how they arrived at that amount.

I am writing to tell you this, and warn other *PW* readers to be very careful when radio parts are listed on custom labels.

Francis Rose G2DRT
High Wycombe
Buckinghamshire

Editor's reply: 'Personal Imports' from abroad have long been a problem. I've even suffered myself when special, long body-length, 'T-shirt' type vests (not available in the UK) have been sent by a relative from the USA as gifts. I wear the vests to alleviate discomfort caused by my artificial arm 'harness'. However, this didn't stop the Post Office opening the parcel **(which they charge the addressee for)** and the Customs & Excise charging me more duty than the parcel was worth! And, to make matters worse, the Post Office give you a 'take or leave it service' when they seemingly insist on 'Cash On Delivery'. There appears to be no appeal!

We'll look into this problem and hopefully will be able to publish some guidelines after we've consulted the 'experts'. Fortunately - where EEC countries are involved - it should become easier from 1992. We'd be very interested to hear from other readers who've suffered in this way.

Dear Sir

Recently I built the 'Marland' s.s.b. transmitter designed by G3RJV and published in *PW* between July, August and September. I have had a vast amount of fun operating it at about 10/15W into my 'doublet' antenna and getting very complimentary reports.

Among the stations worked are: EA6/G4VPG, LY2ZO, Y52WB, 9H1ARC, LAPXG, HG4P, N2RM and W9RE; all the QSOs were very good copy for relaxed and casual operation.

I have written to George Dobbs in appreciation of his design, and I'd like to thank *PW* for publishing it and making available the printed circuit boards. Now we need the companion receiver (please don't be frightened of integrated circuits, most of us use them these days!).

Stewart Sims G3WQW
Burton Joyce
Nottingham

Editor's reply: It's very gratifying to receive letters like Stewart's. We were very pleased when readers told us they enjoyed building and operating the 'Marland'. It's been a popular project, and like the 'mini' QRP *PW* 'Peanut' transceiver, it has become a project for many clubs.

George Dobbs has started work on the receiver side of the 'Marland' and we hope to publish it in the autumn or winter of 1991. Incidentally, when I suggested the original project - which eventually became the 'Marland' - to George, I specified that it should be based on 'discrete' devices rather than integrated circuits. I thought this was the best approach, because in the past I've had to abandon projects (on several occasions - to my disgust!) as the manufacturer had discontinued or modified a particular 'chip'! However, *PW* 'listens' to its readers and I would be pleased to hear from anyone waiting for the companion receiver. Come on now - you don't have to be 'discrete' unless you want to be! Sorry for the dreadful 'pun' - but the choice is **yours** and we await your comments!

Dear Sir

Well at last it has happened and it took a lady to tell them! The manners of some people at Radio Rallies are questionable - and I hasten to add - that not all the blame lies with the younger ones.

With quite a serious leg condition, I've been kicked, suffered scraped shins, been prodded with articles and rods, and have rarely, if, ever received a 'pardon or excuse me' from the person involved.

Worst of all perhaps is when we get the people - when the gangway is full - who have just met a long lost 'brother' and stand 'nattering' regardless of others who wish to pass by.

I've been told that I shouldn't go to rallies but you know, age is a great leveller, and it used to be said that 'manners maketh man'.

Thank you Mrs Littlewood!

R Williams
Grantham
Lincolnshire

★★★★★STAR LETTER★★★★★

Dear Sir

I'm a s.w.l. and in my shack I have several short wave receivers, all 'home-brewed'. I've also recently put up an antenna for 3.5MHz in my small garden. So, it was with interest that I read Paul Essery GW3KFE's article - 'Lower Frequencies in Smaller Gardens' in the November issue of *PW*.

However, the article left me with a question after I read the following (and I quote directly): "Secondly it was noted that my house was wired up in accordance with the questionable PME (Protective Multiple Earthing) technique, and whatever I did would allow for this problem".

Having read the article, I am now somewhat worried about the earthing system in my house. Should I, as the writer suggests, unplug my receivers from the mains, when they are not in use? Or, does this only apply to transmitters? My home is wired in accordance with PME, along with the other houses in this area which are all less than nineteen years old.

What is "questionable" about the Protective Multiple Earthing system? I thought it was the latest, and the best!

W. E. Naylor
Parbold
Lancashire

Editor's comment: Mr Naylor has raised a very interesting question. Over the years I've heard many comments about PME, both 'for' and 'against' the system. Bearing in mind that it's the area 'board' which acts as a 'distributor' for the 'wholesaler' so to speak - we've approached the 'Southern Electric' Company (the successors to the Southern Electricity Board) for their comments in an article. We hope to have a definitive answer for you very soon. I've no doubt that the article will raise a number of other questions, comments and opinions!

Dear Sir

There is a bewildering assortment of equipment on the amateur radio market. Many advertisements seem to assume that the reader is familiar with the type numbers and give very little detail.

I am sure that many readers of *PW* would appreciate a listing of the more popular models together with a potted specification. Will you consider this?

K. S. Seddon
Stockport
Cheshire

Editor's reply: Mr Seddon has come up with an excellent idea. I can remember the edition of *Guide To Amateur Radio*, written by Pat Hawker G3VA and published by the RSGB, carrying a section devoted to this very subject. We'll work on it,

but in the meantime you may like to know that we have a list of equipment and ancillaries published in reviews in *PW* (since 1979) and *Short Wave Magazine* since 1987. From this list - if we've reviewed the equipment you're interested in - we can produce and send you a photocopy for 85p.

Dear Sir

Can you please ensure that subsequent *PW* offers, where a corner 'flash' has to be enclosed, that it is so positioned that it does not deface the technical literature you publish. I do not wish to have paragraphs missing from any article overleaf, and not all your subscribers have photocopiers.

I realise that to have corner 'flashes' over your advertisers' pages would cause some adverse comments from them, but surely a small space could be allotted to, say, the top left corner space of a 'Book Service' page?

I should be pleased to receive your comments as I'm sure you must have received many other complaints from readers

Eric Lambert G3FKI
Harrow
Middlesex

Dear Sir

Please find a way for me to enter your competitions without having to deface my beloved *PW*!

Geoff Lamb G0LAM
Staines
Middlesex

Dear Sir

You are discriminating against your foreign subscribers. My *PW* arrived here on the 7th August and you want the competition entries by 9th August!

John Clarke G8LA
Cauro
France

Editor's reply: G3FKI, G0LAM and G8LA all have valid points. Steve Hunt, our Art Editor and designer, agrees with the suggestion regarding the corner flash on a 'Book Service' page. We'll aim to place 'flashes' there in future! By now, we hope that G8LA will have noticed that we have lengthened the 'closing date' for our competitions to allow for postal delays abroad. I wonder if the service will improve with the Channel Tunnel - or will mail travelling that way have to pay a surcharge? **G3XFD**

PLEASE NOTE THAT FROM NOW ON WE WILL ACCEPT PHOTOCOPIES FOR COMPETITION ENTRIES.

Competition Corner

PRIZES...PRIZES...PRIZES

First prize winner can choose either a one year *PW* subscription or £20 in vouchers for the book service.

The **two runners-up** can choose from either a six month *PW* subscription or £10 in book vouchers.

Circle the 13 differences, fill in the form below and send your entry to PW Publishing Ltd., February 1991 Spot The Difference Competition, Enefco House, The Quay, Poole, Dorset BH15 1PP.
Closing Date 27 February 1991.
The Editor's decision on the winner is final, no correspondence will be entered into.

Name .....

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Services

Queries
We will always try to help readers having difficulties with a *Practical Wireless* project, but please note the following simple rules:
1: We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2: We cannot deal with technical queries over the telephone.
3: All letters asking for advice must be accompanied by a stamped, self-addressed envelope (or envelope plus IRCs for overseas readers).
4: Make sure you describe the query adequately.
5: Only one query per letter please.

Back Numbers & Binders
Limited stocks of many issues of *PW* for the past years are available at £1.65 each including post and packing.
Binders, each holding one volume of *PW*, are available price £4.50 each (£1 P&P for one, £2 for two or more).
Send all orders to the Post Sales Department.

Subscriptions
Subscriptions are available both for the UK and overseas. Please see current issues for the latest prices.

Constructional Projects
Each constructional project is given a rating to guide readers as to its complexity.
Beginner: A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.
Intermediate: A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.
Advanced: A project likely to appeal to an experienced constructor and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on their own.
Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. Kits for many of our recent projects are available from CPL Electronics and FJP KITS, both of who advertise in the magazine.
The printed circuit boards are available, mail order, from the Post Sales Department.

Mail Order
All *PW* services are available Mail Order, either by post or using the 24hr Mail Order Hotline (0202) 665524. Payment should be by cheque (overseas orders must be drawn on a London Clearing Bank), Access, Mastercard or Visa please.

Wireless Line
This is an information service for the radio enthusiast, updated each Friday. Calls cost 44p per minute peak time and 33p per minute off-peak. The number to ring is: (0898) 654632.

Newsdesk '91

Club News

Coventry ARS meet Fridays, 8pm at Baden Powell House, 121 St. Nicholas Street, Radford, Coventry. January 11 and February 1 are Nights on the Air and Morse tuition, January 18 is a Members' Slide/Video show, the 25th is their Annual Dinner and February 8 is a Quiz Night versus Tamworth ARS. Further details from **Neil on Coventry (0203) 523629.**

Bristol ARC meet Thursdays, 7.30pm at St. Aidans Scout HQ, Firtree Lane, St. George, Bristol. More details from **Steve Alder G0HTS on (0272) 583441.**

Thornbury & District ARC meet at the United Reformed Church, Chapel Street, Thornbury, 7.30pm. January 16 is an HF activity/natter night and February 6 sees a Visit from the Radio Investigation Service. Details from **Tom Cromack G0FGI at Rose Cottage, The Naite, Oldbury-on-Severn, Bristol, Avon BS12 1RU.**

Wimbledon & District ARS meet 2nd & last Fridays, 7.30pm in St. Andrews Church Hall, Herbert Rd, London SW19. January 11 is New Year Resolutions and the 25th is R(F) Burns Night (Working GM). **Chris Frost G0KEB, 61 Selbourne Avenue, Tolworth, Surrey KT6 7NR. Tel: 081-397 0427.**

Sutton & Cheam RS have a 3.5MHz AFS Team Contest on January 13, 'Linears' by John Stockley G8MNY on the 17th and a Natter Night in the Downs Bar on February 4. They meet 3rd Thursdays, 7.30pm at Downs Lawn Tennis Club, Holland Avenue, Cheam, Surrey, with Natter Nights on 1st Mondays in the Downs Bar. More details from **John Puttock G0BWV at 53 Alexandra Avenue, Sutton.**

Stourbridge & DARS meet 1st & 3rd Mondays at the Robin Wood's Community Centre, Scotts Road, Stourbridge. Details from **Dennis Body G0HTJ, QTHR.**

Norfolk ARC: Wednesdays, 7.30pm. The Norfolk Dumpling, The Livestock Market, Harford, Norfolk. More information from **Mike Cooke on (0362) 850591.**

Bromsgrove & District ARC meet 2nd Fridays at Avoncroft Museum of Buildings & Arts Centre, Bromsgrove. More details from **Trevor Harper on Bromsgrove 33173.**

Acton, Brentford & Chiswick RC meet 3rd Tuesdays, 7.30pm. Details from **Paul Truitt G4WQO on 071-938 2561.**

Torbay ARS meet Fridays at the ECC Club, Newton Abbott. RAE and CW Classes on January 11, 25 and February 1, 8. January 18 is Construction Cup Competition and February 15 is their AGM. **Walter G3HTX on (0803) 526762.**

Plymouth RC meet Tuesdays, 7.30pm at the Fredrick Centre, Plymouth. RAE classes with Peter G6ZKQ and CW classes with Jack G3GZQ. Also C & G Examination centre. Peter G6ZKQ would like to wish all those who took the RAE in December the best of luck in their new hobby. Details about the club from **Peter G6ZKQ at 21 Elmbank, Buckfastliegh, Devon TQ11 0DN. Tel: (0364) 43433.**

Highest Amateur Station

On Tuesday 20 November 1990, Alan Ingram G1OYM believes he was the first station to operate on 2m from the top of the Canary Wharf Tower in London's Docklands.

Rising some 51 storeys (244m high), being the tallest building in Britain, he had the opportunity of going to the top. Operating a Yaesu FT-23 hand-held with a quarter-wave whip, he put a call out on 145.500 with the QTH details.

Many stations called in, and during the short spell, he was only able to work six stations, the furthest being G6YWT at Fleet in Hampshire. Unfortunately, the combination of construction noise and the extreme cold (it was 6° colder at the top of the Tower, than at ground level), he had to cut short the operation.

QSL cards were sent to each of the stations, as a memento of the first amateur radio operation from the Tower.

Terrabyte Electronics

Computer memory chips are increasingly traded as a 'commodity'. The price advantage this brings only filters down gradually to end users. Now Terrabyte will buy memory at international commodity prices and sell it directly to those users. Memory bought this way will cost as little as half the price currently prevailing at retail. This will be especially good news for computer owners upgrading to take advantage of memory hungry software such as Windows 3.

Further information from:

Peter Lioncourt
31 Laundry Lane
Wytham
Oxon OX2 8QQ
Tel: (0865) 794848

Calling All Radio Enthusiasts

Would-be radio Hams searching for a way to gain their Radio Amateur Licence 'A', can study with leading distance learning college RRC to sharpen their skills before taking the Radio Amateurs' Examination.

Enthusiasts will be aware that the Home Office requires all Radio Amateur Licence applicants to have passed the Radio Amateur's Examination. The RRC City & Guilds programme covers both Parts 1 and 2 of the course and prepares students for the examinations which are held in May and December of each year.

The RRC programme covers the following subjects: Licensing conditions; transmitter interference; operating practices and procedures; electrical theory; solid state devices; radio receivers; transmitters; propagation and aerials and measurement.

Michael Sole, an RRC student, recently completed both stages of the examination gaining a credit in each. Enabling him to obtain the 'B' Licence. Michael, a retired Dental Surgeon from Epsom, Surrey, decided to take up amateur transmitting as a hobby. The course brought back many memories for Michael who joined the Army's Royal Corps of Signals in 1946 as part of his National Service.

Michael is now looking forward to completing the Morse code examination before applying for his 'A' Licence.

For further details, contact:

RRC, Tuition House
27/37 St. George's Road, London, SW19 4DS
Tel: 081-947 2211

Auction

Alton Communication Engineers Ltd. and Communication Development Specialists Ltd., will be moving premises. Thousands of items are for sale at auction or by prior arrangement.

The auction takes place on Tuesday 12 February, from 1pm onwards, viewing 9.30am to 1pm.

To be held at Herriard Village Hall, Herriard, Nr Basingstoke, Hampshire (off A339). Bar and refreshments available. Stock to include: two-way radio equipment (new and used), masts, towers, power supplies, tone signalling equipment, test equipment, tools, furniture and office equipment.

For a list of products, telephone **(0256) 83528** or **(0256) 82377**. Or send an s.a.e. to:

Unit 4, Summerlea Court
Southrope, Herriard, Basingstoke, Hampshire RG25 2PL

Newsdesk '91

Young Electronic Designer Awards

The Trustees of the Young Electronic Designer Awards (YEDA) recently announced that Mercury Communications Ltd. would become joint sponsors of YEDA. Texas Instruments Ltd. have sponsored the scheme for the past five years and had guaranteed YEDA's survival in 1991. The new joint sponsorship arrangements provide long-term security for YEDA.

Details of the revised time schedule for YEDA 1991 were also announced, as was the decision to hold the finals at a new venue. Following the regional judging during the first term of 1991, the finals will be on Wednesday 3 April at the Science Museum in South Kensington, London. There will then be a public exhibition at the Museum on April 4 and 5.

As part of its commitment to the project, Mercury Communications will provide a new Mercury 'Planet' Award for environmentally aware technology, open to all catagories. This will compliment the existing Texas Instruments award for the project with the greatest commercial viability, a category also open to all YEDA entrants and carrying a cash value of £2500 for the educational establishment sponsoring the winner.

The two-day exhibition of all the finalists' projects will be held adjacent to the 'Exploration of Space' area by the museum's entrance, where an estimated 25 000 visitors will view the display.

The exhibition will publicise the high standard of design and innovation regularly achieved by YEDA entrants. The opportunity to view the projects should encourage even more young people to turn their minds to developing useful and creative devices to improve further the quality of life.

Public recognition by members of the Royal Family, by Government and by the CBI, has been given to YEDA for its role in making young people more aware of the commercial requirements of the electronics industry and of the opportunities available to innovative designers. The sponsorship support of Texas Instruments and now of Mercury Communications will secure that role into the next century.

For further information, contact:

The YEDA Trust
24 London Road, Horsham, West Sussex RH12 1AY
Tel: (0403) 211248

Congratulations!

All of us here at *Practical Wireless* offer a great big Congratulations to Mr T. H. J Baddeley G1YQF, who took the RAE on his 80th birthday, 11 May 1987. On the 9 October last year he took the Morse test and passed. He now awaits his G0 callsign. Quite an achievement for someone at 83 years of age! He is now looking forward to going on the h.f. bands with his KW-2000.

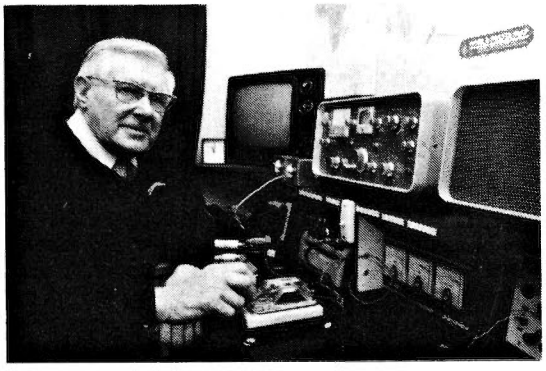
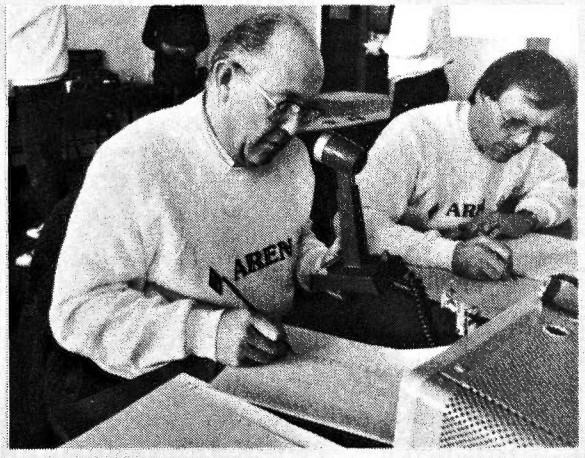


Photo Courtesy Manchester Evening News

AREN National Disaster Exercise In Ireland



AREN (Amateur Radio Emergency Network) recently demonstrated the potential of amateur radio in a disaster situation to various state agencies in the Republic of Ireland. The Department of Communications, Environment, Fire Services and Civil Defence had senior representatives present at the AREN operational headquarters in Dublin City.

The main call-in station EI0RTS was active on 3.650MHz. To give the exercise an added dimension and also to involve 'B' licencees, regional nets were set up all over the country with 144MHz stations reporting to their local h.f. controller, who in turn, relayed all station callsigns to AREN HQ.

There was also a local 28MHz net, a FSTV demonstration (located and transmitting to HQ) from the Wicklow mountains, and also a packet station which downloaded hard copy and other data from regional digipeaters.

The whole exercise lasted approximately two hours and Con Hunter EI9V, President of the Irish Radio Transmitters Society, reported that visitors to the exercise were extremely impressed at the smooth and disciplined way the demonstration had proceeded.

It is expected that talks on setting up a co-ordinating committee consisting of the interested State agencies and AREN representatives will now progres as a result of the exercise.

'Gulf Link' - Extended Again

BBC World Service recently extended its 'Gulf Link' programme on the air for an extra quarter of an hour every day. The special programme, launched after Iraq's invasion of Kuwait, now runs for 45 minutes daily, including weekend editions.

Freed British captives have described the programme as a lifeline and some have reported how men huddle around their radio sets in the hope of hearing a message from their families.

"Since we launched 'Gulf Link' as a personal link back home for English-speaking people trapped in Iraq and Kuwait, we've broadcast thousands of messages" said Elizabeth Smith, BBC Controller English Services. "Calls from friends and relatives are still coming in at the rate of hundreds a week, and this extra broadcast time will enable us to put their messages on the air as quickly as we can," she added.

'Gulf Link' can be heard in Iraq and Kuwait on special frequencies as an alternative to mainstream World Service English Language output. The programme is broadcast daily at 1645GMT with a repeat the following morning at 0415GMT.

The telephone number for anyone wanting to send a message is **071-257 2373**. It will either be recorded for broadcast or, if preferred, read by a BBC presenter. Messages can also be sent to the programme on a special FAX number **071-836 5195**.

Five Star Connectors

Two versions of retrofit latch header shields which convert AMP unshielded connector leaders, are available from Five Star Connectors.

Designed for use with AMP latched headers to convert unshielded headers for use with earlier shielded sockets, styles are available for free or board mounting direct soldering to p.c.b. ground planes. Both cover the range of AMP connectors with between 20 and 60 pins.

For further details, contact:

Five Star Connectors
Edinburgh Way
Harlow
Essex CM20 2DF
Tel: (0279) 442851

Newsdesk '91

G4NKH Buyers & Sellers Wanted

Somewhere, someone is after the item you intend to sell. Through the G4NKH Buyers & Sellers Register you can list as many items as you wish for the annual registration fee. You may wish to turn those surplus items into hard cash, or maybe you are looking for an exchange.

All radio amateurs, short wave listeners and computer buffs have, at sometime, equipment to sell. Regular daily updates, specific, itemised equipment, either by make or compatibility are freely available to enquirers.

For the price of a first class stamp, you will receive the latest updated selling list on the equipment you are looking for.

Simply send a large self-addressed 9in by 4in envelope with a first class stamp - list either the general type of equipment you seek, or specifically state the manufacturer and type number.

Annual registration fee is £8.00

G4NKH Brian Smith
42 Arnott Road
Blackpool, Lancashire FY4 4ED
Tel: (0253) 62925

A Safe Oscilloscope

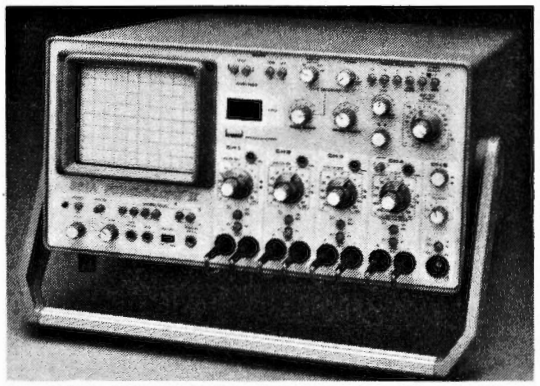
Using conventional oscilloscopes to monitor high voltages and currents can prove hazardous for both the user and the equipment under test. Anyone servicing mains-operated equipment, designing power supplies or working with digital or analogue control systems will have experienced difficulties.

The new BWD POWERSCOPE II™ available from Tandem Technology Ltd., has been designed specifically for these applications and can be used safely up to 15kV. All controls are insulated and the input terminals are recessed. Four 30MHz Differential Input Channels are provided with a CMRR in excess of 86dB and input sensitivities as high as 20mV/div. Trigger signals can be displayed using a convential single-ended channel.

Sophisticated triggering and referencing allow the direct readout of phase relationships between channels or with respect to the line supply. The voltage or current signals applied to Channel 1 and 2 can be multiplied to allow dynamic power measurements.

This rugged product is compact and can be powered from a.c. sources between 90V and 264V/45 to 440Hz, d.c. 100V to 350V or its own self-contained battery pack.

For further details, contact:
David Sawyer on
(0243) 532766



New Range

A new range of UK designed and manufactured ROM emulators are now available from Hertfordshire-based SMART Communications. These products provide a low-cost alternative to blowing and erasing EPROMS during the development of PROM-based and embedded microprocessor boards. The range consists of three basic variants with 256kbit, 512kbit and 1Mbit capacity and prices commencing at £99.00.

The PROMulator contains many innovative features which include flexible configuration and architecture with high-speed download - speeds of 100kbits per second being readily achieved. Special safety features to prevent damage to the board and utility software with a full screen editor are also provided.

The flexible configuration permits emulation of a single 2716 EPROM on an 8-bit bus through to four 27010 devices on a 32-bit bus - and any combination in between. The flexible architecture allows SMART communications to offer configurations for registered PROMS, 16 bit devices and access times down to 45 nanoseconds.

These rugged products have many applications in the Electronic, Education, Communications, Computer and Manufacturing Industries.

Further details from:
Bill Upsdale on 081-441 3890

The Matelect PCI-3 Picoammeter

To compliment their range of current calibrators, Matelect Ltd. recently announced the launch of the PCI-3 picoammeter. The PCI-3 offers impressive specifications at a very competitive price. The use of state of the art analogue circuitry gives this British-built instrument a resolution of 0.1pA on its lowest range with an accuracy better than 0.3%. The accuracy rises to 0.05% on the higher ranges. Eight ranges allows the PCI-3 to measure up to 20mA. Full manual or digital auto-ranging is incorporated. A four and a half digit l.c.d. is used to display the current or its logarithmic value. Analogue outputs of the log and linear values are also provided, the log feature being ideal for chart recorders.

The PCI-3 is available in a rugged instrument case with optional handle or as a rack mounting unit. A unique 4-20mA loop option is available for industrial users.

Personal Computers

STC Electronic Services has introduced a range of high performance AST Personal Computers to suit various users. The AST Premium 386 SX/16 is designed as a platform for standard 8/16-bit applications. It incorporates AST's 32-bit Cupid CPU architecture and the Intel 80386SX processor (with memory cache). The machines are easily upgradeable with a range of 80386/80486-based AST FASTboard CPU cards available for processor-intensive applications. Three models are available - a 3.5in. floppy 3V version, the 5.25in. 5V and the 45V which offers a combination of 5.25in. floppy and 40Mb hard disk. All models have VGA graphics as standard and a disk access time of 28ms.

The top of the AST Premium 386/33 range is an 80386-based micro computer system running at 33MHz. The 386/33 uses a modular design and includes a processor card with a 33MHz Intel 80386 processor, 2MB 32-bit 80ns SIMM memory, 32KB of very high-speed zero-wait state cache RAM, support for the 33MHz 80387 maths co-processor or the 33MHz Weitek 3167 floating point processor.

The AST Premium 486/25 makes available mini-computer and workstation power in a PC environment. It is based on a 25MHz i486 microprocessor which features 8kB cache memory and an 80387 maths co-processor integrated on the chip. The 486/25 is an ideal machine for applications such as Lotus 1-2-3 and AutoCAD. It also supports the Weitek 4167 co-processor for specialised application such as CADKEY 3 and ANVIL-5000pc.

In addition, the versatile AST Premium models also meet the requirements of operating in MS-DOS, MS-OS/2, UNIX and XENIX.

For further details, contact:
The Computer Products Group
STC Electronic Services, Edinburgh Way, Harlow, Essex CM20 2DF. Tel: (0279) 626777

The Alba Radio Group

Alba Radio Group's list of events for 1991 will be available early in February 1991. Included will be amended details regarding their On-Going Awards, a list of the single event awards, details regarding a brand-new award (in colour) and an information pack on some of their locations.

Can you please enclose a couple of 2nd class stamps when replying to:
Paddy GM3MTH
9 Ramsay Place
Coatbridge
Lanarkshire, Scotland.

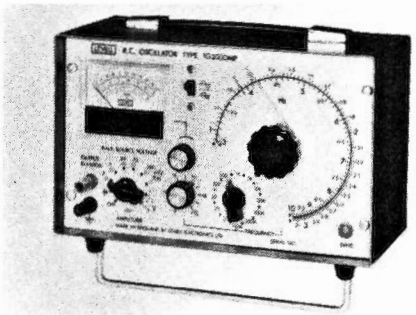
Newsdesk '91

Stolen Equipment

Due to a 'Break-in' during the period of 28/29th November 1990, a quantity of amateur radio equipment was stolen from David Kiellor G0CJL, which included:

Yaesu FT-902 DM, minus the mains plug and lead and connecting plug, serial number 1H200025
Yaesu FC-902 Antenna tuning unit s.n. 1H220210
Yaesu FTV-901 Transverter, 430MHz and 50MHz modules + 144MHz s.n. 9K050644
Yaesu FV-901DM Scanning v.f.o. s.n. 1C060241
Yaesu Power supply unit s.n. 0L060489
Yaesu FT-290R and Binos 30W amp s.n. 4F360950
Yaesu World-time clock
President Madison CB converted to 10m s.n. 03001562
F50 frequency counter, to 30MHz

Luton Police Station would be interested if anyone has any information, tel: (0582) 401212, and a reward of £100 is payable on the return of the equipment.



Levell Electronics

Levell Electronics Ltd. has recently joined the Advanced Electronic Technologies Ltd (AET) Group. Levell has been an established manufacturer of test and measurement equipment for nearly 30 years. Its core products are RC oscillators, insulation testers and a.c./d.c. voltmeters which are sold into a wide range of markets. Other Levell products include capacitance meters, multimeters and thermometers.

Levell will continue to manufacture these products and the substantial investment being injected by AET, promises improvements to existing products with more new products being launched in the future. Sister companies in the AET Group include Digitron Instrumentation Ltd.

Since joining, Levell has moved to the AET Headquarters based at Technology House, Mead Lane, Hertford, Herts. The new Sales Manager is **Nick Bebbington and he can be contacted on (0992) 501231.**

New Power

A new high-frequency module for Bruel & Kjaer's Type 2123 and 2133 signal analysers broadens applications areas in underwater acoustics, transient analysis and fast analysis of stationary signals.

With the ZT 0318 high-frequency module the analysis range of Bruel & Kjaer's realtime frequency analysers is extended by a factor of eight.

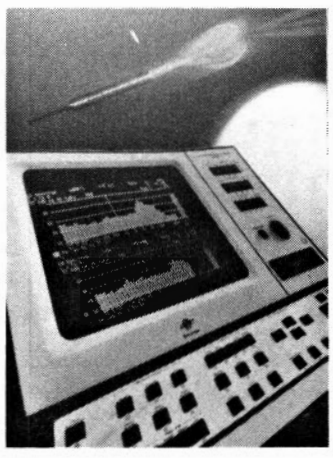
The module can be installed in either analyser to enable single-channel spectra to be measured in realtime at higher frequencies. Of particular value in underwater acoustics measurements, are the increases in octave and 1/3-octave analysis maximum centre frequencies to 63kHz and 80kHz respectively. Excellent for QC applications are the available 1/12-octave analysis up to 21.8kHz for either one of two channels, and 1/24-octave analysis up to 11.1kHz single-channel.

Installation of two modules in the dual-channel analyser similarly extends the realtime frequency range of dual-channel measurements.

The high-frequency digital filters of the ZT 0318 are in accordance with ANSI S1.11-1986, IEC 225-1966 and DIN 45652.

Measurements via the ZT 0318 are simply added to the screen display. All analyser post-processing capabilities can be applied to the high-frequency data. Although the new module significantly advances the analysis power of the instruments, there are no changes in operation.

The new module broadens the scope of Bruel & Kjaer's highly-successful 2123 and 2133 analysers, which offer wide-ranging facilities for noise and vibration measurement in realtime, and incorporate post-processing and storage capacity to make the computer redundant in most applications.



For further information, contact:

Les Minikin
Bruel & Kjaer
(UK) Ltd
92 Uxbridge Road
Harrow HA3 6BZ
Tel: 081-954 2366

A Lifetime Guarantee

Global Specialties' comprehensive range of Breadboards carries a lifetime guarantee. If they fail to meet your requirements they are replaced without question. All of the solderless interconnecting systems make designing, developing and testing of electronic circuits faster, easier, less expensive and consequently more enjoyable by reducing the work involved in transferring circuits from drawings to final designs. Further help is provided by 'Scratchboard', a workpad that allows designs to be quickly sketched for permanent record, while 'Matchboard' is a pre-drilled p.c.b. for producing a finished circuit. While stocks last, Global are supplying FREE 'Scratchboards and Matchboards' with all orders for their Experimenter 300 Breadboard.

A full range of breadboards are readily available and offers: no solder spill, dry joints or burns; quick cost effective development and test; component lead sizes from 20 to 26s.w.g. and standard 22s.w.g. solid hook up wire; plug-in 8 to 40 pin d.i.p. packages, including microprocessors; common and, 'bussed' tie-points for components leads and power connections. Applications include Professional Design and Development, Education and Hobbies.

For further information, please contact:

Justin Stanyard, Global Specialties, Rackery Lane, Llay, Wrexham, Clwyd LL12 0PB. Tel: (0978) 853920

FOC Jubilee 1991

To commemorate the 200th anniversary of the birth of Samuel F. B. Morse, the First Class CW Operators' Club will hold a special Jubilee activity period for members and non-members alike, using c.w. throughout the world. It is not intended to be a pure contest, but more of a celebration of Morse code and its use in world-wide communication.

It will commence on Saturday 27 April 1991, the actual anniversary date. Morse was 80 years old at the time of his death so the requirement (task) for FOC members is to work 40 EU and 40 DX members in 40 days. Non-members should attempt to work as many FOC members as possible within the 40-day period.

During the weekend of 27/28 April 1991, station G4FOC will be especially active, contacting Jubilee participants and other special event stations celebrating the birth of Samuel F. B. Morse.

Full details are as follows:

Date/Time: 0000GMT Saturday 27 April 1991 to 2400GMT Wednesday 5 June 1991.

Frequencies and Mode: 1.8MHz - 28MHz (except WARC bands), c.w. only.

Eligible Entrants: All licensed operators.

Exchange: Send RST plus club initials if appropriate, e.g., 599 FOC, 599 GQRP, 599 HSC.

Scoring: Total number of QSOs

Logs: Use any convenient log sheets/log books, giving details of callsign, date, time, frequency and reports exchanged, together with club member details if appropriate.

Address for entries and closing date: Entries should reach Peter Miles G3KDB, PO Box 73, Lichfield, Staffs, England by 5 July 1991.

Awards: (a) For non-members of FOC, an engraved paddle to the station contacting the greatest number of FOC members within the 40-day period. (b) For members of FOC, a plaque to the station contacting the greatest number of non-members active in the Jubilee, and to the station completing the members' task first.

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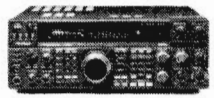

NEW TS950 H.F. TRANSCEIVER £P.O.A.

ALSO PANORAMIC DISPLAY SM 230 STATION MONITOR AVAILABLE P.O.A.

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Kenwood R5000	£799
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TS440 inc Auto ATU inc. Microphone	£1,150
TS940 inco Auto ATU	£2,000
TS790 2/70 + SAT	P.O.A.
TM241 2mtr FM NEW	T.B.A.
TH77 Dual Band Handie	£379
TR751E 2mtr Multimode	£575
LOWE HF 225 receiver, 30KHz-30MHz	£425

ICOM

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FT470 inc. Nicad/Charger	£375

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PANADAPTOR DeLuxe
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INC. PSU

FRG 9600
50 – 950 MHz
£500.00
INC. PSU

R.N. Electronics 28 to 50MHz Transverter

Since building the PW *'Meon' Richard Ayley G6AKG has been 'hooked' on 50MHz, so we thought he was the ideal candidate to review the R. N. Electronics transverter.*

The transverter and its 'prime mover' — a 28MHz multimode transceiver.

"Six metres isn't worth the effort," I heard one fellow say above the din of my last rally. How wrong could he be, 50MHz DX doesn't stop with the passing of the summer Sporadic-E!

After successfully building and using no less than three 'home-grown' transverters since the band was released, I feel well qualified to comment. So when I was asked by *PW* to review one of those nice, shiny 50MHz transverters from R. N. Electronics, I leapt at the chance, as any red-blooded six metre devotee would.

Long Nets

I use 50MHz for everything that I would do on 144MHz. The only difference is you can always find a quiet frequency for one of those five-hour long local nets, generally without comment from other band users! It's also quite good for going around, or over obstructions, showing many of the characteristics of h.f. groundwave communications.

Best of all, there are those winter jewels of DX from across the 'pond'. So with all this, and with the six metre-induced adrenalin pulsing through my Class B veins, I feverishly unpacked the transverter. It was supplied in a very substantial double cardboard box of the type that will make two nice junk boxes - I've no doubt that you know the ones I mean.

First Impressions

My first impressions were that the man who designed this transverter means business. A really professional paint job, in black gloss with a simple, but 'classy-looking', anodised front plate. Protruding through the front plate is a single l.e.d. which glows red when power is applied to the transverter, changing to green when the unit goes to transmit.

I thought that if the inside looks as good as the outside, then I'm in for a treat! After removing six countersunk machine screws, I wasn't disappointed. It was a delight to the eye, a very professional layout. It also used standard discrete components, and that's something you don't find in many of the latest amateur 'black boxes'.

Why do I consider this to be important? You would soon find out if you had to repair the unit after a 'near miss' lightning strike or the more likely 'static build-up' associated with 'thundery weather'. It's generally cheaper and easier to repair 'discrete' component-equipped gear.

Construction

The internal construction of the transverter is worth a mention. The main transverter p.c.b. is placed in the bottom of the 190 x 120 x 55mm die-cast alloy box with the p.a. stage mounted on the lid. The idea of using the bottom half of a smaller die-cast box, bolted over the p.a. to enclose the assembly, is one that I shall remember for my own projects.

While looking around inside I decided to remove this cover to reveal the p.a. stage. I was a little surprised at first glance, as the quality of construction for this stage certainly did not match that of the unit's main p.c.b. I'm sorry to say it reminded me of some of my prototypes, but having said that, it was mechanically OK, and I was soon to find out that it worked well.

Instructions

My attention was then drawn to the operating instructions - comprising a neatly folded A4 sheet. To my amazement, there before my very eyes was a circuit diagram - minus the p.a. stage. Perhaps my comments about the prototype were not so far off the mark. Anyway, the circuit diagram made my job a whole lot easier as I wouldn't have to guess how the transverter operated.

One feature of the transverter impressed me immediately. It was the ease of which the transverter could be configured to operate with just about every type of p.t.t. system likely to be encountered. This includes the more usual type of r.f. control with a hang-time of 0.8s.

This, combined with the wide range of drive levels that it can handle (0.5W to 20W), must make it one of the most versatile transverters I've come across. The operating instructions seemed simple but are comprehensive and well-written.

REVIEW

Legendary Performance

The heart of the transverter is a single SBL-1 double-balanced mixer. The SBL-1 is used both for receive and transmit, meaning that the internal switching is a little more complex. However, this is the approach I've taken myself on 'home-grown' transverters, as the price of the SBL-1 type mixers make them a bit of a luxury to include two.

There is no doubt to the legendary performance of the chosen mixer, particularly in receiver technology. They are also by far the easiest and most effective method of providing clean transmitter mixing.

Their other advantage is that they don't need a really 'super clean' local oscillator source. This means that little or no effort has to be put in, other than providing the right level of local oscillator drive. With this transverter, the local oscillator is provided by a very simple, two-transistor Butler type oscillator.

The receiver stage line-up consists of a more than adequate BF981 dual-gate m.o.s.f.e.t. pre-amplifier. This feeds the SBL-1 mixer, via a multi-stage filter fitted with two traps. This filter is obviously to provide spot attenuation for 'close in' mixer products and is used on receive and transmit.

More Complex

The transmitter line-up is a little more complex. The design consists of a power attenuator network, which is switched out during receive. This feeds the SBL-1 via an adjustable *pin* diode attenuator, giving a variable drive control.

After the mixer and the traps, which are also used on receive as previously mentioned, the transmit signal is fed to the p.a. driver circuitry via a bandpass filter.

All the filtering is necessary believe me, particularly if you intend to boast about spurious emissions that are better than -60dB! The transmitter driver circuitry itself is a little unusual, in that it consists of quite a complex push-pull amplifier arrangement.

This amplifier then feeds two stages of quite conventional power amplification using two Motorola 'plastic-power' type transistors. This is the first time I'd seen these used above 27MHz, and they certainly make for easier mechanical mounting than the more usual 'capstan' style.

Check Out

The next thing to do was button up the case and try the unit 'on-air' and through some test equipment. The only quick test I could try, using my company's measuring equipment, was to check the unit's output for spurious emission.

This is quite a useful test for any 50MHz transverter, as failures in this area will make you very unpopular with the local Band II f.m. listeners! I'm pleased to report that all spurious emissions were well below the manufacturer's specifications.

Next, I tested the output power on a Bird Throughline meter. The measured output resulted in a very respectable 22W on f.m., for a supply voltage of 13.8V.

Woolly Prime Mover

Unfortunately, the prime mover transceiver I borrowed from a friend had a rather 'woolly' transmitter and a 'deaf' front end. On f.m. transmit it had poor levels of modulation and on s.s.b. high levels of carrier.

The transceiver was also incapable of operating below 28.410MHz. However, I persevered, thinking if this transverter provides me with some contacts with a 'dodgy;' transceiver as 'driver' then it must be good!

On Air

Having spent some time with an h.f. receiver and a dummy load trying to make up my mind what state the driving rig was in, I decided to connect up the transverter. It was then that I noticed the plug on the input lead of the transverter was terminated in a rather inferior 'twist-on' type PL259 plug, which seemed to be loose.

On closer inspection, removing the outer shell revealed a rather poorly made-off plug. It was poor, even for this type. Too much insulation had been stripped off the inner conductor, leaving a bare wire less than a millimetre or so from where it could have 'shorted out' to the plug shell.

On Schedule

Once I'd made sure that the plug was safe, I arranged a 'sked' through our local u.h.f. repeater with a friend some twenty miles away. I first established contact using my Yaesu FT-690, and it was at this point I found that the path was only just workable due to local QRM at both ends.

So, I tried the transverter - with little success I'm afraid. However, I did establish that the other station was using the 'sister' unit to the one I was testing! He was using the R. N. Electronics 144MHz i.f. version of the transverter.

I must admit it was a very nice signal, and he was obviously hearing me better than I was hearing him on my Yaesu 'box'. I think that proves that a transverter is only as good as the 'prime mover'.

A Good Move

Appearing on the local repeater seemed a good move, because as soon as I'd finished one 'sked', two other stations came up on the frequency to give me a contact. These, I'm pleased to report, were

Manufacturers Specification

R.N. Electronics 50MHz Transverter Model RN 6M/10/25

Transmit	
Output Power	25W p.e.p.
13.5V Supply	20W f.m./c.w.
Frequency	50-52MHz
Supply Voltage	12-14V d.c.
Harmonics	-70dB or better
Spurious Emissions	-60dB or better
Intermodulation	32dB typical. 25W p.e.p. o/p (3rd order relative. to p.e.p.)
Current consumption	3.5A typical, 4A at full output.
Receive	
Frequency	50-52MHz
Intermediate freq.	28-30MHz
Conversion gain	+6dB typical.
Noise figure	<2.5dB
Interception point at output	-6dBm
Frequency Accuracy	±500Hz
Current	270mA typical.

successful and each station said that the transverter had a 'tight' and 'clean' output despite the poor modulation from the originating transceiver.

Last Word

Overall, I enjoyed using the transverter and would have liked the chance to have tried the 144MHz to 50MHz version, so I could guarantee the quality of the 'driving rig'. The transverter is a well-produced unit with a smart appearance and a high degree of versatility.

The two negative points, mentioned earlier, didn't dampen my enthusiasm for the product. Changing the plug type to a slightly 'up-market' version of the PL259 and a little tidying up of the p.a. will turn this good transverter into an excellent product.

Pounds For Watts

I think that when you consider '£s for watts' the transverter at £209, compares favourably with the small mono-band transceivers currently available for 50MHz. For those people who own a 'top-of-the-range' h.f. transceiver, this unit will provide a neat approach to gaining access to this new band.

My thanks to R. N. Electronics for the loan of the review equipment, to AQL EMC Ltd., for the use of their test equipment and to all those who helped with the on-air tests.

PW

REVIEW

Feature

Amateur Radio Repeaters - The Story Behind Your QSO

Love them or hate them, the various forms of amateur radio repeaters are yet another facet of our hobby. Rob Mannion G3XFD looks at the multiple effort hidden behind each repeater callsign.

Personally, I've never really understood why so many people become 'hot under the collar' when the subject of repeaters is discussed. But, on the other hand I can understand that some radio amateurs don't enjoy working via automatic 'relaying' stations, and they will usually avoid doing so.

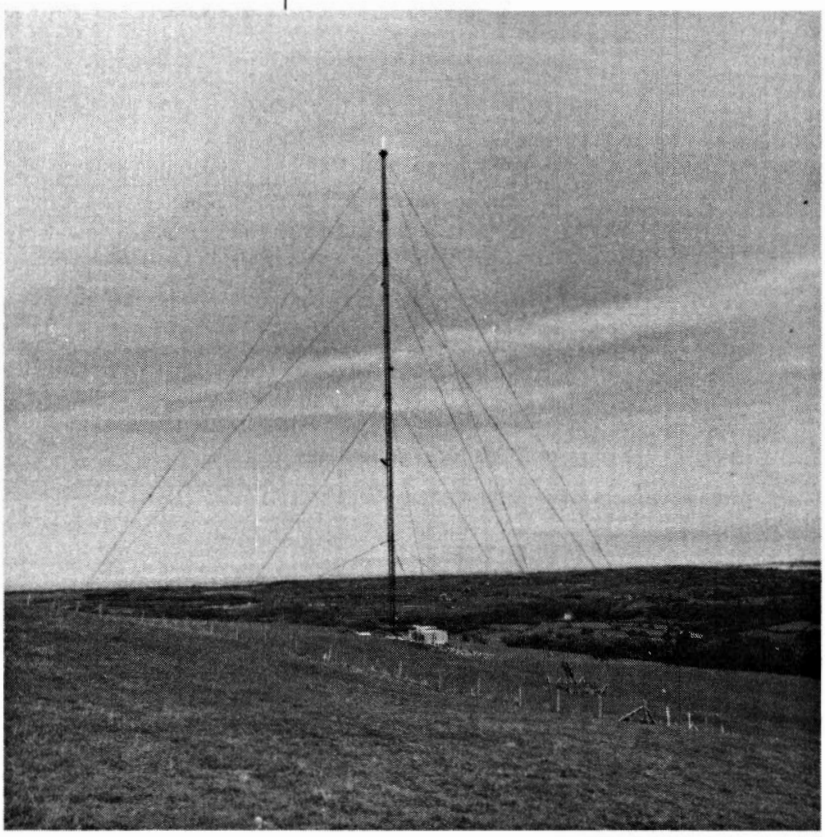
However, some (rather odd in my mind) people then go as far as trying to dictate whether or not other amateurs should use the facility provided. I am, of course, referring to the strange 'noises' and other categories of 'nuisance' operating.

I don't intend to dwell on this unfortunate problem as the purpose of this article is to show how much hard work and dedication lies behind each repeater. Still, before I move on to look behind the scenes, so to speak, I think it's worth pointing out that the problem of the anonymous noises, 'squeaks', verbal abuse and other effects is not confined to amateur radio!

In any situation - or so it seems from my own observations - where anonymity is assured, the most unlikely of people will drop that (often very thin) veneer laid by society, and act in most uncharacteristic ways.

The very best example that springs to mind is the 'loo artist'! It seems that a freshly-painted toilet cubicle wall brings out the 'closet' artist in many people. A closer analogy, for our comparison - are my memories of the many 'party' telephone lines operated by British Rail a few years back.

Most of the signal-boxes, stations and other locations were staffed by normally reticent, hard-working and un-adventurous railwaymen. The change came over them when they 'eavesdropped' on the 'selective ringing' party-line.



Co-operation at the highest level. Moel-y-Parc TV transmitter in North Wales provides a base for the 144MHz repeater GB3MP with the support of the IBA (ITC).

At first you would hear a 'heavy breather', he'd be followed by a 'giggler' or by someone offering 'unhelpful' advice. But, by far the worst time came if you had to call the personnel office and speak to one of the ladies in the office! All inhibitions promptly disappeared and the very worst of 'Blue' public house humour could be heard!

So, there it is - it seems that we've got this unpleasant 'something' that's just 'itching' to rear its ugly head. It's not just amateur radio, it's us and our attitudes. I haven't got an answer, but I know we can control it within ourselves!

Behind The Scenes

Many radio amateurs using v.h.f. and u.h.f. voice repeaters scarcely give a thought to the organisation behind the running of each station. I think that our cartoonist - John Worthington GW3COI - has summed it up very well in his cartoon for this month's 'Spot The Difference' competition!

However, in retrospect I think we could have made another modification to the picture by illustrating £20 going into the repeater, and £35 leaving it to pay bills, etc! This would serve as a reminder to all of us (including me) that repeaters and the facilities they provide - don't come free.

In fact, the repeater facilities provided by the various groups from the Isle of Lewis to Devon and Cornwall and from the Channel Isles and Sussex to the Orkneys cost an enormous amount of individual effort and money. Unfortunately, in this 'money-minded' world of ours the emphasis is often put on the amount of money expended - rather than the hours sacrificed by repeater groups and their families.

It's all too easy to just regard that a repeater is 'there' and to be used by anyone who wants to use it. Since I've been involved in the research for this long-needed article, I've come to realise the dedication that has to be provided by each repeater group.

Landlords & Eviction

It's rather obvious when you look at the news every month, listen to the GB2RS bulletin or the *PW* 'Wireless-Line' telephone information service - that suitable repeater sites are a problem. The battle is not over when the group has found a site, for they've got to keep it and that usually requires constant negotiations. I haven't had the chance to 'sit in' on a landlord and tenant site liaison meeting, but I've no doubt that it would be an interesting experience.

For example, there's GB3ET the Amateur Television repeater which, appropriately enough, is located in the observation platform level of the IBA television tower at Emley Moor. It's a wonderful site, set high above Huddersfield in Yorkshire and is ideal for the purpose - but the tenure of the location is not guaranteed.

One of the first to reply to our request for help to prepare this feature was Trevor Brown G8CJS, Chairman of The British Amateur Television Club. He knows that his site is provided by the goodwill of the IBA.

Of course, there are many radio amateurs who

work in broadcasting and their influence can often 'smooth the way'. Trevor told me that he is hoping that the nominal rent charged by the IBA won't change when the ITC take over in 1991.

In this situation, where a repeater shares a location with commercial users - who often pay far higher rentals for the site - amateur radio users rely greatly on goodwill and the reputation that the hobby has developed over the years.

Trevor Brown reminds us that, unlike voice repeaters, GB3ET runs its transmitter all the time. When not in use by a particular television amateur, a test-card and identity can be seen. The repeater's output is on 1316MHz and it's an f.m. transmission that can help you 'have a look' for yourself.

Trevor says that you can try receiving GB3ET by using a satellite TV receiver (there should be some real bargains about now HI!) with the low-noise-block and replacing it with a Yagi antenna with a pre-amplifier. It's as well to remember to block the d.c. feed that is fed up the coaxial to power the l.n.b., you never know, this could be your introduction to ATV!

The Swansea Repeater Group - GB3SA - aren't quite so fortunate, they lost their site in May 1989 and are busily looking for another. Peter Alexander GW4RXO, is the Secretary of this group ("Only because no-one else will do it" he told me!) and he says that since they became operational in September 1986 they've had to move site twice.

Peter says that, "This time we're trying to obtain a dedicated radio site as, although the two previous sites were rent-free, they were subject to change of ownership".

Slow Progress

The Swansea Repeater Group has found a preferred site, but have run into a common problem - slow negotiations with authorities. "The BBC landlord site at Kilvey Hill just outside Swansea rates as favourite, but progress through the official channels is painfully slow and although the RSGB have obtained a good site rental, the cost of installation and building of accommodation could well exceed £1000. As we are only a very small group it is still a lot of money to find - although to be fair most regular users and a few others are generous come rally time!

"We were in the process of building a complete stand-by unit, but this has had to be postponed because of the expected future expense. Mobile and portable operation is particularly difficult in this area due to the many hills and valleys and the repeater has been sadly missed. However, when 'SA was operational we did, thankfully, suffer very little repeater abuse".

Peter went on to say that they are very grateful to the RSGB for their support at the headquarters end of the repeater network. He states firmly that without their backing - things would be even more difficult. He went on to point out that despite the impression some amateurs have of the network and the RSGB support - that each repeater group is self-supporting.

In other words, the actual equipment, running and management costs are financed by the actual group and not by central RSGB funds. "I hope," he said, "that this statement will clear up any misunderstanding regarding repeater funding, which came about because of a vaguely-worded illustrated leaflet issued by the RSGB. The leaflet misled some people into thinking that by joining the society they'd already paid for repeaters".

Weather Hazards

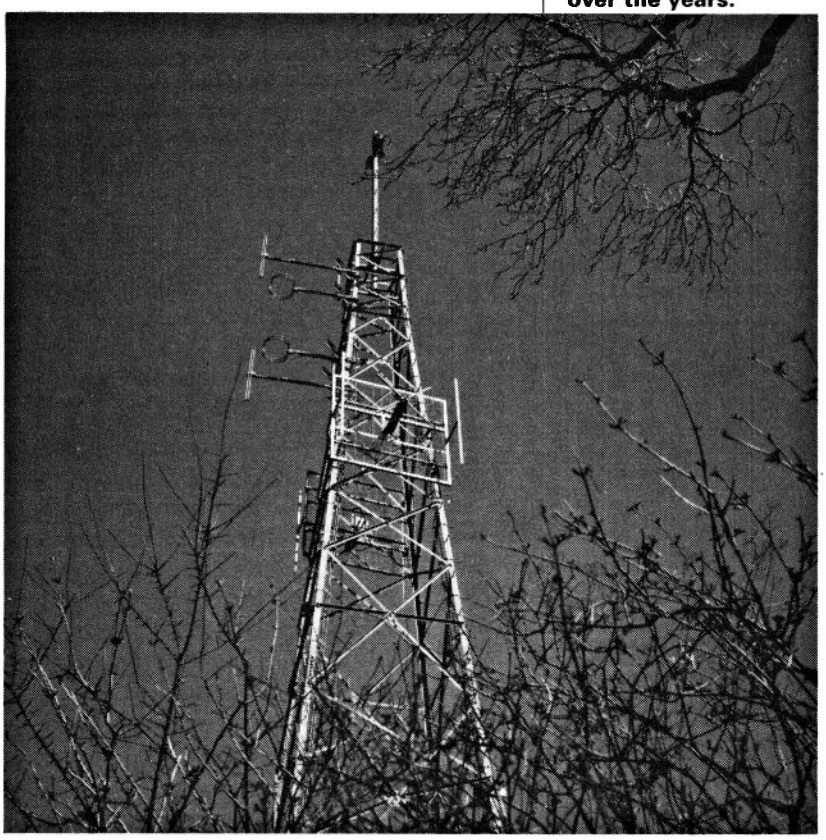
'Britain is ruled by its weather' so the saying goes. I don't know who it was that originally said it - but I think that they were right - especially as I'm writing this article during a snowbound winter Sunday afternoon! Various repeater groups have harrowing tales to tell regarding their experiences and GB3TR in Devon had a narrow escape in the winter of 1989-90.

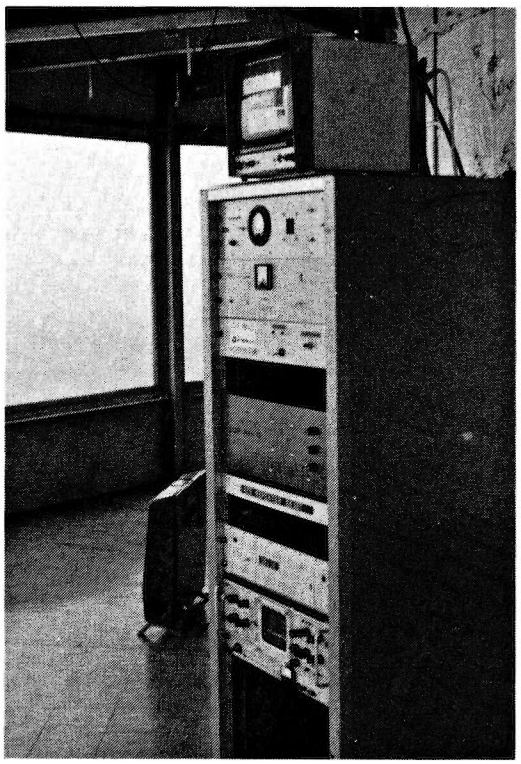
Mike Mangan G1FON is the co-ordinator for GB3TR, the Torbay repeater and he had such an adventurous time - Mike says he "nearly lost his best friend" - that he put the story into writing for the Torbay Amateur Radio Society. I thought that the tale sums up the responsibilities of repeater management so well, that we'd have an extract or two from the story.

Mike tells us that it all started on Thursday 25 January 1990. "It began simply with a telephone call. It was from my friend Ben, to tell me that GB3TR, although still on the air, was running at very much reduced power due to the mast having been blown down in the storm.

A quick set of excuses enabled me to get the afternoon off, so I could go and check the damage. I hoped to be able to salvage what gear I could -

In situations where a repeater shares a location with commercial users, who often pay far higher rentals for the site - amateur radio users rely greatly on goodwill and the reputation that the hobby has developed over the years.





The equipment 'behind the picture'. The ATV repeater GB3ET, located high up on the Emley Moor TV tower, radiates a test card and identity that can be received on a modified 'Satellite' TV receiver.

especially the T100. There was a little hope as I was told the GB3TR still had users but for how long could the T100 stand the punishment?

The journey from my work-place to the repeater should have been simplicity itself, but it turned out to be 'one of those days'! The Torbay ring road was closed due to heavy lorries being blown over, and the back-lanes and byways were choked with other worried-looking motorists trying to find their way home".

Problems At Home

"After a hair-raising drive I eventually arrived home, only to find I had problems there too! Where my antennas were usually to be seen - all that was left was a broken stub-mast on the roof.

The back garden was a real mess with broken fence panels lying about and I could see my neighbours brand-new shed lying on its side - as if it were dead!

I had to make a quick decision. My problems at home had to wait, I had to get up to GB3TR to attend to its problems before someone damaged the p.a. stage. I grabbed the keys and jumped into the car. It was only a five-minute drive to the site and I'd be able to switch the repeater off very quickly.

But, it wasn't as easy as that! In two minutes I was greeted by a fallen tree, successfully blocking my pathway to the site. A quick reverse, and I was on my way, via another route, to find another tree down across the road!

So, I tried yet another way but this time I met up with a variation on a theme with a tree down, but this time it had a car alongside, - well and truly stuck in the ditch. I was getting desperate and prayed inwardly 'Oh God - let me have the strength to give up, go home and relax with a drop of the 'hard stuff'!

But, the challenge was there, I just could not give up! I would make it to the site. I was thankful that Devon has more roads than any other county in Britain - I'm sure I tried most of them before I got through to the repeater".

Down In One Piece

"Finally I made it! Although the mast was down, our antennas had not fared too badly although they were partly buried in a vegetable plot next-door to the site. We'd got away lightly when I considered the 'other users' on the mast.

A quick call on the output of the repeater soon brought assistance from my friends Brian and Richard who brought a toolbox with them. Once we'd done that, the usual spate of 'phone calls followed to arrange help to get GB3TR back 'on air' as soon as possible.

On the following Saturday - it was raining of course - I arranged to climb the mast at the original site of the repeater to salvage a seven metre long extension pole. The owner of the site managed to provide a welder and his gear, to straighten and remount the tower on the stump of the original base which had fallen in the storm.

They did a fantastic job, after they'd finished and we were on our 'new' site, the mast was only one metre shorter than before. By that time I was looking like a bloated, drowned and frozen rat and as it was getting dark quickly we all decided to call it a day and make a fresh start in the morning".

Back On Air

"Shortly after 9am on the Sunday morning, along with friends John, Bill and Roger, I returned to the site to install all the antennas that we could manage in the time available.

While the other three were carrying out the boring and tedious - but vital - task of sorting out cable runs, which antenna and cable belonged to which user, etc., I was doing my best imitation of a monkey - up and down the mast , spanners and cable ties in pockets, nuts and bolts held in my teeth and safety-belt around my middle.

I'd just reached the point where I thought my legs were going to give way when I heard a cry of delight from within the users' hut that we were back on air, and a station in the depths of Kingsbridge was already using GB3TR.

Well dear user, that was an account of a mere four days (albeit hectic ones) in the life of a repeater. The custodians of GB3TR know what running a repeater entails. So, when you see John G4VUD or myself and you feel that your subscription to 'TR have lapsed - feel free to dig deep into your pockets, because the next time something goes wrong it may not just cost man-hours and replacement parts may be needed.

Surely, you wouldn't want to wait too long before 'TR was on air again because YOU didn't do YOUR bit to support GB3TR!"

Organisation & Management

After reading Mike Mangan's story involving GB3TR, there's no doubt in my mind that we should all lend the skills we have. In other words - if you're an accountant you should help in that way. If you read 'Keylines' in the January issue of *PW* you'll see that I freely admitted that money management is not my forte!

When it comes to efficient management I get the impression that the Central Scotland FM Group have solved the problem. They must be successful - their expertise is in demand and the influence of the CSFMG can be seen (and heard) throughout Scotland.

Alaisdair Fraser GM3AXX, the group's secretary, reports that the group is responsible for GB3AY, GB3CS, GB3FF and GB3PA. Another station - GB3DG - is almost ready to come on the air. They've also provided technical help for GB3SS, GB3IG and have completed a new repeater and antenna system for the Black Isle repeater at the old 405-line Mounteagle TV station near Inverness.

The group consists of 11 committee members who meet monthly, and some 250 members. All the members pay an annual subscription of £7.50.

In return for the subscription they have the use of the repeaters plus a quarterly 28-page magazine. Their annual general meeting in February consists of a three-hour 'trade' show followed by a three-hour business meeting. Around 100 to 150 members attend the show and - apparently - appreciate the committee's work as they re-elect them 'en-bloc' year after year!

Alaisdair it seems is a fortunate man when it comes to the expertise on the committee. He says that, "We are fortunate that members include GM4COX who was involved professionally with v.h.f. and repeaters for many years, GM0HYY who is an antenna rigger with the IBA, and GM8MRW - our treasurer - who insists on receipts for everything - even postage stamps. How can we lose?"

Confiscated Equipment

The CSFMG have suffered very little 'repeater abuse'. They did have one 'misguided' person who was located, reported, prosecuted and fined heavily. He then had his equipment confiscated. At the moment the group have one 'jammer' who occasionally creates a nuisance on one repeater. However GM3AXX says that "We know his identity, and no doubt some of the committee will be co-opted as 'witnesses for the prosecution' in the near future"!

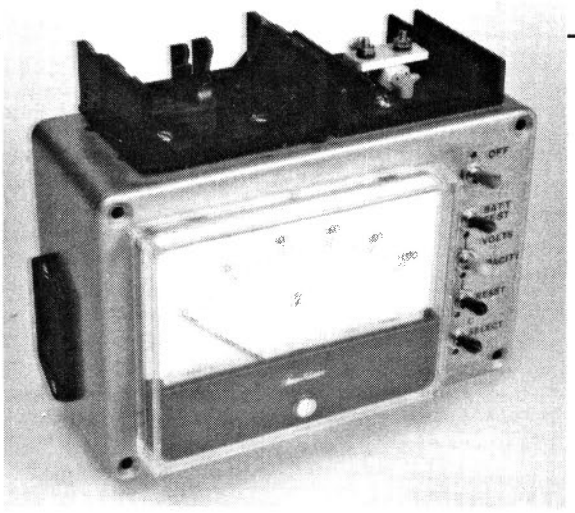
By far the biggest problem that affects the Scottish group - and others throughout the UK - are the radio amateurs who frequently use the repeaters but don't contribute to their upkeep. Alaisdair comments wryly that "We continually let it be known that what with the cost of high-grade coaxial cable, filters, hardware, professional antennas, site rentals, electricity, etc., that repeaters don't come cheap. We are often baffled by the opinion held by many newly-licensed amateurs belief that repeaters are provided free by the RSGB, the DTI or other benevolent institutions". **PW**

Last Word

I think that surely must be (almost) the last word on the subject in our 'behind the scenes look' at repeater operation and management. Surely, we'll all think twice when we use a repeater next time. It's up to us to support all the groups and their hard work - you never know when you'll next need a repeater!

Construction

Having recycled his NiCads, Alastair Downs set about checking the capacities of his re-juvenated cells, and came up with the idea of a dedicated tester.



Low Cost NiCad Tester

There comes a time in the life of every NiCad cell, when questions are asked about its capacity and efficiency. This can prove very difficult to verify. With a disposable (primary) cell, a simple measurement of cell voltage is adequate. In the case of a rechargeable cell, such as NiCads, this may not be sufficient. They can maintain their voltage when placed on load. To verify that they can hold the charge, the individual cell must be monitored over the complete discharge period.

There has been a previous article in *PW* (§1) about how to re-juvenate a suspect cell. But how do you tell a suspect cell? The purpose of this project is to answer that question. The easy answer is that the (preferably fixed) discharge current is measured, and the total time noted. By multiplying these two together we arrive at a figure for the capacity in mA-hours. Look now at **Fig. 1.** Shown here are the cell voltage profiles for NiCad cells under load. They are C/1, the one hour discharge rate, C5 the five hour discharge rate and 5C, the 12 minute discharge rate. They all show differing cell load lines, but all end with a very sharp downturn at the end of their respective periods.

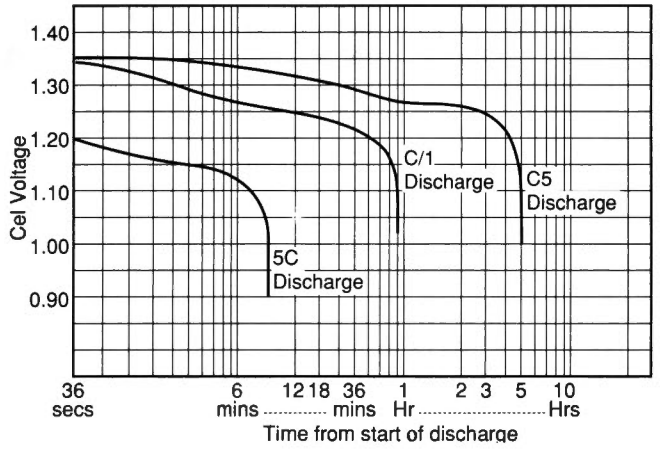


Fig. 1: Terminal Voltage curves for NiCad cells for various discharge periods.

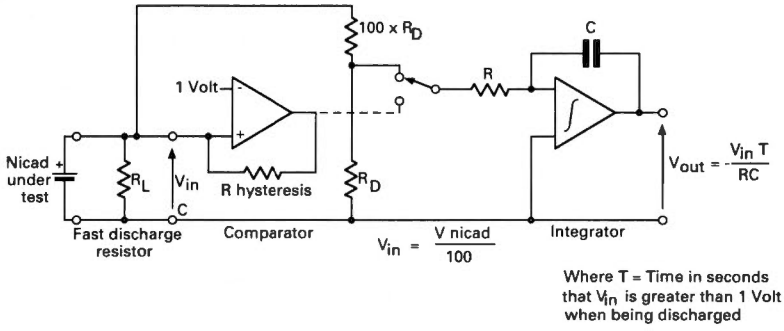


Fig. 2: An operation outline for the cell tester. See text for further explanation.

Maths Once More

There is a mathematical method that takes the graphs as shown, and calculates the total ampere hours (Ah) by measuring the total area of the active section of any one of the graphs. This is called 'integration' in mathematics, and it would be expressed as:

$$(1)\quad \text{Capacity (ampere - hours)} = \int_0^t \frac{V_{cell}}{R_{load}} \partial t$$

Can we measure this figure easily without standing over meters, noting down voltages and timings with a stop-watch ourselves? Quite simply, the answer is yes. We use an integrator to do this for us. Look now at **Fig. 2.** The following explanation is simplified of course, as there is no need to go into a great deal of maths in this article. The circuit consists of two 'operation amplifiers' (op-amps). These may be considered as almost perfect amplifiers. The left hand op-amp will measure the cell voltage, and turn off the integrator after a cell potential of one volt is reached. The right hand op-amp acts as our integrator. This gives an output voltage of:

$$(2)\quad V_{out} = -\frac{1}{RC}\int V_{in}\,dt + C$$

If we generalise slightly, and say that the input voltage will be a constant 1.1V (i.e. the mean of 1.2V, charged, to 1.0V, discharged) then the equation simplifies to $V_{out} = -(V_{in} T)/RC$. Where R is in ohms, C in farads and T is the total time in seconds to discharge from 1.2 to 1.0V.

Practicalities

If we use a load resistor of 1Ω, then a 500mAh cell will be able to hold a 1A discharge for a maximum of 30 minutes (1800 seconds). Substituting 1800 for time (T) into equation 2 along with a V_{in} of 1.1V, it may be seen that unless the product of *C* and *R* are very large, then V_{out} will be very large. So large in fact, that is it will more than exceed the supply voltage. One solution would be to make *CR* very large. Problems of insulation occur if R is large, or of leakage if *C* is large. However if we divide V_{in} by 100 then those figures become more manageable. Using the values of V_{in} of 11mV, R=10MΩ and C=1μF, gives a much more manageable 1.98V(2V) for a 100% capacity battery. By using a 100μA meter and suitable limiting resistor,

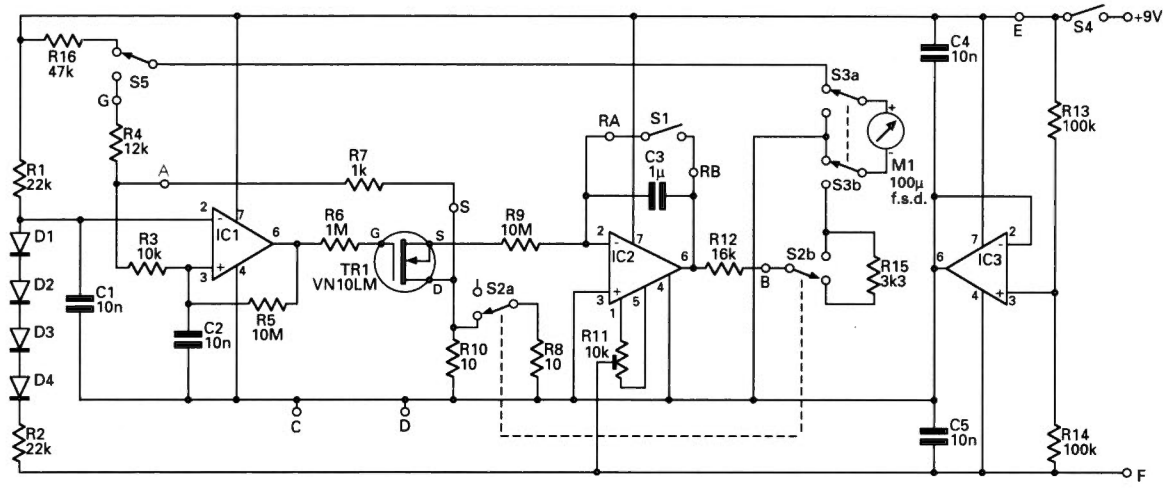


Fig. 3: The complete circuit diagram of the NiCad Tester.

the output can be scaled to a reading of 1µA/percent.

The use of this large value of resistor (10MΩ) places some constraints on the type of op-amp we can use. The input voltage V_{in} is going to create an input current in the order of 0.001µA (11mV/10MΩ). The input bias current of the op-amp must be, **at most,** one tenth of this figure to have any pretence of accuracy at all. For this task I chose an CA3140 f.e.t. input op-amp. This has an input current requirement of 30pA (3.0×10^{-11}A). This very low current, coupled with a trimmable input voltage offset of 0.5mV, make the CA3140 more than adequate for the job.

Final Circuit

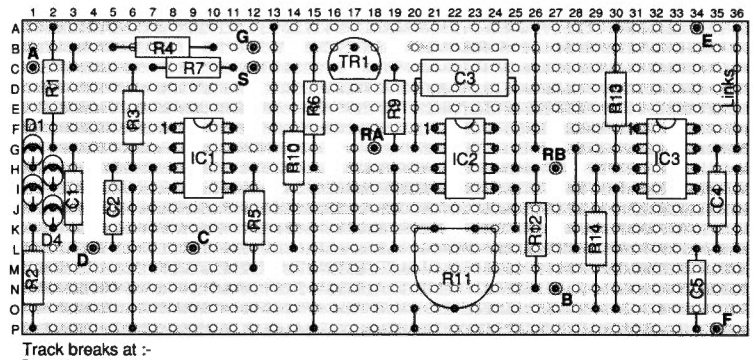
A complete circuit for the measurement electronics is shown in **Fig. 3**. As you can see, the circuit comprises three op-amps, of which only IC1 and 2 are directly concerned with the metering action. The integrated circuit, IC3, provides an accurate voltage-centre rail. This is so arranged to provide a 'fixed' rail for the other ICs, with a ±4.5V (nominal) positive and negative rails from a single 9V battery. A simple resistive divider would cause a change in this centre rail value, with respect to say the negative rail, as the meter current reading varied. One way around this would be to use a resistive divider taking a very large standing current. Using this method would cause the 9V batteries to have a very short life span.

Component Descriptions

The op-amp IC1 is a comparator. Diodes D1-4 provide a reference input to the inverting input of about 1V positive. Resistor R5 (10MΩ) acts to sharpen up the switching action of this comparator. During the period that the cell voltage exceeds a figure of one volt the output pin of IC1 is held close to the positive supply rail. This has the effect of putting TR1 into a low resistance mode, allowing the cell voltage, or at least one 100th of it, to be applied to the input of the integrator IC2.

If S1 is open, and while V_{in} is applied, the inverting integrating action of IC2 causes a steadily falling voltage at the output (pin 6). This steadily falling voltage is displayed on the meter as an increasing reading.

When the terminal voltage, on load, of the cell under test falls below this reference level the output of the op-amp falls from +4V to a value of -4V. At this point TR1 is turned off. This causes IC2 now to act as a sample-and-hold circuit. The sampling was made while the battery terminal voltage was greater than one volt. Now this reading of output voltage, which equates to the capacity of the cell, is held. The peak capacity may be read on the meter for some considerable time after the sample was made.



Track breaks at :-
B9,14,19
C9,17
D12
E12
F9,12,22,27,33
G9,16,22,27,33
H4,9,16,22,28,33,
I4,9,13,22,27,33,
J4
K4,22,27
M13

Fig. 4: Component placing overlay. Please remember to use sockets for the three integrated circuits.

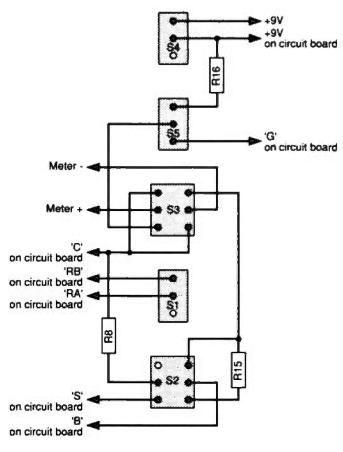
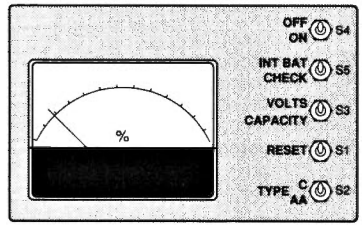


Fig. 5: The interconnection of the switches is shown on the left, with a drawing of the prototype front panel layout on the right.



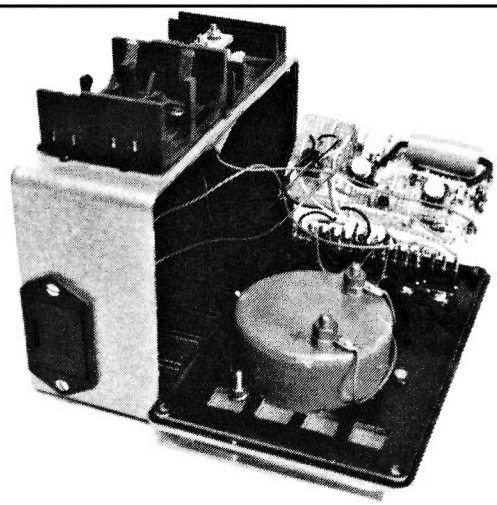


Fig. 6: The completed unit just before final assembly.

Modifications

At first I had only 500mAh cells to verify, but I later found some 1.2Ah cells. A modification was needed to enable these higher capacity cells to be measured. Instead of taking some half-hour to discharge, they would have taken about 75 minutes. I could have merely added another limiting resistor to the meter circuit. The output would then have needed to rise to about 5V equating to 100%. This of course with a maximum rail voltage of ±4.5V would have been impossible.

I solved the problem by two additions. I added R8, a second 10Ω resistor across R10. This has the effect of reducing the input voltage to the integrator to 5.5mV. This is equivalent to 1000mAh. I also added R15 to reduce the reading of the meter by some 20%. A good cell should hold its terminal potential above one volt for some 2.4 times longer than a similar 500mAh cell. These changes should result in a 100% reading at the end of this time.

It would be a simple matter to change the meter to one capable of reading either 2 or 4Ah cells (C or D type cells). Though, in both these cases it would be preferable to decrease the discharge time, by reducing the value of the discharge resistor to 0.25Ω (total) for C cells, or 0.12Ω (total) for D cells.

Construction

The unit is built on a piece of Veroboard, 37 holes by 17 strips in size. The overlay diagram of **Fig. 4**, and the switch connections shown in **Fig. 5** have more details.

Start by making the breaks at the strip locations, with either a 3mm drill or the correct spot-face cutter. Use sockets for the integrated circuits. Because of the very high input impedance of the op-amps they are easily damaged by static electricity(§2). Add all other components, and then the pins for off-board connections. You should encounter few problems with the circuit, even if you don't follow my layout. The circuit operates at almost d.c., and so has no problems with extraneous coupling.

Mark and drill the holes in the box for the switches and meter. The drawing of Fig. 5 is just a suggestion, and again the layout is not critical. You can see in the photograph of **Fig. 6** that, the wires used to couple the various switches to points on the board have been left long enough to allow board re-location if neccessary. When all other components are fitted, gently push the three ICs into their respective sockets. Make sure that their orientation is correct.

The battery holder and loading resistors, with its heat-sink, should be mounted on the top of the box and as close together as possible. If you wish to test D cells then perhaps you might like to fit a further switch, putting a second discharge resistor in parallel with the present one, as outlined above.

Setting Up

There is little to be done in the way of setting up, but the following step is crucial to the accuracy of the instrument. Temporarily connect the junction of TR1 source and R9 to the centre rail point. Set S1 to the closed position and S3 to the 500mAh position. Connect a 9V battery to the circuit and switch S5 to battery test. An almost full-scale reading should be the result. If this is not the case, switch off and investigate. Otherwise measure the centre rail voltage with respect to the negative line. It should give a reading within a few milli-volts of half of the battery voltage.

Connect the meter between the centre rail and the output pin of IC2. Set offset adjuster R11 to give 0V offset. A digital multi-meter, or a very sensitive moving coil meter should be used to measure this offset voltage. Remove the short from TR1/R9 juntion to the centre rail. After completing this, the unit is ready for use. **PW**

How Much **£15+**
How Difficult **Intermediate**

Shopping List

Resistor 5% 0.4W

10Ω	2	R8,10
1kΩ	1	R7
3.3kΩ	1	R15
12kΩ	1	R4
16kΩ	1	R12
22kΩ	2	R1,2
47kΩ	1	R16
100kΩ	2	R13,14
1MΩ	1	R6
10MΩ	2	R5,9

Resistors wire-wound

1Ω(3W)	1	Cell discharge resistor (see below)
Variable Resistor horizontal mount		
10k	1	R11

Optional Resistors

0.33Ω(4W)	1	in parallel with 1Ω (500mAh setting) resistor
0.15Ω(10W)	1	in parallel with 1Ω (500mAh setting) resistor

Capacitors

Disc Ceramic low voltage		
10nF	4	C1,2,4,5

Low Leakage non-polarised (polyester or polycarbonate)

1µF	1	C3

Semiconductors

CA3140	2	IC1,2
LM741	1	IC3
VN10LM	1	TR1
1N4001	4	D1-4

Miscellaneous
A suitable box and battery holder(s), a small heatsink for the load resistor(s), Veroboard, Veropins, 8-pin d.i.l. sockets, 0-100µA meter, 2 off dual-pole double-throw switches, 3 off single-pole dual-throw switches, connecting wire.

Further Reading

§1 NiCad Recycler by Peter Lovelock, *PW* May/June '90.
§2 Electrostatic Precations For The Amateur Maintainer by Stan Crabtree, *PW* January '91.

Access VISA **0202 665524**

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WR281	HIGH VOLT REG PSU	JAN 91	4.60
WR276-80	MARLAND SET (7 BOARDS)	SEPT 90	21.50
+263/4	TRANSMITTER		
WR272	NICAD RECYCLER	JUNE 90	6.92
WR275	LOW VOLTAGE ALARM	JUNE 90	6.36
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WR274	RX ATTENUATOR	MAY 90	5.72
WR271	PRODUCT DETECTOR	APRIL 90	4.95
WR270	BADGER CUB	APRIL 90	4.94
WR269	GLYME	FEB 90	6.70
WR268	IRWELL (r.f. p.a.)	FEB 90	6.00
WR264	IRWELL (relay)	FEB 90	5.00
WR263	IRWELL (vfo)	JAN 90	6.00
WR267	FORTYNINER	JAN 90	6.00
WR266	TUNED ACTIVE ANTENNA	JAN 90	5.60
WR265	TUNED ACTIVE ANTENNA (psu)	JAN 90	5.60
WR262	REPEATER TIME-OUT	DEC 89	4.82
WR261	AM TX FOR 1.8MHz	NOV 89	6.50
WR260	10MHz RECEIVER	OCT 89	5.00
WR259	10MHz RECEIVER	OCT 89	5.00
WR258	10MHz RECEIVER	OCT 89	5.00
WR257	LOW BATTERY WARNING	SEPT 89	5.88
WR256	ACTIVE FILTER	AUG 89	6.96
WR254	TX CONTROL FOR MOBILE USE	JULY 89	5.08
WR253	TS940S MODIFICATION	JUNE 89	5.54
WR252	TWO TONE OSCILLATOR	MAY 89	6.52
WR251	RF OPERATED RELAY	FEB 89	3.80
WR250	DC/AC POWER CONVERTER	JAN 89	3.22
WR249	"MARLBOROUGH" MF CONVERTER	DEC 88	4.60
WR248	"BADGER" 144MHz RECEIVER	OCT 88	9.10
WR247	ZENER DIODE TESTER	AUG 88	3.56
WR246	"PORTLAND" RF VOLTMETER	JULY 88	3.59
WR244	PRACTICE MORSE KEY	JULY 88	2.96
WR245	STOPBAND FILTER FOR PW BLENHIEM	JUNE 88	2.90
WR243	VHF MONITOR RECEIVER (AUDIO)	APRIL 88	2.30
WR242	"ORWELL" VARICAP TUNE OPTION	MAR 88	6.00
WR241	"ORWELL" MED. WAVE RECEIVER SET	MAR 88	
WR240	.. ..	..	9.10
WR239	.. ..	..	
WR238	"OTTER" 50MHz RECEIVER	JAN 88	7.10
WR237	RTTY TUNING INDICATOR	NOV 87	5.20
KANGA	HIGH STABILITY VFO (see issue)	OCT 87	-
WR236	"BLENHIEM" VHF CONVERTER	SEPT 87	7.00
WR235	MAINS ON/OFF FOR BATT RADIOS	SEPT 87	3.00

Board	Title of Article	Issue	Price £
WR234	SIDE-TONE OSCILLATOR	JUNE 87	2.70
WR233	"DOWNTON" F-V CONVERTER	JUNE 87	3.90
WR232	"AXE" SIGNAL TRACER	MAY 87	
WR231	.. ..	..	9.20
WR230	.. ..	..	
WR228	"BLANDFORD" RECEIVE CONVERTER	APRIL 87	
WR227	.. ..	..	9.70
WR226	.. ..	..	
WR298	"ITCHEN" LCR BRIDGE	APRIL 87	5.85
WR225	"WOODSTOCK" SW CONVERTER	MAR 87	4.10
WR219	MASTHEAD PRE-AMP PSU	FEB 87	2.50
WR218	MASTHEAD PRE-AMP FOR 144MHz	FEB 87	4.20
WR224	"WESTBURY"BASIC WOBBULATOR	JAN 87	3.50
WR214	MOD SRX-30D (AUDIO)	DEC 86	3.00
WR223	HIGH-IMP MOSFET VOLTMETER	DEC 86	2.90
WR222	"TAW" VLF CONVERTER	NOV 86	5.80
WR216	LF BANDS ACTIVE ANTENNA	NOV 86	2.40
WR220	GET STARTED LOW-COST CONVERTER	OCT 86	2.40
WR215	SIMPLE 50MHz CONVERTER	SEP 86	3.60
WR213	MOD FRG-7 (CARRIER Osc)	JUN 86	2.70
WR210	"ARUN" PARAMETRIC FILTER	MAY 86	8.10
WR211	"MEON" FILTER (SMALL)	APR 86	3.10
WR209	SIMPLE AUDIO OSCILATOR	MAR 86	4.30
WR208	RF SPEECH PROCESSOR	MAR 86	4.10
WR207	CRYSTAL CALIBRATOR	JAN 86	2.10
WR206	RTTY/MORSE MODEM (Plug-in)	JAN 86	2.80
WR205	RTTY/MORSE MODEM	JAN 86	5.40
WR203	SIMPLE CAPACITANCE METER	OCT 85	2.80
WR199	"MEON" 50MHz TRANSVERTER	OCT 85	6.70
WR202	ECONOMY UHF PRE-SCALER	SEP 85	3.70
WR201	ADD-ON BFO	AUG 85	2.50
WR200	LOW-COST CRYSTAL TESTER	JUL 85	2.50
WAD302	BATTERY CHARGER CONTROLLER	JUN 85	3.00
WR197	"COLNE" (Osc/Converter)	JUN 85	3.90
WR198	"COLNE" (Product Det/Audio)	MAY 85	3.90
A005	"COLNE (VFO)	APR 85	3.10
A004	"COLNE" 3.5/114MHz RX (RF Amp)	APR 85	3.10
WAD249	MOD FRG-7 (BFO)	FEB 85	3.00
WAD280**	TRIAMBIC KEYER	FEB 85	7.10
WA002	"TEME" (RECEIVER)	JAN 85	6.55
WA001	"TEME" (VFO/DOUBLER)	DEC 84	5.19
WR178	DART (Audio / change)	DEC 83	3.00
WR177	DART (p.a.)	NOV 83	3.00
WR176	DART (v.f.o.)	NOV 83	3.00
WAD246	"DART" FOLLOW-UP	DEC 84	4.00
WR196	"TEME" 7/14MHz WRP (TX)	NOV 84	3.70
WR195	STABLE TONEBURST	NOV 84	2.60
WR194	MOD FRG-7 (FM/SQUELCH)	NOV 84	4.50
WR189/92 Pair	BUG KEY WITH 528-BIT MEMORY	OCT 84	8.50
WR190	MOD FRG-7 (SWITCHING)	OCT 84	4.50
WR185	AUTO-NOTCH FILTER	JUN 84	6.50
WR183	TOP-BAND DF RECEIVER	APR 84	6.50
WR179	TRANSCEIVER VOX UNIT	MAR 84	7.50
WR161	"MARCHWOOD" 12V 30A PSU	JUL 83	4.20
WR165 ect set	"SEVERN" 7MHz QRP TX/RX	-	14.90
WR169	"SEVERN" (TRANSMITTER)	JUL 83	6.50
WR168	"SEVERN" (CH.OVER/SIDETONE)	JUL 83	6.50
WR166	"SEVERN" (RECEIVER/AUDIO)	JUN 83	6.50
WR165	"SEVERN" (VFO)	JUN 83	5.20
WR167	RTTY TERMINAL UNIT FOR ZX81	JUN 83	7.80
WR160	LMS REGENERATIVE RECEIVER	FEB 83	5.20
WR156	REPEATER TIME-OUT ALARM	NOV 82	5.20
WR143	ATV CONVERTER	APR 82	7.10
WR144	IAMBIC KEYER	MAR 82	6.50
WR126	"EXE" 10GHz TRANSCEIVER	AUG 81	7.70
WR095	TRANSCEIVER POWER SUPPLY	SEP 80	3.85
WR068	AF SPEECH PROCESSOR	JAN 80	5.20

REVIEW

50MHz Power Amplifier

Need a lift? Boost the output of your 50MHz gear with a power amplifier. 'Tex' Swann G1TEX looks at a Spectrum Communications p.a. kit.

The new TA6S2 50MHz amplifier kit.

In the 'lift' conditions, occurring early last August, I managed to convince my battery-powered 50MHz rig to put sufficient energy into the antenna, to talk to several stations outside of the UK. Notice that I said talk to. Due to a combination of low-power and poor antenna location, I didn't have sufficient 'belt' to call the stations myself. I had to rely on the generosity of a fellow amateur to act as my 'announcer'. Ian had a better signal than I, and so was able to attract the attentions of the LA9 and the OE5/OE6 stations. I fared slightly better with those closer to hand, like the DL stations. Here I had adequate output with my own QRP signal to allow calls to be effective.

Natural Break!

After Ian had deserted the band I continued monitoring 50MHz for some time, and was surprised to hear two ex-patriots in conversation. They were on islands in the Mediterranean (Malta and Gozo). The two stations were clear, but quite weak so I resisted the urge to shout myself hoarse. However the following morning they were much clearer and very much louder. Ah well nothing ventured - nothing gained, "Break please, QRP station G1TEX standing by". Nothing! At the approach of the next break in their conversation, and, by gathering both lungs full of air, I launched a wall-shattering call into the ether, **"Break please, QRP station G1TEX standing by"**. To be rewarded with - the final faint tinkle of the shards of next-door's favourite vase falling to the ground, mingled with the sound of their baby crying in fright. Not even the G7 who was talking to the Malta station could hear me.

That's it! More power is needed. But with little money to play with, which amplifier do I choose? I finally settled on the Spectrum Communications TA6U2, which is a 50MHz unswitched power amplifier. I found sufficient money to pay for it, then phoned and placed the order. Within a few days a padded envelope dropped onto my desk. It had arrived. Included in the kit were the preformed coils, all capacitors and resistors, a heat-sink and two small clear plastics containers with a 'capstan' power transistor in each case.

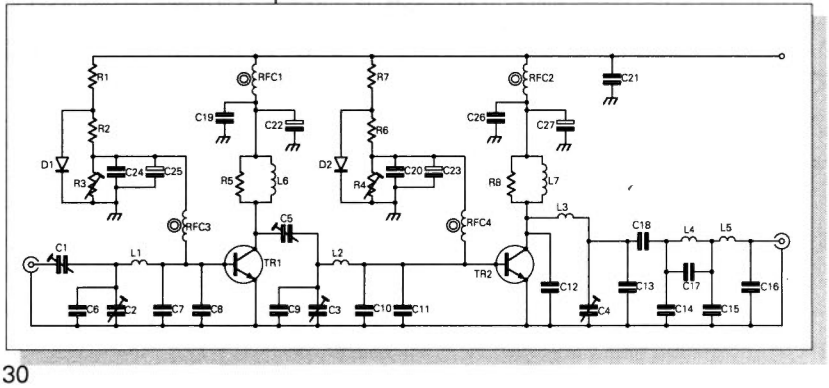


Fig. 1: The general circuit of the power amplifier, by permission of Spectrum Communications.

Pre-Tested Transistors

Each transistor was clearly marked with the input and output power levels on the base and collector leads. They had been tested before dispatch. So if it doesn't work I'm the one who's to blame. The circuit diagram is as shown in **Fig. 1**, reproduced by kind permission of Spectrum Communications.

The actual component values have been left out and the component numbering system is my own. The amplifier is a fairly standard layout, with each stage having its own bias setting circuit. The diodes, D1 and 2, shown in the circuit are in close thermal contact with the amplifier stage that they control the bias point for. This creates a very stable bias arrangement which drifts little with temperature, and yet is simple.

The amplifier, which has been recently updated, was based on a 144MHz amplifier. To give stability and to reduce the gain a little, 'slugging' capacitances had to be added to each stage. This created a slight problem, which I will describe later. This amplifier was designed to accompany the *PW* 'Meon' transverter kit. The design and layout of the amplifier have been improved since then. This may be seen in the photograph showing the kit laid out. The heading photograph is of the new TA6S2 and not the kit that I made up.

Add-On Stage

Basically, each stage has a design gain of about 8-10dB. The amplifier may require an attenuator before the input stage, to restrict the input power from some rigs. This is shown as the three unmarked resistors in the p.a. input circuitry of **Fig. 2**. An input power of no more than 500mW, is required to give the maximum output of 20W(nominal). In fact the sample I had required only around 50mW input for full output power. It could be driven from the signal generator to almost full power.

If anyone is planning to build a simple c.w. or single channel f.m. rig, this amplifier and a good strong crystal oscillator would be more than adequate for the job. The kit could successfully be built by anyone with an ability to follow instructions and a good soldering iron. The two power transistors have large gold-flashed 'wings' on them, and require soldering to large circuit board areas. This must be

done quickly, with a high heat capacity soldering iron, to prevent heat damage to these expensive devices. In testing I managed to destroy the most expensive transistor costing over £12+ to replace.

There's one very important point to remember, a contributory factor in the above mentioned destruction, is that both transistors sit on one heat-sink in close proximity to each other. This has two side effects. One, is as the system takes around 4A on full load, it can become quite hot in use. I had it upside down with no convection cooling during testing. Secondly, to make the heat-sinking efficient, the securing nuts on each transistor must be screwed tightly, **but gently**, home. The transistors **must** be accurately aligned with each other. The transistor/heat-sink mating surfaces must be at the same height from the board. If this is not the case, both transistors might not be adequately 'heat-sinked', which may cause premature failure of either transistor.

Testing Time

If all is well, set the bias setting resistors to minimum and connect the p.s.u., preferably one with current limiting set to about 500mA. Measure the current taken by the first stage, and set it to the recommended level of 25mA. Now do the same for the second p.a. stage, and set its bias also to 25 mA quiescent.

The amplifier is now ready for 'tweaking'. Disconnect the p.s.u. and solder the links in the collector circuits of each transistor. Attach a suitable power meter with a load of 50Ω to the output. This load must be capable of withstanding 25-30W continuous power. Again connect the p.s.u., and monitor the overall standing current. This should be in the order of 150mA. If all is well set the current limit to maximum, or at least 4A. Set the rig on 51MHz (mid-band) f.m., and apply lowest power to the attenuated input.

Working backwards from the output filter, you should adjust each variable capacitor for a 'peak' on the power meter. Then you should 'peak' the capacitors around the first stage. At this point, depending on the drive level, there should be about 15 or 20W of r.f. at the output. Should you have a wide range of peak settings, or if you are unable to obtain a definite 'peaking', it may mean that the input power is too great. The input power should be reduced to a more manageable level. One possibility is that the amplifier has 'taken-off', (burst into oscillation). My amplifier, under hard drive levels, did just that. If removing the drive does not cause a fall of output power this is most likely what has happened. I was advised by Spectrum, on phoning to query the problem, to stretch the base loading coil of the second stage. Then I had to readjust all the capacitors again.

This time the set-up was easier, and no instability was noted. A slight amount of under-driving gives the amplifier a margin of overhead on speech peaks. This reduces the 'splatter' caused when shouting, or using a compressor microphone to achieve a good modulation level on s.s.b.

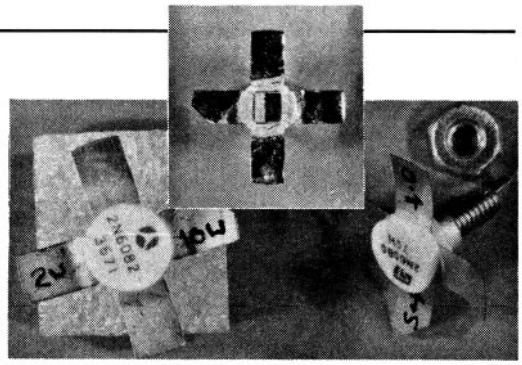


Fig. 4: Photographs of the power transistors. The two transistors are as they were received, but the single (inset) one shows what can happen if one of them overheats.

Change-Over

The new TA6S2 model now supplied by Spectrum Communications, is a redesign with on-board change-over switching, and the circuit is on a larger board.

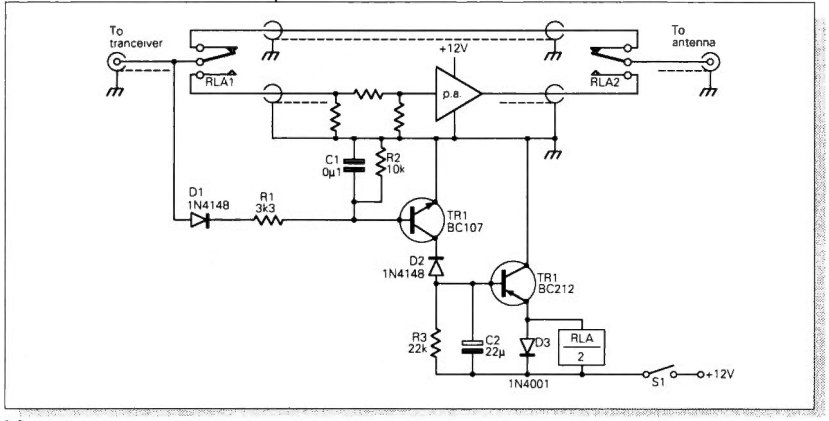
On my kit I had to arrange a change-over relay to put the p.a. stage into circuit when transmitting. The circuit is not very exotic, but was chosen for simplicity and sensitivity. This is because only 3V, or so, of r.f. is available when the power is limited to 250mW. The 'hold-on' time has to be arranged as long enough to hold on during pauses in speech, but to drop-out soon after transmission ends. Certain transceivers have a steady potential available at the centre contact of the antenna connector when in transmit, so no coupling capacitor was used in the design. If this is the case with your rig, then the 'hold-on' time may be reduced to about 0.25 or 0.5s.

So now I have my equivalent of a 50MHz 'ghetto-blaster', with at very minimum another two S-points available on transmit. All I need now is the opportunity to try it.

PS. What a pity 9H5ET and 9H4CM couldn't hear me. They'll never know how close they were to a direct link into the editorial offices.

PW

Fig. 2: This is the circuit I chose for my change-over switching.



Specifications

Output Power	30W peak, 20W continuous output.
Minimum of 20W with 500mW input at 13.5V supply.	
Spurious emissions	better than 40dB below maximum output.
Maximum input	500mW without attenuator.
Power requirements	12-13.5V at 4A maximum current.
Temperature rise	no more that 20°C above ambient.

Price £58.50 for the boxed kit, from:
Spectrum Communications,
Unit 4, Grove Trading Estate, Dorchester, Dorset DT1 1ST . Tel: (0305) 262250

My thanks go to Spectrum Communications for all their help given, and for permission to reproduce the circuit diagram.

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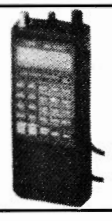

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A 'Magnetic' Loop for 50MHz

Going Portable? Would you like a shopping bag sized antenna for 50MHz? Kevin James G6VNT can deliver the goods.

Have you ever wished for a small antenna that would fit behind the driver's seat of a small car for portable operation? Or one that would fit through the loft trap-door? With this novel design, you no longer have to wish. This loop antenna is just over 470mm in diameter and is not only tunable over the whole of the 50MHz band, but is also simple to build.

Loops In General

The 'magnetic' loop antenna has been described in greater detail by Fred Judd G2BCX, in his articles in recent issues of *PW*, (Dec '90/Jan '91). So no mathematics or other description will be given in this article. Sufficient to say that as a high 'Q' antenna, it has a narrow bandwidth. This bandwidth is typically 200kHz, but may vary about this figure from antenna to antenna. As explained by Fred Judd, the polarisation is in the plane of the loop and so the loop must, to comply with your licence, be operated (at present at least) horizontally. Also the capabilities are not equal to a $\lambda/2$ dipole, but subjectively, it's not very much less. It does however, more than make up for this deficiency by its very small size. It is only a seventh of the width! The open ends of the loop are very high impedance points. Consequently, tuning will be affected by hand capacity effects. For this reason an insulated extension is fitted between reduction drive and the tuning capacitor.

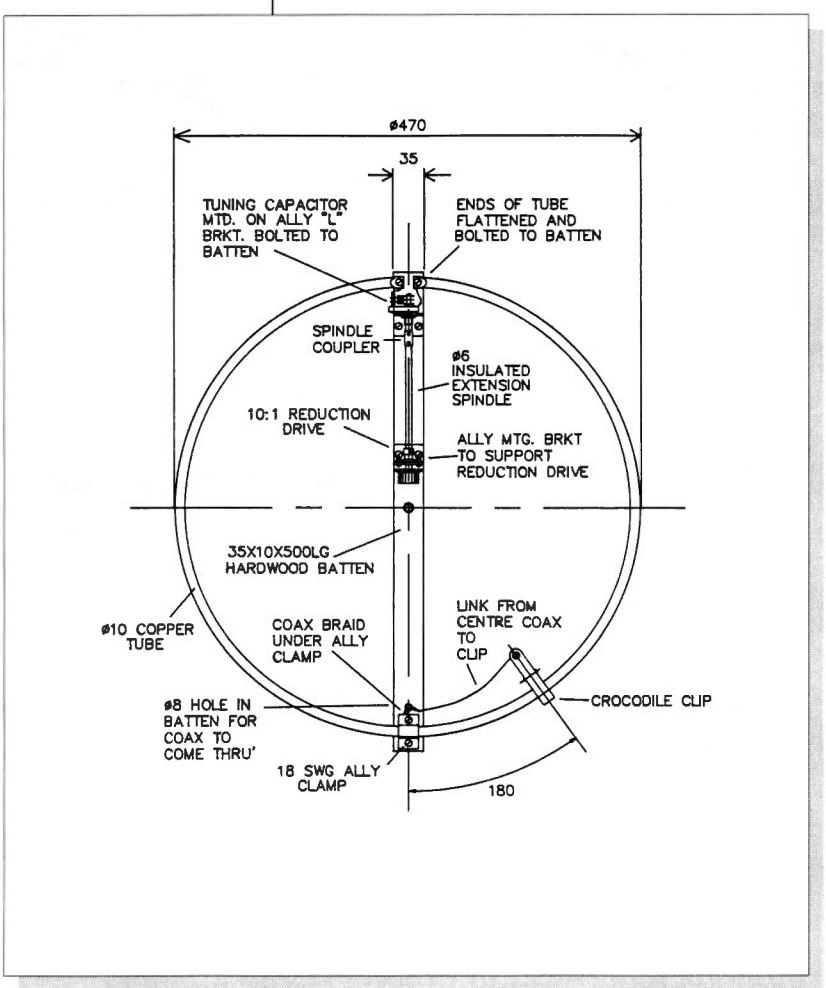


Fig. 1: Full drawing of the 50MHz loop, note the centre mounting hole for horizontal polarisation.

Construction

The main mounting member, a piece of hardwood 35x10mm in size, is a little over 500mm long, **Fig. 1** has more details of the overall construction.

Micro-bore central heating pipe of 10mm diameter is extremely easy to bend to the required shape. Hammer the ends flat in the plane of the loop, and drill holes to take an M3 screw in each end. The tuning capacitor and associated pieces were all obtained from my local Maplin store.

High levels of r.f. voltage are present at the vanes of the tuning capacitor, so this **must** be of good quality. To further improve the flash-over protection and reduce the capacitance, remove two fixed vanes from the tuning capacitor, to leave just two fixed vanes. This may be done by gently bending, each vane to be removed back and forth, with fine pointed pliers. Solder one short wire from the fixed vanes terminal, to one end of the loop. Then a second wire from the moving vanes terminal, to the other loop end. Make up a couple of aluminium 'L' shaped brackets, as shown in **Fig. 2**. These support the reduction drive and the tuning capacitor. The drawings **Fig. 3** show more details of the mast adapter bracket.

The RG58 coaxial cable (from the rig and s.w.r. meter) goes through a hole, close to the loop clamp on the batten. The braiding is held under, and connects electrically to this clamp. The centre of the cable is extended with a short length of pvc covered wire, with a large 'crocodile' clip on the end.

Points To Watch

Matching of the antenna system is by a gamma match 'rod'. Although somewhat crude the clip used does make it extremely easy to adjust. Keep the loop, and especially the tuning capacitor, as dry as possible. Water will cause serious detuning or even the possibility of shorting out altogether. Only an airspaced tuning capacitor should be used due to high r.f. voltages generated at this point. Other types may be likely to break down.

When making v.s.w.r. adjustments, key up on low power, adjust the tuning knob backwards or forwards for lowest s.w.r., then repeat this at the working power level. In order to achieve the lowest v.s.w.r. you may find it necessary to adjust the clip either side of the dimension shown in the diagrams. Tuning is critical, but easy.

Mast Details

I use a home-made telescopic mast from three lengths of aluminium tubing, each about 1.5m long. These had diameters of 22, 19 and 16mm. Each one fits, without slackness, inside the tube of larger diameter. Holes were drilled about 50mm in from the end of each tube. Spring clips, purchased from the local camping and caravan shop, were inserted (one in each of the two smaller tubes). These clips are designed for the 'click' ends of awning frame tubes. When each tube is inserted into the next largest tube it will click into position, stopping the tubing mast from collapsing. A metal ground spike (with tight-fitting polypropylene bush around it) is fitted to the end of the bottom (largest) tube. These

Fig. 2: Three views of the capacitor or reduction drive brackets. Two of these are needed for the antenna.

Fig. 3: This 'L' shaped bracket attaches in the middle of the support member to allow the loop to be held horizontally.

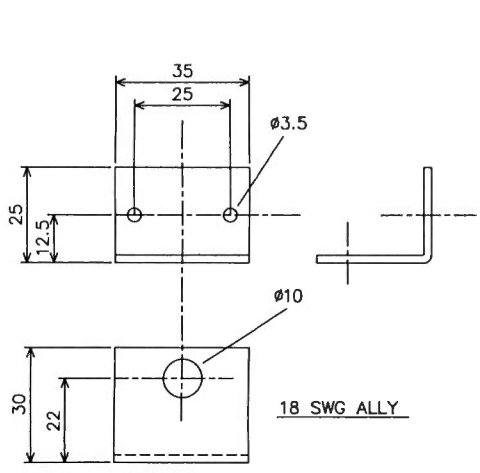


Fig. 2.

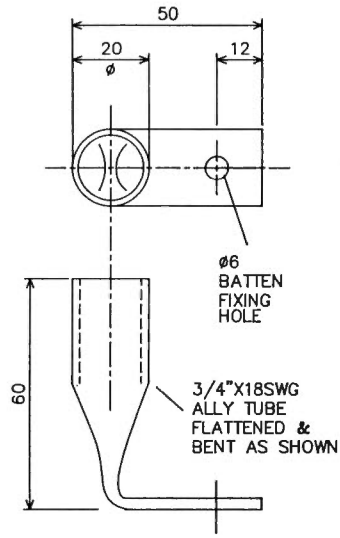


Fig. 3.

spikes are also available from the local camping shop, being used on the end of awning support stays.

Loop On Location

The mast has the loop pushed firmly onto the top tube, and the bottom tube (with the spike in it) is pushed firmly into the ground. The extended mast is tied to the car, with an old piece of rag, so as not to scratch the car and so upset the XYL!

PW

HOW MUCH? £12 approx. HOW DIFFICULT? Beginner

Shopping list

1.5m of 10mm copper (micro-bore) central heating piping
5pF air-spaced tuning capacitor (ceramic Jackson, 10pF with two vanes removed, is best). A reduction drive (10:1) for 6mm shafts, plus a suitable length of 6mm diameter plastics shaft. One large 'crocodile' clip, several pieces of 18s.w.g. aluminium flat sheet and short lengths of tubing (see drawings for more detail). A suitable length of 35x10mm hardwood

Errors And Updates

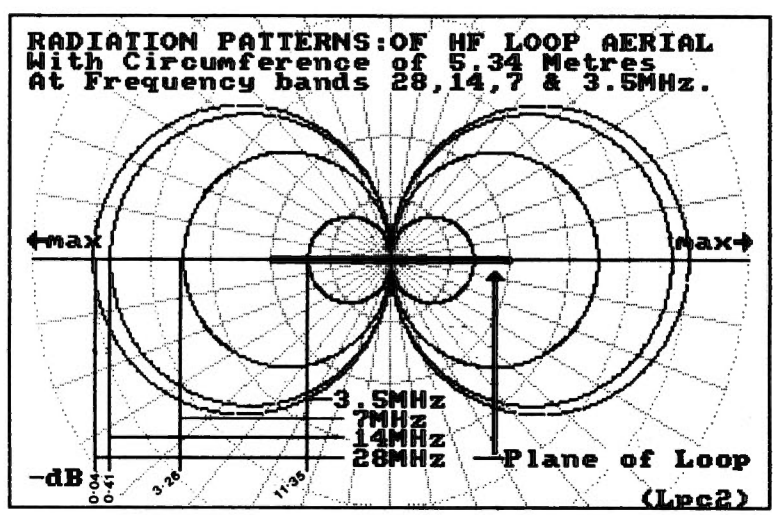
Circular and Square Loop Antennas
Part 2
January 1991 Pages 24-26

A case of 'crossed-polarisation' occurred with **Fig. 2.7,** on page 26 of this article. The diagram of Fig. 2.6 was inadvertently repeated into the space. The correct **Fig. 2.7** is reproduced here. The caption, printed below the figure, was correct. Only the diagram it was placed under was wrong.

A further slip of the editorial pen (mouse?) also cut out some words from the last paragraph of the article. The last sentence that begins, "But the magnitude of the pattern.....", should have appeared after the following text:

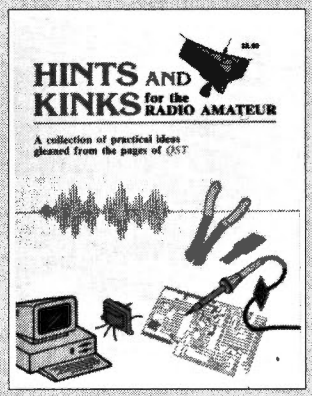
"The angle of this lobe shown depends on the distance, measured in wavelengths at the working frequency, that the λ/2 antenna is above ground, and is for comparison only."

We apologise to the the author, Fred Judd G2BCX, and to our readers.



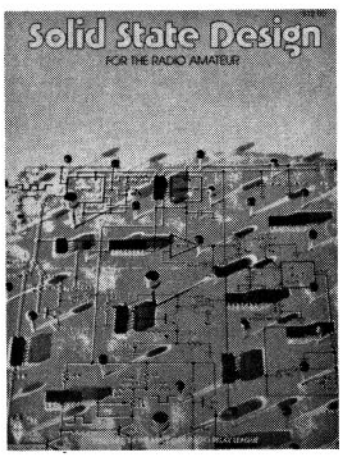
Book Reviews

Hints And Kinks For The Radio Amateur
Editors Charles Hutchinson K8CH and David Newkirk AK7M
American Radio Relay League Inc. (publishers)
152 pages, £4.95
Available from *PW* Book Service, 85p post and packing



If you're a keen 'snippets' collector and enjoy the 'What A Good Idea' page in *PW*, this book is for you. All the items in the book are drawn from the 'Hints & Kinks' column in the ARRL's *QST* magazine. It's an indication of how popular the book is, as this edition is the 12th of a series that began in 1933. You can find out how to use a hair-drier as a 'heat gun' for surface-mounting components and also how to make a de-soldering jig for integrated circuits. The book contains a wealth of practical advice and ideas, gathered from many years practical experience.

Solid State Design For The Radio Amateur
Wes Hayward W7ZOI and Doug DeMaw W1FB
American Radio Relay League Inc. (publishers)
256 pages £10.95
Available from *PW* Book Service, 85p post and packing.



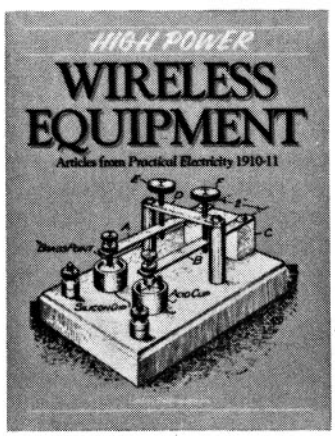
This book can be said to be a designers compendium. If you need advice on an amateur radio project, from the designer's point of view, you'll find it here. This book is well worth having in the shack, just to have access for the various proven circuits it contains. It's also a very useful source of design tips and aids that could save you many hours of fruitless labour trying to trace faults. You could avoid design errors with the help of this book, and enjoy yourself while learning and building any of the host of projects.

The Radio Amateur's Question & Answers Reference Manual Fourth Edition.
R. E. G. Petri G8CCJ
W. P. Publications ISBN 0-9509335-3-8
235 pages £7.95
Available from *PW* Book Service, 85p post and packing.

Ray Petri's reference manual has - since its first appearance in 1984 - become deservedly popular as an RAE class handbook. The book does not claim to be a 'stand-alone study source'. However, it does the job intended, as the title clearly indicates, in a simple, unpretentious and practical way. The manual provides sample RAE questions in book form - with the answers nearby for the student to check, after they have absorbed material from it, and other sources.

Best used in a classroom environment, the book lends itself to examples and answers in just the way the Ray Petri intended. The manual also serves a useful purpose as a 'quick reference' reminder to 'older hands' who might find their mathematics growing stiff through lack of use. A useful book for any radio amateur and teacher, let alone the beginner.

High Power Wireless Equipment - Articles From Practical Electricity 1910 - 11.
Edited by Henry Walter Young
Lindsay Publications Inc.
99 pages £6.85 ISBN 0-917914-95-3
Available from *PW* Book Service, 85p post and packing.



This is an unusual book as it provides an interesting look at the 'good old days of wireless' through the reprinted pages of a contemporary American magazine. If you're fascinated by the pioneering days of radio and would like to see just how they had to build literally everything for themselves, you'll enjoy this well-illustrated reproduction.

Essential Circuits Reference Guide
Edited by John Markus and Charles Weston
McGraw-Hill Publishing Company ISBN 0-07-040462-3 (HC) & ISBN 0-07-040463-1 (SC)
530 pages £32.00
Available from McGraw-Hill Books, Shoppenhanger Lane, Maidenhead, Berkshire, Tel. 0628-23431.

Many more radio enthusiasts should be aware of this book. In format it's a large and heavyweight-style paperback publication - but that's only because there are so many 'building brick' circuits and projects packed into the 530 pages. If you're an enthusiast who delights in looking for circuit ideas - with only the basic essential information provided - this is the book for you. The material in the book - it could be called a circuit encyclopaedia - has been gathered from various other publications edited by the late John Markus and his co-Editor Charles Weston.

Some of the circuits have been gathered from the invaluable McGraw-Hill *Guidebook of Electronic Circuits* - this one had over 1000 pages! - and if you're not fortunate enough to own one of these - this smaller publication covers many areas of interest to amateur and professional alike. It is extremely wide-ranging, and within 62 logically-planned sections includes everything from antenna circuits to zero-voltage measuring ideas. This book is an essential guide for any designer and builder - amateur or professional - and is highly recommended for any strong bookshelf.

Dayton Hamvention Holiday - Final Call!

Fly *PW* on April 25 to the biggest and best amateur radio show in the world. Don't miss the chance of a lifetime, come and join us as we fly from the UK to Dayton USA - with the minimum of fuss. So much to see, so much to do - but hurry - this is the **LAST CALL for the *PW* Dayton '91 Hamvention Holiday.**

The *PW* party leaves the UK on Thursday April 25 and returns on Monday 29 April. We shall be staying in the luxury 'up market' Radisson Inn during our stay in Dayton, Ohio. For confirmation of the price of the fare, deposit required, and further exciting details of what's on offer for you and your family - **contact Roger Hall G4TNT on 071-731-6222** - but hurry - this is the **LAST CALL FOR DAYTON '91 - BOARDING ON APRIL 25 1990.**

Many amateurs have dreamed of visiting Dayton Hamvention but have been put off by the cost and the normally awkward journey. Now readers can take advantage of the very special deal we have put together. The Dayton trip leaves the UK on the Thursday before the show and returns on the following Monday.

Included in the price is the air fare, four nights accommodation, transport to and from the airport and a three-day pass to the show.

Courtesy buses will be provided to take us to and from the show, the shopping malls and local places of interest. Food is not included in the price, but anyone who has eaten out in America will know that this is a minor expense.

Please do try to book early as the number of places is very limited and bookings will be dealt with on a first come first served basis. Just fill in the coupon and return it to: DAYTON OFFER, PW PUBLISHING LTD, ENEFCO HOUSE, THE QUAY, POOLE, DORSET BH15 1PP.

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Prices quoted are based on air fares and Hotel prices as we go to press in December 1990. Readers should be aware that due to the present International situation, prices, booking conditions and arrival times in April 1991 may be subject to changes.

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Five Up, One Down On 144MHz

Many new licensees, on the air for the first time, start out with 144MHz and spend as much as they can on the new rig. This leaves little over for a good antenna and often leads to disappointment with the band due to a poor signal both ways. What is needed is an antenna, both cheap and yet good.

I read an article in the mid-'80s about feeding an h.f. dipole λ/4 from one end, with odd multiples of λ/4 in the other direction. I guessed that such an antenna might work as well on either the 144MHz or 430MHz band. As I had no suitable u.h.f. rig, I decided to try the idea out on 144MHz. The majority of the bits came from an old λ/2 CB antenna some 5.3m in length. These pieces consisted of two 1.5m lengths of 12mm diameter and two 1.5m lengths of 9.5mm diameter. The feed point was a hard plastics, weather-proof dipole centre.

Difficulties First

The fun part came with the mathematics, a subject that I hate passionately. With the aid of my trusty, but battered calculator, I began to play with the numbers. The first item to be worked out is the value of λ/4 at 145MHz. That works out as (75/145 x 1000)mm, the answer being 517mm. Part of this distance is taken up by the connections within the centre connector box, leading to a revised measurement of 495mm. I used a length of the 12mm diameter tubing for this piece. The upper piece, 2.55m in length, I could just make from the old antenna bits. It matched reasonably well, but required shortening a little to provide an efficient match.

Design Review

The first attempt worked, but was rather 'end-heavy'. After I reviewed the notes, I realised lighter tubing was needed. So I bought some 6.3mm diameter rod during my visit to the 'G-MEX' show. I rebuilt the antenna using this rod as a sliding tuner. Drawing, **Fig. 1,** shows all the details of the antenna, which is the equivalent of a 5λ/4 vertical with a feed impedance close to 50Ω.

Adjustments

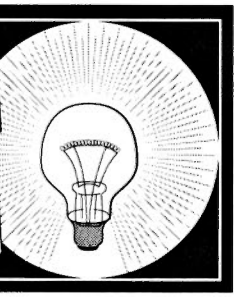
Set the overall length to 2.55m before beginning the tune/matching adjustment. This is done by sliding the 6.3mm rod into the 9.5mm tube. Tighten the Jubilee clamp before checking the v.s.w.r. again. It should be possible to achieve almost a 1:1 s.w.r. As the antenna is both slim and light, it may be fixed almost anywhere. Clamped to the top of a short 38mm diameter pole, it could be mounted on the wall just under the eaves, or on a bracket on the chimney. You should remember that to maintain the advantages of a good match, low-loss coaxial cable should be used if the run is more than a few metres in length.

Results

I loaned this antenna to a friend who's just received his licence. He has it clamped to the edge of his loft hatch indoors. Using a hand-held rig, he has obtained a 5 S-point better signal using it, compared to a smaller antenna. Though he is only a few miles away and S-meters are not all that accurate, this should serve as an indication of the sort of improvement which might be expected.

J. D. Bolton G4XPP, Timperly, Cheshire.

WHAT A GOOD IDEA



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We've always been proud of our authors and their work. Now you can join in - and win £25 - by sending circuits and projects to 'What A Good Idea'. It's the ideal solution to the advice often offered by friends who suggest that 'You should publish that!'

Circuits - accompanied by the minimum of text - must be **neatly** and **clearly** drawn in ink. Wherever possible the idea must be original, although your suggestion might be a significant improvement based on another idea. In which case you should always quote the original source. All entries will be acknowledged. Send your entry, with your name and address, to: **'What A Good Idea', Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP.**

PLEASE NOTE: that we at *PW* may not have built and tested the circuit, but present it on an 'as-is' basis. We do take the greatest care in preparation of the article, but cannot be held responsible for the suitability of the original suggestion, or for any damage that may occur to property or equipment in implementing this idea.

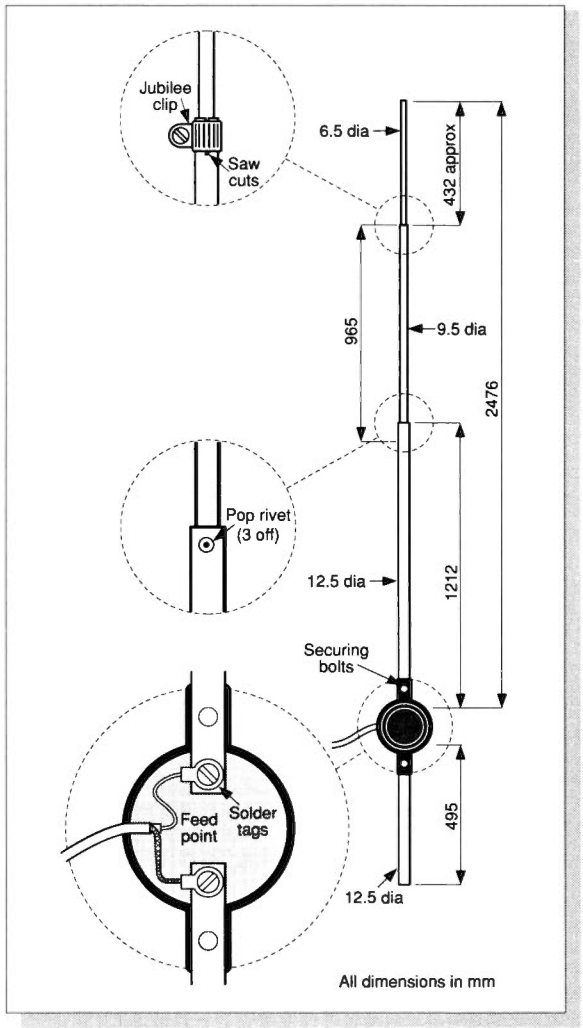

Fig. 1: G4XPP's simple antenna design

WHAT A GOOD IDEA

Regulated discharge, the key to improved health?

The only disadvantage of the otherwise excellent 'NiCad Recycler' that appeared in *PW* in May/June '90, was a rather poor discharge method for the cell(s) under test. The use of a fixed resistor is fine, if the number of cells being recycled is fixed. However, most of us use a variety of battery packs whose terminal voltage may vary from 4.8 to 12V.

Design Ideas

To achieve a constant(?) current discharge, would require many differing high-power, high-cost, resistors. I calculated that I would have to spend at least £20 on these resistors to satisfy the many types of battery that I wished to check. There had to be a cheaper, and better, way to make a voltage independent, constant current discharge path. This unit had also to be built into the 'NiCad Recycler'.

It's easy to create a constant current unit which works at a voltage of some 2V upwards. A circuit to work at a potential of 1V was more difficult to design. A bipolar transistor circuit was tried and discarded, as too complex to be effective. A power f.e.t. (v.f.e.t.) seemed to offer a suitable compromise, but needed a higher voltage on the gate to bring it into a high current conduction.

With most of these devices, a forward bias of about 2-4V is required to bring about a drain-source current of about 1A. I decided that a maximum of about 5V should be necessary to bring the v.f.e.t. into adequate conduction. Just to make sure I used the 21V rail provided in the original unit. This was limited to 5.1V by a Zener diode, shown in **Fig. 1** as D1. Transistor TR1 acts as the current regulating device, regulating the bias to TR2, to maintain a relatively constant voltage of 0.6V across R2 and any other resistor in parallel with it.

Construction

Transistor TR2 was mounted, using an insulating mounting kit, onto the rear wall of the unit, in place of the resistors. The Zener diode D1, transistor TR1 and resistors R1 and 2 were mounted on a small piece of Veroboard, mounted strip-side up and stuck with epoxy resin adhesive close to TR2. The leads from TR2 were soldered directly to this board.

Remove the wire that connects the circuit board to the wiper of S4. Replace this wire with one from the same point on the circuit board, connecting it to the drain of TR2. The original resistors on S4 are replaced with a selection from those in the table of **Fig. 2**. The wiper of S4 is now connected to the source of TR2. The 21V supply is picked-up from the output of IC1 on the original circuit board.

Carefully check that you have correctly wired the unit and that there are no solder bridges anywhere. The unit is now ready for use.

Niel Starkie
Allerdale, Cumbria

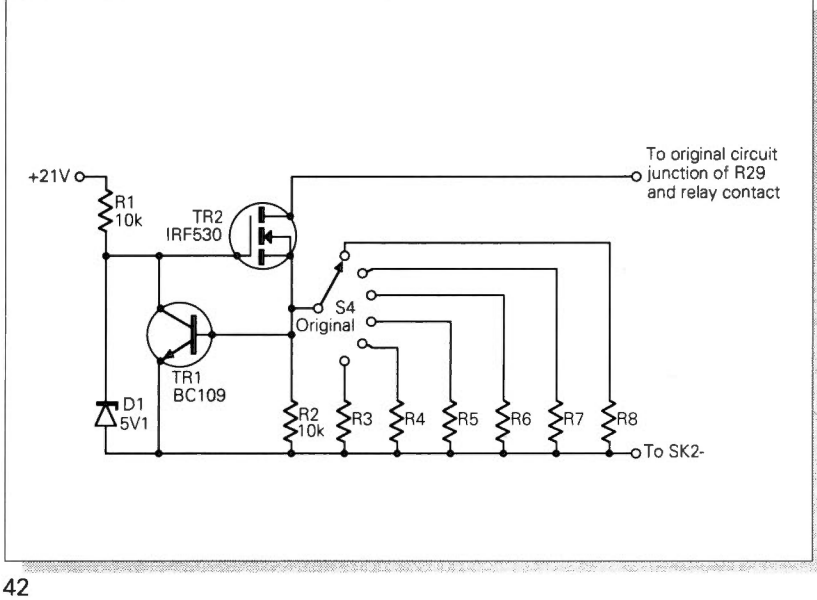

Fig. 1: The circuit of the simple constant current generator. The power f.e.t., TR2, is a 100V, 14A device with a maximum power rating of 75W.

Resistor Selection

Current limit	Resistor value	Power rating
5mA	120Ω	0.25W
10mA	62Ω	0.25W
20mA	33Ω	0.25W
50mA	12Ω	0.25W
100mA	6.2Ω	0.25W
150mA	3.9Ω	0.25W
250mA	2.2Ω	0.25W
500mA	1.2Ω	0.4W
1A	0.62Ω	1W
2A	0.33Ω	1.5W
4A	0.15Ω	2.5W

Fig. 2: The new resistor selection dissipates much less heat. Even at 4A constant current only a 2.5W resistor is required and this is the maximum dissipation whatever the battery voltage.

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Reflections

Ron Ham draws your attention to auroras in his regular propagation and personalities column.

This month I must give pride of place to **Patrick Moore's** fantastic drawing of the massive sunspot group, **Fig. 1**, which he observed at 1040 on November 21. As usual he used the solar projection apparatus attached to his telescope at his observatory in Selsey, Sussex, to produce this hard copy for us all to see.

At this point lads and lasses, I know that Patrick would be the first to join me in saying, please, **never look at the sun directly, or through any optical instrument because of the risk of serious injury to your eyesight and brain**. I suggest that you get proper advice about the right instruments to use from your local astronomical society, before any of you consider studying the sun. Astronomy, like amateur radio, is a wonderful hobby, but it also has its dangers and the equipment must be taken seriously.

Such a group of sunspots must have been full of activity and, although I have no details yet, I bet it was ejecting streams of charged particles, like 'S' in **Fig. 2**, towards the earth's orbital path. When such complex streams actually collide with our atmosphere then the natural state of the ionosphere will be disturbed and/or an aurora may appear around the earth's polar regions. I remember so well, from 16 years of running a solar radio telescope, just how exciting the life cycle of a large sunspot group can be, especially when its output resulted in an aurora or a general 'foul-up' of radio communications. On such occasions we are seeing the great powers of nature at work.

Aurora

Readers who have seen an aurora, with its colourful light dancing across the night sky, will no doubt agree that it's just fantastic to watch its beauty, randomly changing as intensity ebbs and flows. Most astronomers among you will know that **Ron Livesey** (Edinburgh) is the auroral co-ordinator for the British Astronomical Association and, for his journal reports, he has asked observers to list their auroral sightings under the following headings: **1.** 'Glow or unspecified form', **2.** 'Homogenious arc or band', **3.** 'Rayed arc or band'; **4.** 'Ray bundles'; **5.** 'Active, flaming or flickering'; **6.** 'Corona' and **7.** 'All-sky activity'. During October he received reports from observers, ranging from Worcester, the Isle of Man and through Scotland to the Ocean Weather Ship *Cumulus* at station 'Lima' in the mid-Atlantic. They were of category 1, 4 and 5 overnight on the 9th; 2 on the 10th; 1 on the 11th, 12th, 14th, 16th and 19th; 4 and 5 on the 20th; 3 on the 23rd; 2 and 5 on the 29th and 5 on the 31st. In addition the auroral effect on v.h.f. radio signals was heard by **Tony Hopwood** (Worcester) and **Doug Smillie** (Wishaw) on days 9, 10, 11, 15, 20 and 23. Doug mainly monitored the signals from the 144MHz beacon in Lerwick, GB3LER. There are so many ways in which radio and astronomical enthusiasts can co-operate for the benefit of science in general.

Radio Observation Of Aurora

The chances to study an aurora in detail are limited to its appearance during the hours of darkness and that's reliant on the sky being clear and free from moonlight at that time. However, since the advent of radio, the presence of an aurora under adverse conditions, can be discovered and its position located with a v.h.f. communications receiver and a rotatable Yagi antenna.

Briefly, an aurora is a temporary area of random ionisation, from which terrestrial radio signals can be reflected, and it is these reflected signals that prove its existence. For instance, the normal direct-path reception of the letter 'C', from a c.w. transmitter, would be the familiar sharp 'dah-di-dah-dit'. However, after that signal has bounced off an auroral display it sounds like 'ror-ri-ror-rit' and is then logged simply as 'tone-A'. Although the crisp note of the original signal has been changed by the aurora to a low-pitched 'rasp', the important thing is, that it can still be read and therefore its source identified. Incidentally, reflected television pictures are surrounded by distorted images and the speech and music from many broadcast stations become a continual 'burble'.

Various groups of amateurs alert their fellow enthusiasts by telephone as soon as auroral conditions prevail and such immediate action means that many more operators have a chance to work or hear some amazing DX via this strange mode of propagation. The first priority is to point a 144MHz beam toward the north and 'peak-up' on any 'tone-A' signal heard. Make a note of this beam-heading and if the position of the reflecting area moves then the signals will fade and the antenna direction will require further adjustment. This may happen several times during the lifetime of an event, and by noting each new beam-heading, the position of the aurora can be plotted. Such information is of great help to the auroral co-ordinators of the BAA and the RSGB, who accumulate reports from as many sources as possible.

Right Place - Right Time

A massive and very active sunspot group was present on the sun's disc throughout the first week in August 1972. The accompanying radio-noise, at 136MHz, increased in strength each day and peaked on the 4th while the group was around its central meridian passage. At midday on the 4th, the solar noise was so strong that the pen of my chart recorder spent most of the three hour observational period against the upper stop. This convinced me that the earth was getting full blast from this solar storm.

It had been raining heavily for most of the day, but, fortunately, by 2100 the rain and cloud had passed revealing a dark sky, so clear that the millions of stars in the Milky Way were seen shining like crystals. Later, while looking for satellites, my attention was drawn to an arc of white light in the north and, very soon, a pair of beams, each about 5° wide and some 15° apart reached high above my zenith, **Fig. 3a**, and I suddenly realised that this was the start of an aurora, an event which I had never seen before and, what's more, seldom seen from Southern England.

As it proceeded the beams faded and a great blotch of light appeared in the north-east, **Fig. 3b**, which soon moved to north-west. However, the climax came very early on the 5th when several fingers of light appeared, **Fig. 3c**, but this time they were delicately tinted on one side with red, or green, or light blue. This was spectacular enough, but the grand finale came when the bright stars of Ursa Major (the Plough), top **Fig. 3c**, were seen shining through a pink glow which illuminated the sky and became the backdrop for the many beams of coloured light.

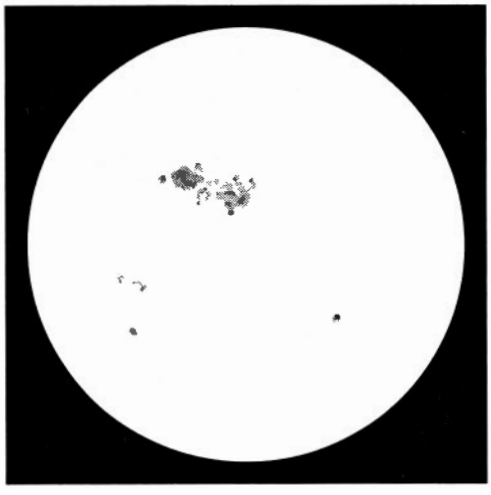

Fig. 1: Sunspot Group Nov 21

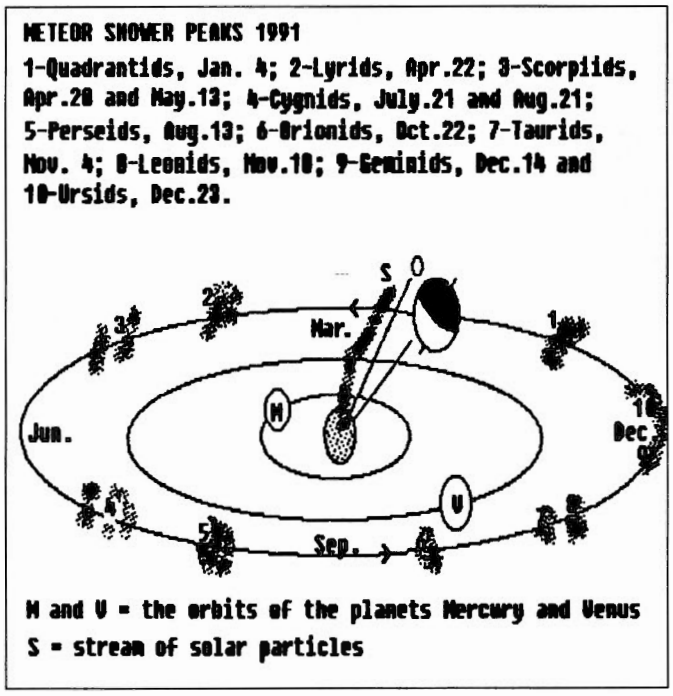

Fig. 2: Orbital Paths & Meteor Showers

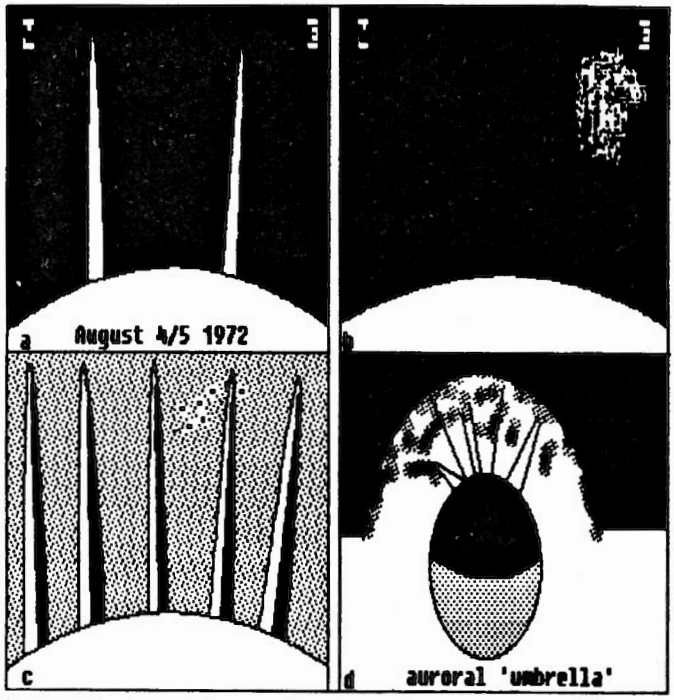

Fig. 3: Ron's 1972 auroral observation represented in diagramatic form

Although I was privileged to see this display I missed out on the radio observations, however, I learnt from colleagues next day that this aurora had an umbrella effect, **Fig. 3d**, and that 'tone-A' signals were being reflected from many directions.

The press reported that these 'northern-lights' were also seen from Northern-France and as far south as Bilbao in Spain. Another aurora manifested around 1400 on the 5th, but this time it was broad daylight and could not be seen. Fortunately it was still 'observed' by a good number of v.h.f. radio-operators who recognised the 'tone-A' signals and were able to tell the astronomical world that another 'unseen' aurora had taken place.

Meteor Trail Reflection

In addition to an exaggerated drawing showing the orbital paths of the three inner planets of the sun's family, **Fig. 2**, I have listed most of the meteor showers which the earth will encounter on its annual journey around the sun. Random meteor particles are burning up in the earth's atmosphere all of the time and are often called 'shooting-stars' because they appear as a streak of bright light darting across the night-sky. At certain times of the year the earth passes through great swarms, called showers, of these particles and, in **Fig. 2**, I have added the date to each of the names which is the predicted peak and best time for observation. For example, the earth is within the Quadrantids between January 1 and 6 and the expected peak is around 0300 on the 4th. There are two lines at the centre of **Fig. 2** which indicate that the light from the sun illuminates the moon and approximately half the earth and at times, the reflected sunlight from the lunar surface is so bright that the colourful displays from aurora or burning meteors cannot be seen. This can be likened to heavy QRM in the radio world, hi!

Autumn Disturbances

Observers using magnetometers in Bristol, Carlisle, Edinburgh, Saltash and Worcester between them found that the earth's magnetic field was mostly disturbed on October 9, 10, 11, 14, 20, 23, 29 and 31. **Neil Clarke G0CAS** (Ferrybridge) reports that the "most active period" was the 10th, 11th and 12th when the 'Ap' index was 44, 38 and 33 respectively. Neil also told me that the solar flux reached 232 units on the 15th and was down to 143 units by the 31st. **Ern Warwick** (Plymouth) found the 28MHz band almost dead on the 10th, very noisy at midday on the 15th and 18th. He also heard echos on the signals from the United States beacon WA4DJS and a New Zealand station ZL3GO around 1600 on the 18th and 0830 on the 22nd respectively. Ern heard echos again on WA4DJS on November 13, 21 and 24 and on the beacon signals from Italy (IY4M) on the 15th and 21st and Australia (VK2RSY) on the 23rd.

John Levesley G0HJL (Bransgore) reports that 28MHz propagation was good on the 10th and several beacon observers showed by their logs that in many cases, between October 26 and November 24, signals from the 28MHz beacons in Australia were frequently copied and those in Germany, North and South America and South-Africa were generally heard each day. **Fred Pallant G3RNM** (Storrington) said that, "during the period the 4 South-Americans beacons were very often amongst the first audible from 0800 to 0930". **John Woodcock** (Basingstoke) said, "Ten Metres has been very good the last few weeks" and added, "seems to be quite a peak again this autumn".

Fig. 4: Dubai TV

David Glenday (Arbroath) received pictures from Spain on Chs. E3 (55.25MHz) and E4 (62.25MHz) during a flurry of Sporadic-E activity at midday on November 19 and earlier in the month, while the high atmospheric pressure was falling from 30.4in (1029mb) at noon on the 6th to 30.1in (1019mb) at 1200 on the 9th, he logged pictures in Band III (175-230MHz) from Denmark and Norway and from Belgium, Denmark, France, Germany and Holland in the u.h.f. band.

Among the Sporadic-E conditions identified by **Lt. Col. Rana Roy** (Meerut, India) during September and October was an opening on September 17, when, at 1345, he received a test-card from the USSR on Ch. R1 (49.75MHz) and at 1926, an Arabic play from Dubai TV, **Fig. 4**, on Ch. E2 (48.25MHz). Rana also identified television signals sometimes from the USSR and Thailand while 'F2' disturbances were in progress on October 9, 11, 13 and 16.

Computers

For the benefit of the computer buffs among you, I used the Microsoft Windows 'Paint' programme to draw the illustrations, **Figs 2** and **3**.

Don't Forget To Write!

Don't forget to write to me at:
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Reflections

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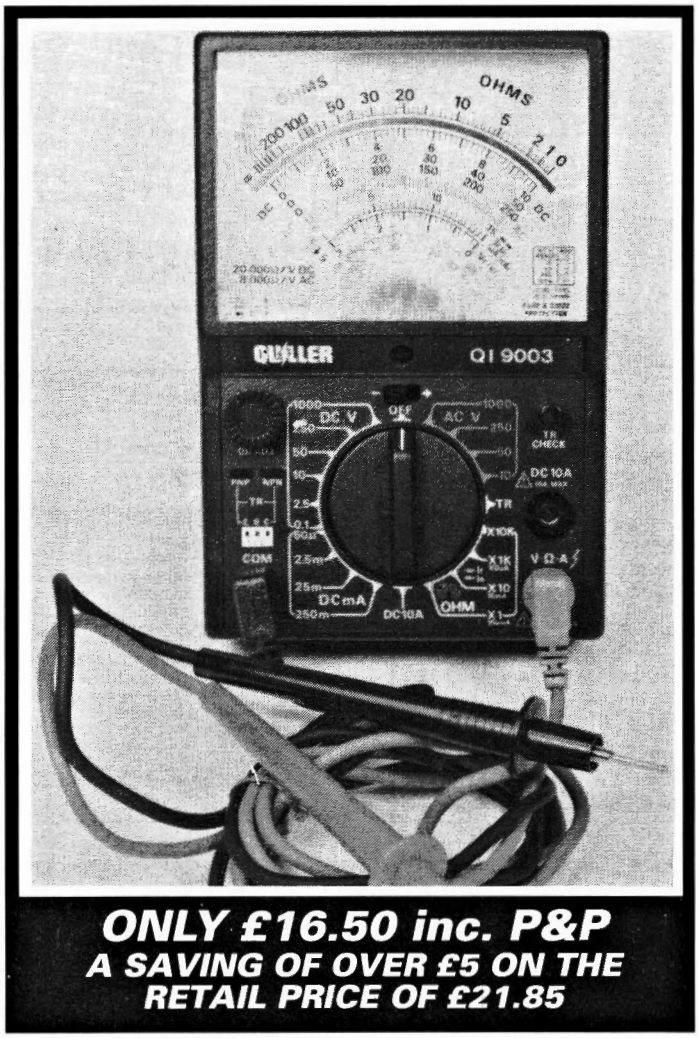

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Universal Repeater Tone Burst Generator

Pep-up your ex-p.m.r. set with this repeater tone-burst generator by Mike Rowe G8JVE.

As a result of changes in the Private Mobile Radio (p.m.r.) regulations in January 1990, the channel spacing for equipment in the u.h.f. band was changed from 25kHz to 12.5kHz. Quantities of redundant equipment found its way onto the surplus market soon after. I was able to purchase one of these sets, a Pye M296, that was suitable for conversion to the amateur 430MHz band.

The conversion of the transceiver was straightforward and was carried out with no major problems. As operation via the local repeater was required, I found it was necessary to install a tone burst generator.

Space A Premium

Several designs were looked at and dismissed, as they required operation of a separate switch. As most commercial equipment is built very compactly there tends to be insufficient space on the front panel for other switches. That's assuming matching switches can be found. With this in mind I decided to design my own tone-burst generator to the following criteria:

It must be small enough to fit inside the host transceiver; it must be automatic in operation and it must be suitable for use in a variety of equipment. The design described and shown in **Fig. 1** meets all of these needs. It is also suitable for other amateur equipment that doesn't possess a tone burst generator, or one that does not have an automatic tone burst, which is an important factor for safe mobile operation.

Circuit Description

From the timing diagram of **Fig. 2** it can be seen that there are actually two actions required. A tone to access the repeater itself, seen on the lower line of the diagram, and a timing period of between a half and one second during which the tone is active. This is represented by the middle line of the drawing. The upper line shows the method by which the whole system is activated. This is by double-keying the transmitter, but I'll explain that action later.

Integrated circuit gates IC1a and IC1b form a monostable, whose time constant is determined by C2 and R3. When the transmitter is de-keyed (and then almost immediately re-keyed) the point TX+ goes low taking pin 1 low for a short time. This triggers the start of the timing period controlled by C2/R3. The capacitor C2, charges via R3 until the trigger point of gate IC1b is reached. At this point the monostable then changes state, pin 3 going low again. On the prototype this time was about 700ms. The pulse occurs each time after de-keying and is normally inaudible. If however, the point TX+ goes high again (as in immediate re-keying) the monostable is still in the enabled state and the oscillations of IC1c are present in the transmission. During this time-period the buffer gate, IC1d, is enabled and the tone is therefore passed to the output.

Construction

There should be few problems in building the generator board, as you can see in **Fig. 3**, it's a very simple construction job. First, with the exception of C1, fit all the components to the p.c.b. observing static precautions (§1) when fitting IC1. Attention should be paid to the correct polarisation of the two tantalum capacitors C1 (when it's fitted) and C2. Then you should check the board for dry joints and short circuits.

Alignment

Before fitting the unit inside the host transceiver, temporarily connect the transmitter positive supply (TX+) and the permanent positive supply (12V Nom.) pins together. Connect these two pins to a power supply equal to the regulated supply lines in the host transceiver and the return to the negative rail. Connect pin 1 of IC1 to zero volts and then, preferably using a digital counter, set R4 for an output frequency of 1750Hz (±10Hz) on the tone output pin.

Disconnect from the test equipment and insert C1. taking care with its orientation. when fitting it to the board.

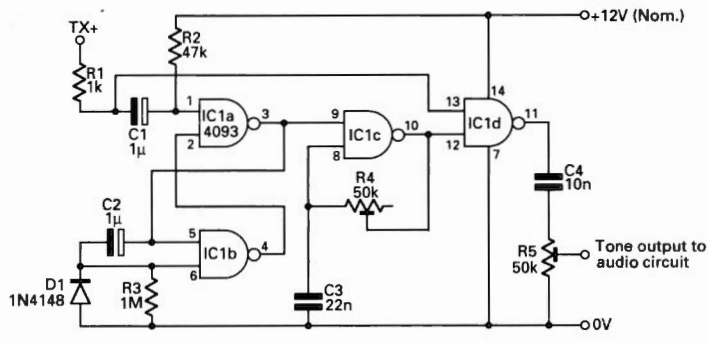

Fig. 1: The circuit, based on a single c.m.o.s chip and a few other components.

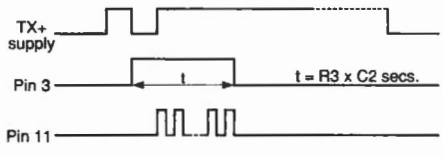

Fig. 2: Pulse and timing diagram, see the text for more details.

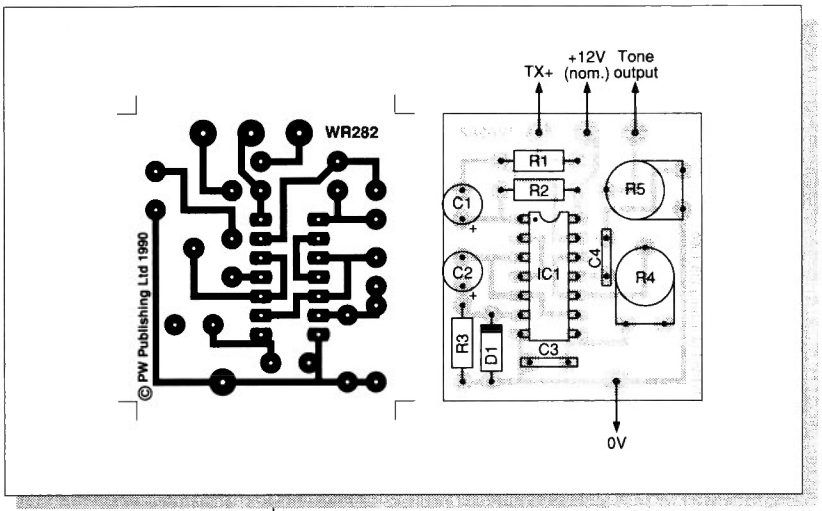

Fig. 3: The board and component overlay. Small enough to fit into almost any rig without a repeater access oscillator.

Installation

As the Pye unit's frequency accuracy is voltage dependent, the positive supply rails of the unit are regulated. The prototype tone burst was fitted in the Pye M296 by connecting the supply pin (+12V nom.) to the transceiver's 10V regulator. Connect the transmitter positive pin (TX+) to the transmit multiplier rail of the transceiver.

The gated tone output may be connected directly to the microphone input. Then adjust variable resistor, R5, for optimum deviation. As with most commercial p.m.r. equipment, there are limiting amplifiers to shape the waveform and prevent over deviation. Should the tone period not be long enough for a particular repeater, increase the value of fixed resistor R3 to approximately 1.5MΩ

Operation

If the repeater is inactive and a tone burst is required, you should operate the p.t.t. switch twice. You can be see from the waveforms around IC1 (shown in Fig. 2) that the tone generator section is enabled immediately the p.t.t. is released after the first operation. However, no transmission takes place until the transmitter is re-keyed. The ideal method of operation is the 'dab-dab-and-hold' method. Remember not to speak for about one second afterwards! Your speech will be almost certainly be overpowered by the access tone during this period. If the repeater is already open, or simplex working is used, and therefore no tone is required, only single operation of the p.t.t. is needed.

PW

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47k	1	R2
1M	1	R3

Miniature rotary horizontal mount.

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Capacitors

Miniature Monolithic Ceramic

2.2nF	1	C3
0.1µF	1	C4

Tantalum Bead 16V working

1µF	2	C1,2

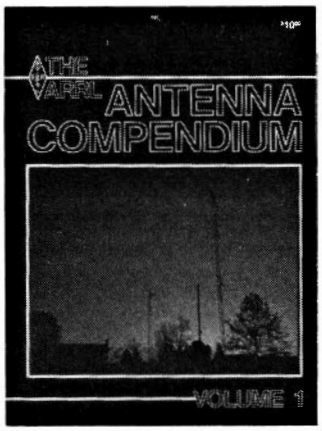
Semiconductors

1N4148	1	D1
4093	1	IC1

Further Reading

§1 *Electrostatic Precautions For The Amateur Maintainer* ***PW*** January '91 pages 19-20.

The ARRL Antenna Compendium Volume 1.
Edited by Jerry Hall, Paul Rinaldo & Maureen Thompson.
American Amateur Radio Relay League (publishers) ISBN 0-87259-019-4
176 pages £7.50
Available from *PW* Book Service, 85p post and packing.



Most of the practical ideas, projects and articles in this compendium have not been published before. Most of the book is taken up with a host of practical antenna designs in work-shop detailed form. In other words, you will find many ideas to help you on the practical side of antenna work. The book also has a friendly, but informative method of explaining how to use the Smith Chart. Unusually, the book also has a very interesting 'up-to-date' chapter on the G5RV antenna - by Louis Varney himself. There's also an essential, and most informative, chapter on antenna polarisation which should take some of the mysteries out of circular polarisation for many people.

QRP Notebook
Doug DeMaw W1FB
American Radio Relay League (publishers) ISBN 0-87259-034-8
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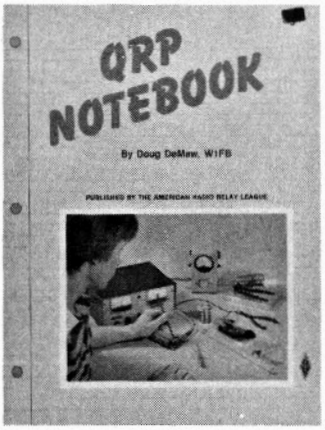

If you are a keen QRP enthusiast, this book will provide you with many ideas. It is essentially a gathering together of many differing projects and circuit ideas based around the common theme of QRP work. Although the book provides many interesting topics, the ideas and projects are all in circuit form. Essentially a book for the keen constructor, this book could provide the cheapest efficient way for anyone to get 'on air'. An ideal introduction to the world of QRP construction and operation.

The ARRL Antenna Book
Editor Jerry Hall K1TD
American Radio Relay League (publishers) ISBN 0-87259-206-5
734 pages £12.95
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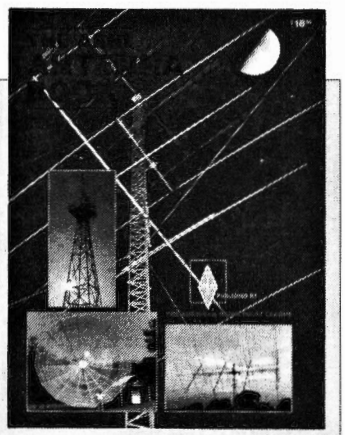

The ARRL Antenna Book has deservedly grown in stature and reputation since it was first introduced. It has progressed from a relatively thick paper-backed volume - to its present ***very*** thick form. As a reference source it's second to none, there really isn't any other work in the same category to equal it. The book is so respected that it is even found in the technical libraries of the UK broadcasting authorities. A truly excellent book. If you have the original edition, this version will certainly complement and up-date your reference library. Covering every antenna and propagation topic, in theory, practice and with very many proven constructional projects, this book is highly recommended.

Even overseas subscribers can enter the competitions as there is a separate closing date for overseas entries giving them about five months to send in their entry.

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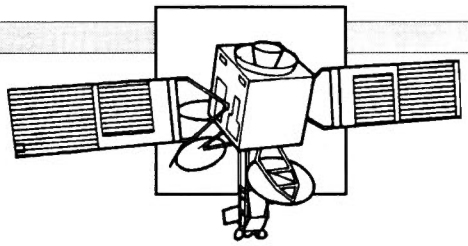


SATELLITE SCENE

by Pat Gowen G3IOR

This month Pat Gowen G3IOR looks at satellites old and new, and launches his column off with all you need to know about OSCAR.

Welcome to 'Satellite Scene'. This month I shall concentrate both on the newest satellite and the oldest satellite of all, leaving lots of the new information on the ongoing existing spacecraft for next month's column. We'll start off with the newest, and look at what you need to know about the new OSCAR.

Radio-M1/Rudak-2

The joint work of AMSAT-U and AMSAT-DL in creating the set of new equipment for the RADIO-M1/RUDAK-2 satellite and its command system was finally completed in early November. The RM-1, RUDAK-2,RS-14 (or AMSAT-OSCAR-21 as it is to be termed when in orbit) was fitted into the main satellite in the rocket launcher, ready to be placed into orbit on November 29.

The launch had already been postponed several times but has now been further postponed to January 7. This is not because of technical problems, but because a 'VIP' wishes to be present at the launch!

The idea of co-operation between the two groups in the USSR and (the then) West Germany, first evolved in the spring of 1989. The detailed discussions continued until their representatives met in Surrey in July 1989, when the preliminary agreement on mutual co-operation was formally signed.

The final version of the agreement of joint co-operation on the new satellite was signed in Autumn 1989, by this time work on the project had already commenced. The ORBITA AMSAT-U group are developing and making the linear transponder, command radio link, telemetry system and power supply system. The group are also handling all the other arrangements with the official organisations regarding placing of the equipment and launching. The final agreement was signed by Victor Chepyzhenko RC2CA, the technical director of the project RADIO-M1 of AMSAT-U-ORBITA, and by Dr. Karl Meinzer DJ4ZC, the president of AMSAT-DL. The co-ordination of the project is being undertaken by Peter Guelzow DB2OS and Leonid Labutin UA3CR.

The RUDAK group of AMSAT-DL, developed and made the digital transponder known as RUDAK-2, a clone of the earlier RUDAK that was on-board, but sadly inoperative in OSCAR-13.

The RUDAK-2 includes a digipeater and a mailbox, using protocol AX-25, and also provides all the other possibilities and experiments for transmitting information using sophisticated modern digital methods. The unit also contains input and output r.f. circuits.

The complete assembly for the ground command station was developed by the AMSAT-U-ORBITA and AMSAT-U-SPUTNIK groups. Many of the highly specialised and difficult-to-come-by digital parts have been provided by the AMSAT-DL RUDAK group.

Ground command station facilities were installed both at UC1CWA at Molodechno, and at RK3KP in Moscow, ready for the launch and the initial orbital test periods. The ground command station for RUDAK-2 only, will be situated at DK1YQ near Munich and at DB2OS near Hanover.

Orbital Details

Planning for the mission involves the spacecraft to be placed into orbit 'piggy-back' style. Hopefully, this will be on-board the USSR geological scientific research satellite, GEOS, to be launched from the North Cosmodrome at Plesetsk.

The planned orbit is a slightly elliptical polar orbit, with apogee 1000km, inclination 83° and a 104.82 minute period. The first pass audible for the UK will appear some 94-96 minutes after lift-off.

Satellite Specifications

The basic satellite is a cylinder 4m high and 1.8m in diameter. The cargo will be thermally-controlled professional geological research equipment, a telemetry system, command link equipment, transponders, associated power supplies, amateur linear and digital transponders, a telemetry system, command link equipment and their power supply.

In flight, the spacecraft's attitude will be maintained by the earth's gravity field. This will be achieved by using a 9m long rod pointing away from the earth, which will act as a 'gravity gradient boom'. The planned service life of the system is three years.

Telemetry

When operating, RADIO-M1 transmits both Morse code (c.w.) and digital telemetry. The c.w. telemetry commences when the satellite separates from the the launch vehicle, the RADIO-M1 equipment being powered by the main satellite power system.

Full photocopied details on the telemetry decode parameters are available from *PW* if you send a large (A4) s.a.e.

OSCAR-0

The October and November ARRL e.m.e. moonbounce contest weekends produced a lot of activity, with many new stations now in evidence. The Swedish station SM4IVE won the event, with DL9KR a close second, both

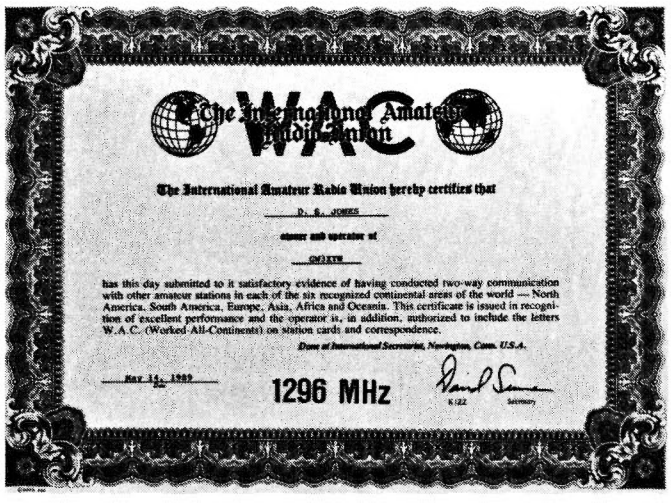


Fig. 1

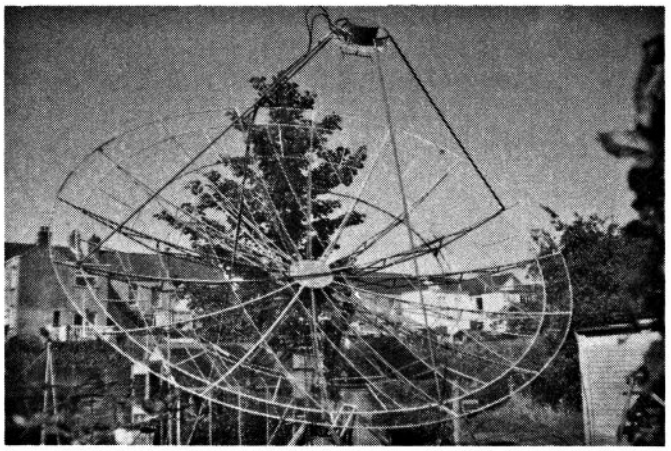
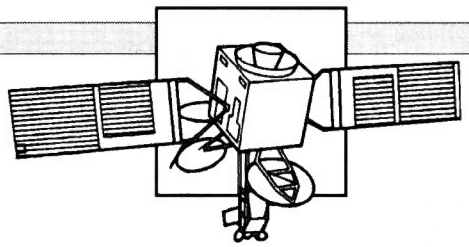


Fig. 2



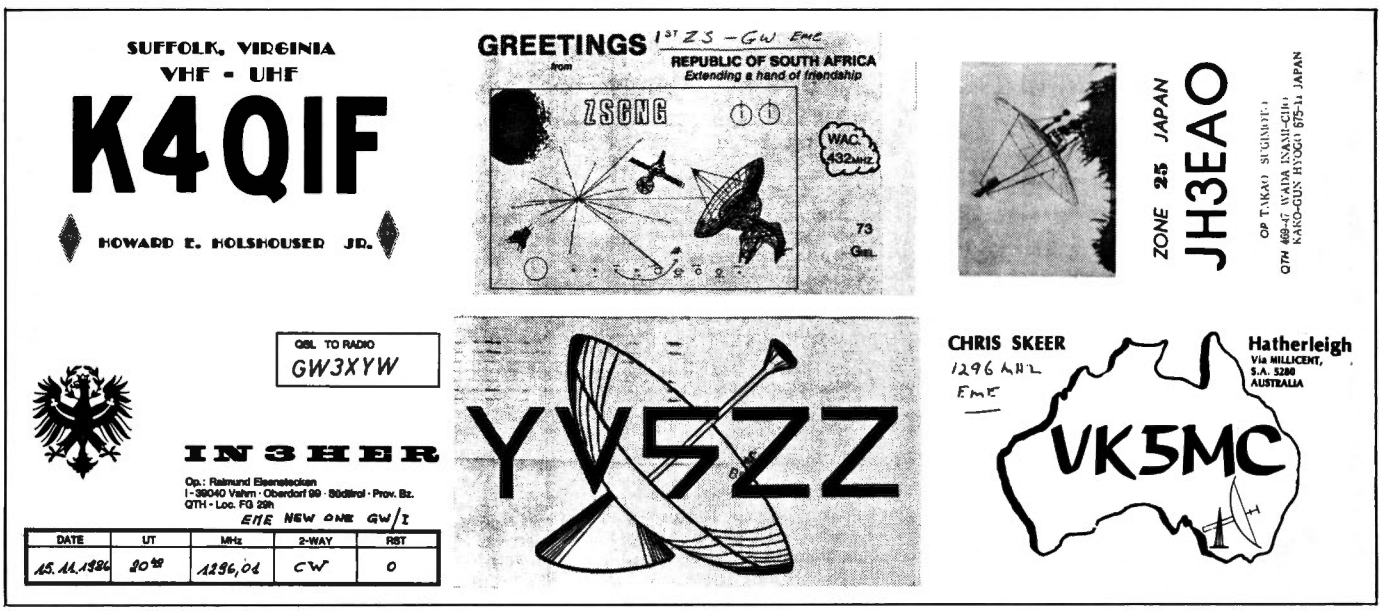


Fig. 3

working over 100 different stations.

The Norfolk entry, G3HUL was operated by G3s HUL and IOR. Despite being dogged by Doug's XYL breaking her ankle, a jammed azimuth rotator and a burned-out h.t. p.a. transformer, we worked 18 stations in the few hours of operation possible on 432MHz. We achieved some excellent QSOs with LA8LF and HG5W as new all-time countries.

Ray Soifer W2RS, running 100W on 144MHz c.w. to a single Yagi, was delighted to make QSOs with VE7BQW, KI3W, W5UN and G8MBI. The latter station was his 17th moonbounce QSO and moonbounce work. G8MBI uses a 224-element collinear array! Ray W2RS was equally delighted to hear, for the first time, his own echoes off the moon when all conditions were perfect, i.e. lunar perigee, maximum ground gain, and an absence of local noise at 6am.

The first European 1296MHz WAC, the ARRL Worked All Continents award shown in **Fig. 1**, has been accomplished by **Stuart Jones GW3XYW**, of Pontardulais near Swansea, South Wales. Stuart's 7m home-brew extended dish (with 70cm feed attached) is shown in **Fig. 2**. The QSL cards from the contacts that made the award possible are depicted by **Fig. 3**.

A further mammoth feat was accomplished by W5UN who, in November, completed his final QSO to give him the very first moonbounce DXCC! Would anyone have thought this possible even twenty years ago?

Modern circuitry and understanding is bringing e.m.e. the possibilities now to many, with stations active in the mode increasing monthly. In the UK alone we now have G3ZIG, G4s BCH, GCM, NPH, VIX, WQE, G6CMS and G0s BPS, EMJ and FRE active on 144MHz. Whilst on 432MHz, G3s HUL, LQR, LTF, RSS, SEK, WDG, XGS, G4s ALH, CEW, CCH, GOM, DGU, EZN, FUF, NQC, PJO, RGK, RNL, GM4TXX, GW3XYW and GW4LXO known to have been active.

Space Pollution

NASA report that they are now tracking over 70 000 objects in earth orbit. Of these, 6645 are recorded as being of over one third of a metre in diameter.

The objects consist of launch-vehicle third stages, nose cones, fairings, live and long 'dead' satellites, camera lens protectors and other assorted 'junk'. These objects now pose a major hazard to manned space flight and to many existing satellites.

Just pause for a moment, and imagine the impact of two contra-rotating satellites meeting each other head-on at 29 000km.p.h. plus velocity!

If such impacts occur, the resulting fragmentation can add to the debris in scattered orbits. The resultant fractions threaten further collisions and so on. It's this factor that might have led to the loss of UoSAT-OSCAR-15, as it was very noticeable that it's orbital

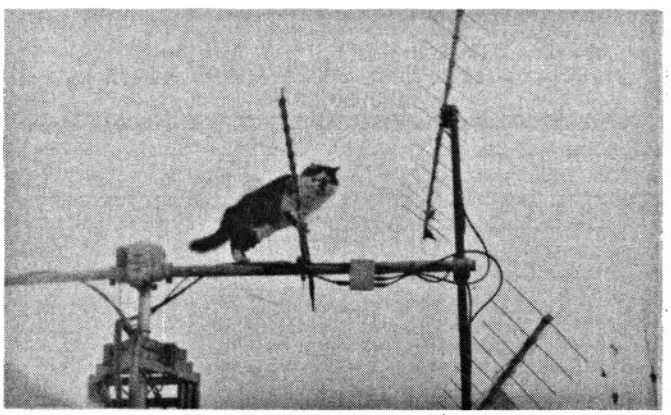


Fig. 4

parameters were very different to the other common-launched microsats.

Hopes for the recovery of this satellite are now fading. **Professor Martin Sweeting**, head of the UoSAT team at the University of Surrey Spacecraft Laboratory, says, "We have not completely given up hope and will still attempt recovery efforts as time permits, but, it has to be said that, we are not very optimistic now".

A-O-16

This OSCAR became fully functional in early November, but, whilst being ASCII loaded by N5BF and WD0E on November 26, the computer crashed, though fortunately, it left the transmitter on.

It would certainly appear that the high-tech and complexity of the microsats in general are very demanding and exhaustive, even their very terminology defeats the average radio amateur.

It's hoped that A-O-16 will soon be put into operational status again, when it will be giving a downlink of AX.25 p.s.k. audible to a sideband receiver on 437.025MHz. Uplinks of AX.25 f.m. are on 145.900, 0.920, 0.940 and 0.960MHz.

Satellites & DX

OSCAR-13 has provided quite a DX 'band' this past month, with some of the rarer countries such as WD3Q/HI3, VE2JLP/HR, CE0ZZZ, 6Y5/WD3Q all very busy, with activity from KH0 on the way.

The RS-10 spacecraft has been fully audible long before and after its horizon crossing, with good signals heard when it was twenty minutes (time-wise) sub-horizon from JA and UA0 stations. Sadly, the 145MHz uplink returns were only re-angulated a few degrees, with access only possible up to 2 -3

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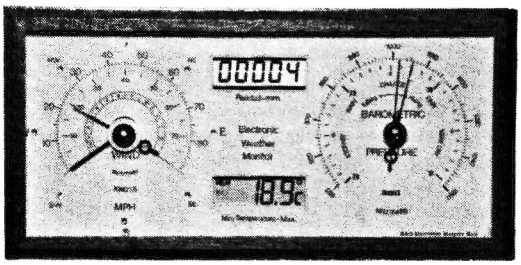

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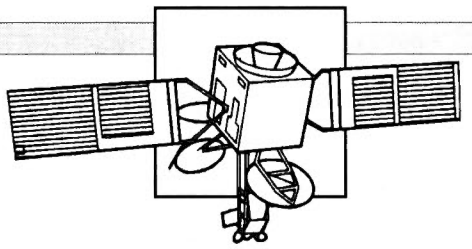
AIR SPACED VARIABLE CAPACITORS 200 + 350pf @ £2.50, 125 + 125pf @ £1.95, 250 + 250 + 20+ 20 + 20pf @ £2.50, C804 Types 25pf @ £2.50, 50pf @ £2.50, 150pf @ £2.95.
ACCESS and BARCLAY CARDS ACCEPTED. P&P 80p under £5. Over Free, Unless Otherwise Stated.
C.M. HOWES AND WOOD & DOUGLAS KITS Available By Post and For Callers.



minutes sub-horizon.

John Branegan GM4IHJ, heard a remarkable event at 1234UTC on November 12, when getting ready for a pass of UoSAT-3. He received a block of good packets from its 9600 bauds transmission when the satellite was not due to come over his horizon until six minutes later!

Even the e.m.e. enthusiasts discovered an unusual phenomena. This occurred when they were 'moon pointing'. Although they didn't hear any echoes in this position, when they increased the elevation by up to ten degrees, good echoes came back.

If anybody still believes that signals at v.h.f. and u.h.f. are not propagationally effected by high m.u.f.s resulting from elevated solar activity, then I think that their text books need re-writing!

CATastrophe!

John G6SVJ, built the antenna controller recently featured in *Oscar News* No. 71, and after a struggle got the program to work with his Kempro-400 rotator. He found that when the tracking antennas should have gone up in elevation, they duly went up, and when they should have gone down, they did so. However, when the satellite went from east to west, the antenna turned from west to east, and vice versa. The answer to the problem lay 'Down Under' in Australia! The program was written by the VK lads, from where the great circle is south pole based!

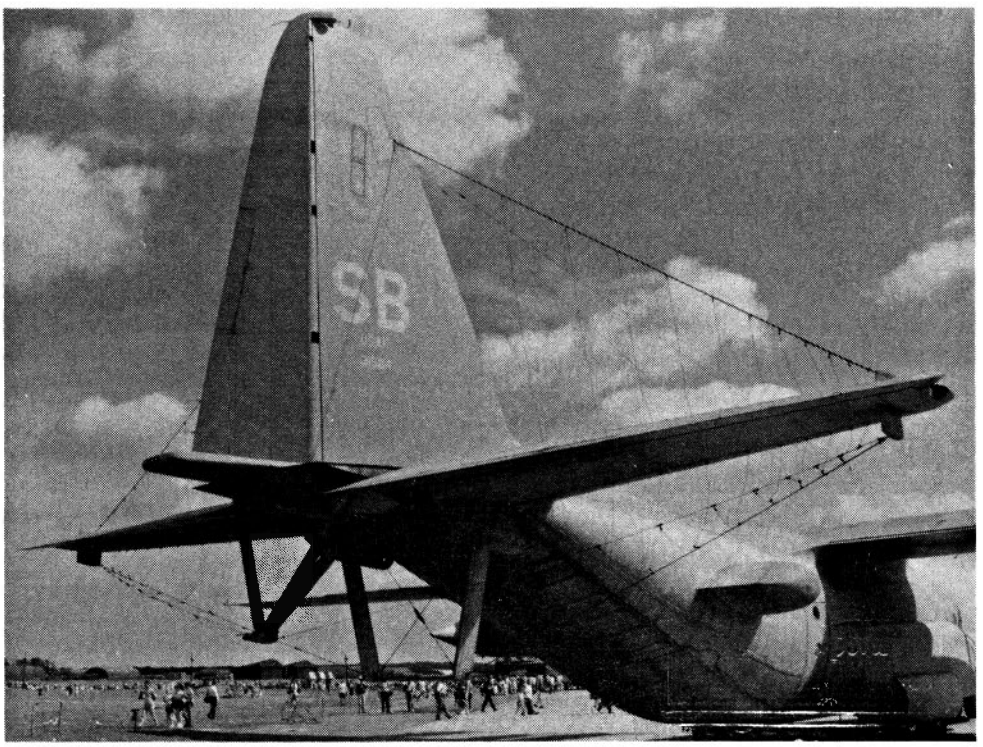
Now, the antenna problem is nothing (?) to do with the photograph depicted in **Fig. 4** this month. The photograph features 'Oscar' (honestly!), John's cat, seen obviously assisting in the orientation of the satellite antennas.

Whilst the 'homing' instinct of the feline species, plus their skill in tracking flying objects is well renowned, John insists that 'Oscar' is merely usefully employed in keeping the birds off his antenna. I would have thought that the 'moggie' would have detuned the antenna more than birds, as the 'cat-pacity' must be greater. Personally, I think 'Oscar' acts as a 'Catronics' interphase for auto-antenna tracking!

More news next month. Keep things 'purring' (sorry - I meant 'ticking') over till then, and don't forget to write or call me at:
17 Heath Crescent,
Hellesdon,
Norwich,
Norfolk NR6 6DX.

To save valuable space in 'Satellite Scene' and to make room for more 'extra-terrestrial' amateur radio activity in his monthly column, Pat Gowen will in future supply listings and telemetry decoding information separately. Anyone requiring the data, in photocopy form, can obtain it free in exchange for an A4 s.a.e.

WHAT ON EARTH IS THIS?



Although aeronautical mobile amateur radio is frowned upon in the United Kingdom - do you think that this pilot is bending the rules slightly? Is this aircraft (seen at an air-show open to the public in 1990) fitted with a new h.f. log-periodic? Or does he like catching butterflies? We know what it is - but do you?

There's a prize voucher waiting for the reader who comes up with the purpose of the aircraft equipment - and there will be another voucher for the reader who suggests the most unusual possible (printable!) use for the device. The only clue that we offer is that the equipment is of interest to some radio amateurs!

Answers, **including the corner flash**, please to Practical Wireless (Puzzle Picture), Enefco House, The Quay, Poole, Dorset BH15 1PP by 15 February 1991.

If you have a photograph showing unusual amateur radio equipment, antennas, vintage or just plain 'odd' equipment that you would like to challenge readers' knowledge with - send it to us, and we'll get 'em guessing!

WHAT ON EARTH
COMPETITION FEB '91

PACKET PANORAMA

This month Roger Cook G3LDI, describes a proposed re-organisation of the h.f. packet networking to improve forwarding of mail.

Network-HF Re-Organisation

The following text is an introduction, as suggested, for a series of papers by Dr. Tom Clark, W3IWI. He has some thought-provoking ideas for the h.f. network and they will be presented in 'Packet Panorama' over the next couple of months. All the major software writers have been informed, including our own, so perhaps they will be off to their towers to lock themselves away for a re-write!

Message Follows

From: W3IWI, August 19, 1990

"The four messages that follow are the text of the papers I have submitted for this year's networking conference. I thought I would share them with you in advance so that you can 'load your muskets'. I apologise that it is not possible to send the formatted version by EMail, since the Greek letters, equations, and the one illustration don't reproduce well in flat-ASCII text. Especially as you look at my second h.f. paper, you will see that I am proposing radical surgery on the way we move mail. It seems to me that our present scheme of having stations involved in mail forwarding, operating as if they were local users (albeit with some special privileges) is the WRONG way to do business.

"NK6K and G0/K8KA (in the context of PACSAT operations) have proposed some similar ideas. If you haven't seen the text of their rather detailed proposals, I'll be happy to ship them to you. Lest these ideas seem too far out in left field, let me cite a few places where basic ideas have already been tried:

"The UoSAT spacecraft data transfers (as cited in paper 2) have used the basic idea for several years.

"Several years ago, WA7MXZ and myself instituted the scheme using DECNET and later Internet to provide mail service for the isolated hinterlands of Utah.

"Later SM0RGV and 4X6OJ also worked with me using Internet/BITNET as a 'by-pass' to move mail to/from Europe and Africa. RGV found it necessary to discontinue his operation. Earlier this year when the main US h.f. gateway to Europe went QRT, the Israeli end was transferred to 4X1RU and now over 90% of the Europe/North American packet mail is handled by 4X1RU/W3IWI using 'bulk mailing'. - N2GTE has written a 'daemon' which handles bulk mail shipment to/from MBL BBSes with data compression and binary file transfers.

"All these were made possible by having transparent mail import/export functions in normal BBS code. Most of the above applications used WA7MBL's BBS code because the transparent import/export functions are implemented very clean and neat - thanks to Jeff for providing the necessary 'hooks'! I had a recent note from WA7MBL in response to my query on his future plans; specifically I asked him if MBL 5.14c was the end-of-the-line.

"Jeff sent the following reply (**Fig. 1**)before he saw the papers I had prepared".

Widely Scattered

"It's discussion that I am trying to get started. Since the developers are scattered all over the world, it will be very difficult to get everyone together for a face-to-face meeting. Therefore if there is interest in exploring new schemes, let me suggest that I could easily provide a conduit for you. My Internet host, 'tomcat.gsfc.nasa.gov' is on-line 24 hours a day connected to both internet and with a 2400 BPS SLIP port. I could provide a mail 'exploder' so that a message, addressed to an address something like 'BBSDEV@tomcat.gsfc.nasa.gov' would be forwarded to all who are reachable by internet (that includes BITNET, UUCP, GTE TeleMail, SPAN, HEPNET etc.) could have the message delivered to them. I could set up accounts on 'tomcat' so the others could call in through 'tomcat's' SLIP port and send/get mail (this uses the 'mbox' mini-BBS that SM0RGV added to the KA9Q NOS code). NOTE: I haven't set up BBSDEV yet and won't until I hear that there is some interest.

"So - is there any interest in such ideas? Is it time to consider perestroika in the amateur messaging world?"

Data Protocol Issues

"1. Introduction: We have discussed (elsewhere) some of the link-level issues in terms of the effects imposed by the ionosphere on h.f. signals and possible Digital Signal Processing (DSP) approaches to those issues. In part 2 we assume that bits can be reliably delivered at reasonable speed and turn to questions like:

"How can more information be crammed into each bit sent?

"How can the overhead associated with each transmission be minimised?

"How can the number of transmissions (and hence the number of times the overhead must be paid) be minimised?

"2. Connected mode: AX.25 is the WRONG solution to the h.f. problem. Having watched literally thousands of attempts to move packet mail, I have become convinced that connected-mode AX.25 is a bad choice for use on h.f. Most of the h.f. nets operated under the ARRL 'SKIPNET' STA (which permits unattended operation) operate 'closed' with each station allowing connections only from other net members".

Net Problems

"Despite the 'closed' nets and well-equipped stations, about half the attempts to forward mail result in time outs due to poor propagation and QRM. One of the most serious sources of QRM is from other net members. An h.f. net like that on 14109kHz appears to have its channel capacity reduced to the 'ALOHA limit' of about 18%, shared among all the net members. Messages longer than about 2kB in size carried on the busier h.f. nets have a significant probability that they will result in a time-out and hence must be re-sent. The number of times they will need to be re-tried is proportional to the message size. The time required for each attempt is also proportional to the message size. Therefore when a message exceeds a critical size, the channel time required to send that message will increase as the SQUARE of the message size.

"Because of the difficulties associated with the ionosphere plus QRM and QRN and the current modem technology used on h.f., a typical h.f. 2-3 link has a bit error rate (BER) in the range of 10:1 to 1:10. Thus any packet frame longer than around 500-1000 bits will probably not work; this has led to stations using PACLEN parameters in the range 40 to 80. Thus AX.25's overhead is about one-third of all bits sent. In AX.25, if 4 frames are transmitted and the receiving station gets good copy on frames number 1, 3 and 4, then the inability of the protocol to re-assemble frames requires frames 2, 3 and 4 to be re-sent. Because of this deficiency in the protocol, the typical h.f. SKIPNET station operates with MAXframe set to 1 or 2".

AX.25 Improvements

"Eric Gustavson N7CL has developed an improved 'PRIACK' modification to AX.25 which is now available for TNC-2 (and clones) and AEA TNCs. PRIACK gives channel priority to <acks> and uses p-persistent CSMA algorithms for sending I-frames. Despite PRIACK being available for nearly 2 years, it has not found wide acceptance. Many h.f. operators say 'it slows down MY transmissions too much'. Even if it were accepted, PRIACK is only a 'get-you-by' applied to an inappropriate protocol.

"Another inefficiency (not intrinsic to AX.25) comes from the fact that all messages sent on h.f. are plain ASCII text and yet a full 8-bits are used to send the data. Only about 6.5 bits are needed for each character, corresponding to some 20% loss of channel utilisation. Even better would be to use data compression techniques (like '.ZIP' or '.ARC') with full binary data transmission, which would give a better than 50% improvement. Add to all these factors the wasted key-up time for amplifiers (if used) on each point of the path required for each frame sent, and the time for the other station to send an <ack> and it becomes apparent why total channel throughput is only a few tens of bits/second".

Fig. 1.

```
> My current feeling is that 5.14 should be the end of the line for the
> 'current' way of doing things, but I am certainly not opposed to being
> part of future development. I just feel like too many kludges and
> 'band-aids' have been applied to the present way of doing things and
> feel like the only hope is a MAJOR re-write which may not be downward
> compatible with the current system (other than that it could look the
> same to the BBS users or at least have an option to do so if necessary.)
>
> No matter what happens, at least I feel good about having contributed a
> few things (or having forced a few things on the world?), but I'm not
> at all thrilled to see how 'H' routing, 'MIDs', and some of the current
> improvements have been added. And it isn't a case of my suffering from
> NIH (Not invented here) syndrome, but I just think things could have
> been done so much cleaner with a little co-operation.
>
> I think it is still crazy that BBSs pretend to be users when forwarding
> to each other. They should just kick into a binary command mode and
> get the job done with file compression and the exchange of necessary
> information which would take care of the problems that MID/BIDs were
> designed to solve. Instead of 'bulletins' we need a newsgroup or
> conference type of system. Bulletins and Mail should be totally separate
> beasts. Addresses need to be extended to more than 6 characters, and
> it should be possible to mail to something like tomclark@w3iwi.
>
> Also, users with computers should have some intelligent terminal programs
> which could take over a lot of the functions currently performed by the
> BBS, so the BBS could ship things like the 'L' list as a quick binary
> burp and the terminal program would format and display it, etc. It
> should also look for unproto packets from the BBS and assemble lists
> of new bulletins (or grab the actually bulletins sent unproto at nights),
> etc, etc.
>
> I see a lot of room for major improvements, but just don't see it happening
> without major changes, and after being involved in the stupid header wars,
> MID wars, etc., I don't want to be the one to try to force a new system on
> the world, and am not sure it will be possible to reach an agreement on
> what needs to be done, so my current plans are just to sit back and watch
> for now.
>
> However, I would enjoy being part of some true advancements, but feel like
> it is time to move away from the present implementation. Hank deserves a
> lot of credit for putting together a great foundation that has come a long
> way, but I think it is time to take what we have learned and start again
> rather than to keep adding features to the existing stuff.
>
> I don't feel like I would be making a major contribution by simply trying
> to add all of the RLI, RE, MSYS, WHATEVER, bells and whistles to the MBL
> code. It seems that those systems are all fairly decent now, and current
> MBL users should have a number of choices, so I don't feel like I am
> abandoning anyone by not producing any enhancements to 5.14.
>
> If you have any suggestions, or think that the other coders would agree on
> some major and useful changes, I'm certainly open for discussion.
>
> 73, Jeff
>
```

Summary

"These factors may be summarised as:

"1. There is a need for new improved modem technology as outlined previously.

"2. Radical protocol surgery is needed to solve the problems of time-outs, multiple re-transmission of messages and channel sharing.

"3. An Alternative 'Connectionless Protocol': This proposal will make use of AX.25 <UI> datagrams as an alternative to the present connected mode protocols. Suppose that the W3IWI BBS has 23 messages to be sent to the European mail gateway at 4X1RU. W3IWI would collect all the messages into a single export file which might be 9132 bytes long. For efficiency W3IWI compresses the first file with PKZIP§ into a new file 3932 bytes long. W3IWI then transmits a <UI> frame that says (in appropriate computerese):

"Hello 4X1RU. W3IWI Calling. I have a '.ZIPed' mail file for you which is, my number RU11367. It is 3932 bytes long will be sent in blocks of 64 bytes/block. Let me know when you are ready".

Framed

"If 4X1RU doesn't hear W3IWI, the <UI> frame is re-sent a few minutes later. When 4X1RU finally hears W3IWI, he responds with a response <UI> frame, acknowledging the request. 4X1RU knows that the data portion of the blocks it receives will be the 64 data bytes plus a two byte frame number. Since (3932 = 61*64 +28), 4X1RU knows to expect a total of 62 blocks and that the last block will have only 28 data bytes in it and allocates space to hold the message. He prepares a response message with enough bits to handle the incoming blocks — in this case 8 bytes = 64 bits > 62 looking like:

00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000011

with 62 zeros and includes this in his response <UI> frame. W3IWI then sends a suitable number of the 64-byte data blocks in one transmission, with each block corresponding to a separate <UI> frame with length 66 (including the two-byte frame number).

"The number of <UI> frames sent in one transmission can be tailored to suit conditions, but lets assume 24 is chosen. Of the first 24 frames, suppose that 4X1RU copied frames 0, 3-10, 14-17, 19, and 22 and would send a response <UI> frame with the 8-

PACKET PANORAMA

byte field now reading:

10011111 11100011 11010001
00000000 00000000 00000000
00000000 00000011

The next transmission would re-send the missing frames and append some new ones. After a few such attempts the acknowledge frame might look like:

11011111 11111111 11111111
11111101 11111111 11101111
11111101 11111111

with only frames numbered 2, 30, 43 and 54 missing. W3IWI would concentrate all efforts at filling in the missing pieces until an 'all ones' response was received from 4X1RU. 4X1RU would then 'PKUNZIP'§ the collected file and re-post the messages to their respective destinations. This process might take a few minutes or it might take hours, but the messages would get through and there would be no such thing as a time-out".

More Next Issue

This discussion document from Tom will be continued in the next issue. If you have ever listened on 14109kHz, you will know what problems exist. I counted 17 different BBS stations on that one channel, so getting mail from one side of the Atlantic to the other is a very real problem, without the other associated troubles of variable propagation, QRM etc. However, I have now settled on 14097.4kHz with WA3TAI, so the forwarding is a little easier. By choosing this frequency though, correct according to the 'suggested frequencies' for packet operation, the wrath of the RTTY operators is incurred.

Local News

On November 4th a meeting was held at Bury St. Edmunds to try and sort out the forwarding problems in East Anglia. It was quite a productive meeting, with 21 local sysops attending. Restricted times of forwarding were agreed, with new routes instigated. The old Eastnet was re-named EADG, the East Anglian Data Group; this will embrace most of East Anglia and strenuous efforts are being made at putting the 1300MHz links into place. Already there are three links 'up and running' so by February 1st, the whole area will be forwarding on 1300MHz. It was also decided to have a contact for each county and they are as follows:

Dave G8KBB @ GB7MXM PRO for Suffolk. Home Tel: (0473) 682266

Roger G3LDI @ GB7LDI PRO for Norfolk. Home Tel: (0508) 70278

Malcolm G3XVV @ GB7ESX PRO for Essex. Home Tel: (0376) 514377

Nick G6NHK @ GB7DDX PRO for Cambs. Home Tel: (0799) 21093

News, views and comments to G3LDI QTHR, @GB7LDI, Tel: (0508) 70278.

73 and Happy Packeting de Roger G3LDI @ GB7LDI.

§ PKZIP/PKUNZIP a 'Try-before-buy' software utility to compress and uncompress files.

Radio Diary

January 27: The CLARC & ULARS are holding their rally at Lancaster University. **Mike Sherlock G4ZYN. Tel: (0257) 452287.**

February 3: The South Essex Amateur Radio Society will be holding their 6th mobile Rally at Paddocks, Long Road, Canvey Island. This will be an all-day event featuring trade stands, Bring & Buy, RSGB Bookstall, Boot Sale, home-made refreshments. Doors open at 10am. There will be extensive free car parking and easy access to Paddocks. **Dave Speechley G4UVJ. Tel: (0268) 697978.**

February 23: The Rainham Radio Rally will be held at the Parkwood Community Centre, Parkwood Green, off Deanwood Drive, Gillingham, Kent. The entrance fee is £1 and the doors open at 10am. **Mr R. Mullett on (0634) 362154.**

***February 24**: The East Coast Amateur Radio and Computer Rally will be held at the Clacton Leisure Centre, Vista Road, Clacton-On-Sea. Doors open 10.30am. Major suppliers of Radio & Computer Equipment, large Bring & Buy stand plus Auction, Test Bench Facility and ample car parking. Only five minutes walk from Railway Station. Bring the whole family! There are sports facilities, swimming, a childrens' adventure playground as well as bar and cafe. Easy access for disabled. Talk-in on 2m. **ClackPak, 18 Litchfield Close, Clacton-On-Sea, Essex CO15 3SZ.**

February 24: The Bideford Bay ARC are holding their 4th Taw and Torridge Rally at Bideford, Devon in the BAAC Halls starting at 10.30am. Talk-in will be on S22. **John Denford G0GFK. Tel: (0237) 476402.**

***March 9/10**: The London Amateur Radio Show will be held in the Picketts Lock Centre, Picketts Lock Lane, Edmonton, London N9 0AS.

***March 17**: The Norbreck Radio, Electronics & Computing Exhibition will be held at the Norbreck Castle Hotel Exhibition Centre, Queens Promenade, North Shore, Blackpool. Admission is £1, OAPs 50p and under 14s free. Free raffle ticket and exhibition plan. **Peter Denton G6CGF. Tel: 051-630 5790.**

March 17: The Wythall Radio Club will be holding their 6th annual Radio Rally at Wythall Park, Silver Street, Wythall, Worcs., which is on the A435 near Junction 3 on the M42 south-west of Birmingham. Doors open 11am. There will be three halls plus a marquee, trade stands, flea market, Bring & Buy, a bar and snacks will be available, talk-in on S22 and admission is 50p. **Chris Pettitt G0EYO. Tel: 021-430 7267.**

*** Practical Wireless & Short Wave Magazine in attendance**

Back-Scatter

HF Bands

Reports to
Paul Essery GW3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

As I sit down to write, November is past; heavy, misty weather and not much warmth about outside, as one of the locals remarked, "Not fit for trees to be out in!"

Last time out I forgot to mention deadlines, making things a mite difficult for contributors as well as yours truly, so this time I'll mention them now before I forget!

So - here they are - February 1 and March 1 to arrive please, addressed as always to me at the address at the top.

Events

These darned ZA rumours persist, the latest one is that three Albanian officials have visited Budapest and discussions are proceeding about the establishment of a ZA club station. The earlier one about the HA group mounting a ZA operation, seem to have died. Just as this was going down, I heard that YU5AD 'Had a guarantee from the ZA authorities for either ZA5AD or ZA/YU5AD for December 16-23'. By the time you read this, that date will have been and gone - but I doubt if any readers will have worked ZA. Don't give up hope, keep a few joss-sticks - but don't expect anything!

Also in the rumours category is the one that suggests VK9NS will operate from S2, and indeed that K5VT may return there in February.

Afghanistan; I hear that three expeditions are on the stocks for 1991. UI8ZAA, a French station, and a group of East Coast Ws. No more details at the time of writing.

Piracy now. I hear of a phoney VK6HD, Mike is not currently active on Top Band, and has had his call pirated. He was QRT from August to October while moving and it seems the new place is for he-men - it took three and a half days with a jackhammer to make the holes in the rock for the tower and the guy points! Mike is, at the time of writing, back on 7-28MHz. Other pirates known to have been about include 5R8QL on s.s.b., XQ0X on c.w., XZ2MR asking for cards via F6FNU and a dud A71BJ - G4HOU who had the call has been back in UK for two years or more! Later news mentioned the TN6PG and TN6PG/D2 giving G3OCA as the QSL Manager, Ken G3OCA has never heard of the guy!

Contests

One for the s.w.l. UBA are sponsoring an all-year s.w.l. contest, January 1-December 31. Five categories: Phone, c.w., RTTY (inc AMTOR, ASCII, Packet), SSTV (inc FAX). Log Forms and details for 3 IRCs from Marc Domen ONL 6945, PO Box 38, Borgerhout, B-2200, Belgium.

UBA have their s.s.b. Contest 1300Z Saturday January 26 to 1300Z Sunday 27th. The c.w. leg is at the same times February 23-24. Categories are single op single or all-band, Multi-op single transmitter, QRP ten watts and s.w.l. It's a world-wide contest, and you exchange RST plus serial number, with Belgians adding the province abbreviation. QSO points are 10 each for contacts in ON, DA1 or DA2. Other Europeans earn three points, and all others one point. The multiplier is the sum of all Belgian Provinces worked, plus prefixes ON4-9, DA1-2, plus EU countries. Logs to be mailed within 30 days to UBA HF Committee, Galicia Jan ON6JG, Oude Gendarmeriestraat 62, B3100, Heist Op den Berg, Belgium.

Habits

Operating habits, I mean of course, not canonical ones. My first pet peeve is the guy who insists on partial calls and then complains if his log is full of 'insurance' contacts. It's his own 'tomfool' fault for being a sloppy operator.It slows things down invariably and I can't see how it can be seenas in accordance with the licence conditions. My second pet peeve is the DX station who fails to indicate his OWN callsign. It's bad enough scratching around trying to fathom his operating method before calling. However, to waste twenty minutes or more trying to establish who he is before you can start looking for the way to call him (or whether he's worth a call!) is plain silly! My third pet peeve is the operator who gabbles and/or lacks a receiver. There is a glorious example on my local repeater. This character regularly calls his pal at 30-second intervals for up to an hour at a time. So far, I have managed to decipher one of the calls but not the other, and since he gives the calls in no order I don't even know whether he owns the readable or the unreadable call. Come to think of it, I don't even know whether he's using our repeater or just accidentally QRMing it while using another one!

My fourth pet peeve is the people who refuse to QSL via the Bureau system!

Bands

As always, winter is a time when, however good conditions are, on the low bands you have to battle through the 'clonks and clanks' of umpteen 'neighbourly' heating thermostats. On the higher bands, the 'open' times are shortened too. All that having been said, I can't really complain - as there is usually something of interest on one band or another.

To those few kind souls who looked up the deadline dates from the previous issue and sent in copy - my grateful thanks!

The 1.8MHz Band

G2HKU (Minster) seems to have given the band a bit of a bashing this time; DJ2TI, CN5N, UZ1TWW, SM6CPY, GU3HFN, DL0KF, 4N4AE, OM5W, SN3A, CT1AOZ, EI7M, OY9JD, W4QM/MM, K1ZM, UC2LEG, SM3BCS, HA8KX, T77C, SM5ADI and LY1BYK, all on c.w. Transmission was on the vertical HF6V, while the receiving side was handled by way of the G5RV.

Your scribe and a group of the locals are on 1.932MHz at 1900 clock on Tuesday evenings and welcome breakers. So far, we have been joined by GU2FRO, which has been of great interest to GW3JPT in Welshpool who had persuaded his home-brew loop down onto the band. Interestingly enough, while the loop puts out quite a decent signal on the band, it really shines forth as a receiving antenna with marked low-noise properties.

I mustn't forget the logical successor to the late W1BB's much missed *160 Newsletters*, and the VE3INQ offering is now being run from UK by G3XTT and G3RBP. They need all the support you can give them, so don't fail to drop them a line with your news, and at the same time organise a subscription for yourself.

The 28MHz Band

G3NOF (Yeovil) found band openings between 0700 and 1800Z. North America was noted from noon on, with USSR stations active during daylight hours. Although JAs were active on the short path around 0900, VKs from then to 1100, nothing was noted from the Pacific. A22AA, HK0TU (Malpelo), JAs, Ws, PJ2/OH3VV, and TI2CC were all worked on s.s.b.

G3JMO (Redcar) mentions that Helen UB4UHP, on 28.7MHz, was his first YL Russian QSO. Although he tried to extend the QSO by reference to details of rig, Wx, etc., UB4UHP would have none of it. As Allan commented, the QSO was like the ones we used to have with Russians in the days of the Cold War, except that at the end she intoned an 88 as a pure formality, like a catalogue request!

GM3JDR (Auckengill) tried a spot of s.s.b. on 28MHz, with PJ1B, VS6WV, TM0E, CE3DNP, P40T, FS/KC1F and JAs all booked in. Those down south tend to bewail the short hours of opening on 28MHz, but it must be far more difficult so far north.

G2HKU stuck to c.w. on this band and raised N4DW, EA9IE and K1AR - he who writes the Contest Calendar from which I can thankfully quote whenever necessary.

Over to **ON7PQ** (Kortrijk). Pat is all-c.w., and this was the way he raised 9H8C, P4/K4PI, CY9CF, PJ4/NL7GP, PJ2/OH1LD, CN2JO, 8J5ILY/5, HK0TU, CO6DD, FR0P, ZD8LII, FH5EJ, ZS9/W6KG and J8/K3IPX.

G0HGA (Stevenage) had rig trouble again, but before it happened she managed, with ten watts, to hook NA8G, VE3FKD and RA3DEV.

Now to **GW0HWK** (Wrexham) who offers 5N30ETP, TA5KA, SV5A, WB1ASV, KC6GFY/2, UM8MDX and LU3PDS.

The 3.5MHz Band

G3NOF made one of his rare forays on the band when he worked J6LRX.

As for G2HKU, Ted stuck to c.w. and was rewarded by EA8/DJ9RB and 4U1ITU.

G0HGA reports that her old long-wire is now transformed into a W3EDP. On the other hand, a rig problem reduced her to 2W for a time. The QRP signal managed a couple of DJs and ON4IM, while the 20W level gave OK1FPS abd DF2YK, plus of course a shoal of G stations and GW3COI - the *PW* cartoonist - for a change!

GW0HWK simply mentions 'plenty of G and Europeans'.

GM3JDR notes that the JA opening on 3.5MHz is due soon at the time of writing, as he finds it occurs December 21 +/- seven days.

The 21MHz Band

G3NOF found the band open from 0800-2000Z. Around 0900, long-path JA and VK, short path 1000-1200Z. Noon-1900 for the N. Americans and the few S. Americans from then to close. QSOs using s.s.b. were with C56/OH7XM, CE2CC, CN15AMV, J5CVF, JAs, OA4QV, RA0AD, SV2RE/A on Mount Athos, SV2UA/A likewise, TQ0LER for IOTA EU 58, UI8FM, V21AS, V29OA, V44KAZ, V44KI, VE7DGI, ZL1UFJ and 4K3BB.

Using c.w. was the way for GM3JDR too, Don found HK0TU, 4K4/UA6WCG, SV9BAI and JAs.

For G2HKU, after his exertions on Top band, there was just the one QSO, a c.w. one with N3RS.

ON7PQ again is c.w., and for Pat there were HI8DMX, CY9CF, P40R, HK0TU, ZW0ORF (IOTA SA24), V85OM, J8/K3IPK and 6F3CS.

For G0HGA we find WB3GOG on 1W, NA8G and CT2A on 2W, and for an anticlimax, CT3BH and UB5KEI with 20W!

For GW0HWK there hasn't been too much activity as his time has been taken up with work; such jobs as setting exam papers and so on. Nonetheless time was made to hook up with CR1BI, CU2DX and NE3F on this band.

The 7MHz Band

Most of the real 'dab-hands' on this band seem to keep quiet about their doings; but GM3JDR notes his s.s.b. contacts with ZD8Z, K4SXT/DU3, ZL2SQ, CE3OZC, CE4MAO, CN2LB, FS/KC1F, P40V, XM2ZP, EA6FB, PJ1B, HI8A, RW0WR, JA2BAY, BY1PK, KL7RA and UZ9QWA; while a spot of 'paddle-wagging' dealt with ZL4BK, LU6EF, YB2UDH, YC2ZEG, CY9CF, 4K4QO, 9H1BM, UA0SEW, KV4AM, HK0TU, PJ2/OH2WR, XE2MX, CO2SO, VP2VI, XE3LPV, YV4AU, YV3DYW, RA0AU, OA4AWE, 8P6AU, ZF2PR, VP2KCW, N5TV/KH6, 6W/JA8RWV, lots of JA, W6 and W7.

Another rarity; G3NOF on this band, working OU5PE.

On the other hand G2HKU managed K4CG, WW2Y, K1AR, N3EA, 9H3OA/4, SV9ADH (Crete), PJ2/OH1WR and N4UB. On the other hand, there might have been a contact with HK0TU - when Ted should have been receiving his report the HK was drowned under TWO S-9++ 'policemen'

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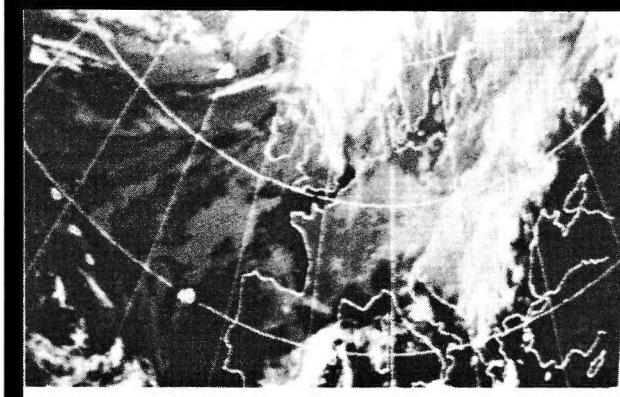

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calling someone else a 'lid.' This event occurred after Ted had spent eleven minutes listening to the DX station without hearing him give his call once. So, G2HKU went QRT in disgust. Such is life!

From ON7PQ; CY9CF, PJ2/OH6MW, ZF2MZ, VP5/WU8A, PJ2/OH1XX, K4SXT/DU3, 4X/YU4OO, FR0P, HK0TU, CE0ZZZ and 3A0AA.

G0HGA just made it with 1.5W to N2ME, UB4FWW and UB4JFJ; while with 25W, it was K0II, W1HMD, K1SS, W1CW, KC3MR, AA4IO, K8CW, WF3M, K1JO, XM1NS (a VE special), 4U1UN, TA2AO, RH8AA, UL8LXQ, PJ2/OH5PT and the usual Europeans.

WARC Bands

9H1IP first. Vince mentions, on 18MHz, UD7KWB, 4U1ITU, J73WA, TI5GLF and HP1XSO, plus 24MHz contacts with UD7KWB, D44BS, 9J2WS, FT4XG, VP5VWB, CN2TU and 7Q7JA, prompting him to comment that 24MHz seems to be opening up fairly well.

On 18MHz, GM3JDR's c.w. made it across to KH6CC, VU2TS, VK4NL, 4Z4CX, FK8FS, RM3M/UA9OF, D68VT, FH5EJ, UA9TX and JAs; 18MHz s.s.b. yielded ZL2AAG and JAs. For 10MHz the tally was PJ2/OH1XX, WP4IXO, VK4SS and JAs. That leaves us 24MHz, and here Don put his c.w. out to ZM2AGY, ZM1HV, PY4UG, ZS5BK, CN2VT, V2/KD6WW, 9H8C, VK5MV, VK6AKG, ZL2ANT, VK1FT, SV9ADH, FK8FS, 3B8CF, 8P9GN, FS/KC1F, UW0SQ, OH0PA, J37A, U0AG, FH5EJ, J37V, VP5/KA8IIC, FY5YE, WN4KKN/ZP5, YN/SM0OIG and a gaggle of JAs.

G3NOF notes that 24MHz is still prone to deep fading, but he managed to hook BV2FA, C53GH, EA9UA, ES5D (Don still has the QSL from this chap confirming his 1937 s.w.l. report!), FP/VE1KM, HV3SJ, KC7BL (Nevada), KI6DL (Idaho), KP2A, N7HGH (Nevada), NW7K (Idaho), PT7BZ, RW9FW, T77J, TU2QQ, W5SAL (N. Mexico), W0GAQ (Idaho), WQ7B (Montana), VU2GHS, 4U1UN and 9H1MF. G3NOF didn't spend much time on 18MHz, but he did net GM4TYU, T77J, TU2QQ and VQ9CQ.

Now we turn to G2HKU. On 10MHz Ted found ZM1HV, VE3CAA, HB9LO, UA2FV, N5VV and OK2LF. 18MHz saw W3QBK and 24MHz KC1RG.

Over to ON7PQ, who notes on 10MHz 4U1ITU, GP6UW, ZB2/WA6CDR, FS/KC1F, WP4IXO, CN2TT, 3B8CF, 4U45UN, PJ2/OH1XX, SV9ADH, AH3C, KH6AK and T77C. On 18MHz the tally was FK8FS, A35XK, 4U1ITU, D68VT, KH6CD, PJ7/OH3VV, J37A, 9H8C, SV9ADH, FR0P, J37V, FS/KC1F, AH3C, LX/PA3DK/P and FH5EJ. As for 24MHz, the scalps mentioned here included FS/KC1F, 4U1ITU, 8P9GN, J37A, KL7CYL, 9H8C, SV9ADH, CN8VV, P40T, TA2AO and FR0P.

GW0HWK mentions D44BC, YL2AG, WA2DPK, W3YY, K2ANR and CU1AC, with 24MHz signals booked in from ZL3ADJ, JA2KSI, CU1AC, W0GBR, EA9TP, JL6FLL, 9H1GP, JJ3LLT, 9H1XX, W1KFY, ZS1ACY, ZS1VX plus Europeans.

Finally The 14MHz Band

G0HGA raised quite a few EUs and Gs in the EUCW contest, with a gaggle of USA and VE stations in the CQ WW c.w. leg.

GM3JDR didn't have much time on this band, but he did make it T33T, RM2M/UA9OJ and the inevitable JAs.

Another one to devote more energy elsewhere was G3NOF. Don looked for Asia and Africa in the evenings and managed s.s.b. with A43ND/20, BY1QH, KH0/JG1OUT, T33R (Banaba), TZ6PS, UH6E/RC2AR, VKs, VQ9CQ, VU2CVP, VU2GPD, W6ALQ (Montana), YB8RB, YK1AA, ZS8MI, ZS9/W6KG, 3B8CF, 4X6DW, 5H3DC and 8J5ILY.

For G2HKU it was s.s.b. out to ZL3FV and 5B4YF, plus c.w. to JA7AS, ZL1AW, N3RS, EA8AGD, K5MA/1 and K1AR.

ON7PQ's c.w. connected with 3C1EA, VU2GTT, 8A6INA, 9H8C, WM1D/KH0, HK0TU, C9QL, T33T, 9M8ZR, HH2JR and J8/K3IPK.

Finally, GW0HWK who raised NL7J (Soldotna, Alaska) using QRP both ways then a demonstration station, IQ1A on SSTV.

Back-Scatter

VHF Up

Reports to
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed, Herefordshire HR2 0HP

Solar Data for November 1990

The quiet side of the sun was looking our way during the first few days of November, and by consequence there was very little solar activity. By November 4, the more active side of the sun was starting to come into view and a flare of 330 flux units, measured at 3GHz, was reported on the 4th but it only lasted 4 minutes. On November 6, a flare of 120 flux units was recorded and on November 7, a major flare alert was issued but nothing came of either event.

The geomagnetic A index during this period was very quiet, being down to only 1 on November 5 & 6. In theory, it is at times like this that propagation over the pole is more favourable. Although this was the case during the period in question, the 50MHz band was also open to Australia and Japan at other times when the geomagnetic activity was high.

Throughout the week, auroral activity was virtually non-existent, but some activity was detected in northern latitudes on November 10. F2 propagation, reaching up to the 50MHz band, was particularly good over the UK-US circuit during the period November 9-11. Despite the fact that the more active side of the sun was facing our way, there was only a very small increase in solar activity in the period up to November 18. The sunspot count peaked at 253 on the 12th, but declined thereafter.

From November 19, the quiet side of the sun rotated into view and by consequence very little solar activity occurred. However, a flare was reported on the 19th but it only lasted for 8 minutes. By the middle of the month, the solar flux had risen to the 255 level, due in part to the appearance of an enormous sunspot region. This magnetically complex region consisted of 78 spots covering an area of 9000 million square kilometres. This region was the cause of a number of short wave fade-outs (s.w.f.), two being reported at 0120 and 2315UTC on November 25.

These fade-outs generally give the v.h.f. operator something like 36 hours warning of an impending aurora. It therefore came as no surprise to a number of operators that an aurora would occur on November 27. During this period the geomagnetic levels were unsettled to active, with an A index of 29 being recorded on the 27th.

1990	TIME	C A L L S I G N
Oct 19	0850	VK4BRG
Oct 27	0925	VK6JQ
Oct 28	0915	VK6JQ
Oct 31	0955	VK6HK VK6RO VK6YU
Nov 4	0940	VK6JQ JH4IUO
Nov 5	0930	JA4MBM
Nov 6	0855	VK6JQ
Nov 8	0945	KG6UH/DU1
Nov 13	0900	JA6WXY JA4MBM
Nov 20	0915	VK6JQ VK8ZLX
50MHz DX heard/worked from the UK		

Fig. 1.

The 50MHz Band

The band was open to all continents of the globe during November. It was, however, a similar case to that of October insofar that openings were fairly brief, but at least some of the openings were predictable.

In the previous issue of *PW*, I recorded many of the openings that occurred during the month of October were to the Far East and Australia. A number of readers have written in to give further details. **Chris Gare G3WOS** (HPH) was one of the fortunates, working VK4BRG (QG48) on the 19th and VK6HK, VK6RO and VK6YU on the 31st. This latter opening occurred between 0956-1006UTC, the signals from VK6YU peaking 10dB over S-9. **John Heys G3BDQ** (SXE) found VK6JQ (PH12) at 1045UTC on October 28 and went on to have a QSO lasting 10 minutes, signals varying between S-4-9. **Johan Van de Valde ON1CAK**

Back-Scatter

also worked VK6JQ, catching him on October 31. The openings to the Far East continued into November, the first occurring on the 4th when G3BDQ heard JH4IUO at 0940UTC, peaking 549. A little later, at 1110UTC, **G0KOI** contacted VK6JQ. **Geoff Brown GJ4ICD** (JER) heard a number of Japanese stations around 0930UTC on November 5, but was unable to work any although conditions were better in other parts of Europe. In the Netherlands, **PA0HIP** worked JR6WPT (PL36) at 0936UTC and heard JR6WXY. Between 0900-1000UTC, DJ9KG, ON4PS, OZ1ELF and OZ1BVW were heard in the Tokyo area (PM95) of Japan. **PA3ECU** managed to work into the Philippines, catching KG6UH/DU1 (PK04) at 1005UTC and hearing VK6JQ at 1115UTC. At 1105UTC both **G3HBR** and **G3IBI** copied VK6JQ peaking 59. This latter station was worked by GJ4ICD at 0855UTC on November 6. At the same time, SMs had propagation into JR6 Okinawa and a number of stations in OZ, PA and LX were working into DU. On November 8, KG6UH/DU1 reported hearing some OZ stations around 0845UTC. By 0945UTC, propagation had extended into the UK, allowing contacts to be made with GD3AHV and GI8YDZ.

On the following successive mornings no path existed from the UK to the Far East, but OH stations heard JAs on November 9, DH2BK heard KG6UH/DU1 at 0950UTC on the 10th and Italian stations heard JAs and worked KG6DX on November 11. On this day, from 0830-1000UTC, PA0HIP copied Chinese TV on Channel R1 and heard JH4IUO for 20 minutes from 0845UTC. French stations were heard working into Japan, around 1015UTC on the 12th, but signals didn't make it across the English Channel!

It was not until November 13 that the UK got a slice of the action. At 0900UTC, **Ted Collins G4UPS** (DVN) heard JA4MBM at 559 and several other JAs including JA6WXY. Chris G3WOS was fortunate to work both these stations at 0907 and 0913UTC respectively. GJ4ICD, on the Island of Jersey, also managed to get a few in the log. To show how selective these openings are, G3BDQ, located on the south coast, could hear PA stations calling and working the JAs but couldn't copy a peep himself. He mentions that it is very similar to working JA on 1.8MHz. The UK is too far west, so we get the path over the north pole region with the attendant loss of signals. The more east you are located the better it is. John thought that in this opening the propagation was better in Holland. This is certainly true, as **PA0HIP** reports working, between 0910-1000UTC, JR6BZK (PM52), JR6UDM (PL36), JR6VSP (PL36) and hearing JR6WPT, JR6WXY and JS6CDB, all in locator PL36.

Nothing was worked from the UK on November 16, but OH2HK worked VK3OT at 0946UTC and VK3AMK & VK3AMZ at 1009UTC. It was a similar situation on the 17th, with PA0HIP working KG6UH/DU1 at 0945UTC. The next recorded opening into the UK occurred on November 20, with **Mike Walters G3JVL** (HPH) working VK6JQ at 0933UTC and G3OIL, in Salisbury, contacting a number of VK8 stations. At 0943UTC, PA0HIP worked VK8ZLX (PG66) and heard VK6JQ. He heard the Channel 0 video carrier on 46.171MHz from 0745-1115UTC, fairly weakly for most of the time, but it peaked to S-6 around the optimum time 0900-1015UTC. To many 50MHz operators, propagation to DU, JA and VK would have seemed non-existent but surprisingly, as **Fig. 1** shows, the band was open on 10 mornings during the months of October and November. I wonder what 1991 will bring?

The band was also open to other continents apart from Asia and Oceania. G3WOS worked ZS9AXT, TR8CA (JJ40), HC2FG (FI07), HC5K (FI07) and 9L1US, in that order, between 1140-1555UTC on October 19 and on October 24. Between 1315-1445UTC, G3BDQ worked V51E and ZS9A. He also worked YO2IS, at 1028UTC on the 28th, 7Q7JA, at 1850UTC on the 30th and a string of 9H stations between 1355-1840UTC on October 31. Johan ON1CAK was another station to work the Maltese stations but in addition he also had QSOs with 7Q7JA, 7Q7RM and Z23JO. **Jacky F2CW**, operated from Morocco at the end of October as CN2CW. He had one opening into the UK, on the 28th between 1130-1146UTC, working G3UKV, G4AHN, G4DDA, G4IGO, G4UPS, GJ4ICD, GW3MFY, GW4EAI and GW4LXO. All contacts, by the way, being made on c.w.

The openings continued into November unabated. On the 1st, **Ela Martyr G6HKM** (ESX) worked TU2EW (IJ75) as did ON1CAK, who also worked 3X1SG (IK51) and ZS9A. Johan also worked 3X1SG on the 2nd, GJ4ICD worked TU2EW and G4UPS heard 7Q7JA, at 579, calling CQ USA. The first UK opening of the season to the USA occurred on November 3, between 1400-1425UTC, with Ted G4UPS hearing K1JRW, K2QIE, K3MLD, WA1OUB, VE1YX and VE2DFO.

Jim Smith G0OFE (DOR), previously known as G1DWQ, reports that he passed his Morse test in October. Congratulations Jim! On November 4, between 1315-1415UTC, he heard the 9L1US, V51E & V51VHF beacons and G4UPS reports V51KC, ZB0T, ZS6XJ & ZS9A all working into the UK. Openings occurred on every day between November 5-9. Some of the callsigns that worked into the UK included K1IKN, K1TOL, WA1AYS, K3MLD, W3WFM, N5JHV, VE1HD, VE1YX, V51E, ZB0T, ZS4S, ZS6WB and 9L1US. Propagation into North America was excellent during the weekend of November 10-11. At my QTH, I managed to make 16 contacts with stations located in FN32, 41, 42, 43, 53, 65, 74 and GN27. The competition on s.s.b. was very intense, and I found it much easier to work stations on c.w. with most of them coming back on the first call. **Gerry Schoof G1SWH** (MCH) worked KM1E, N1ETT, W2CAP/1, VE1MR, VE1ZZ, VO1NE & VO1WA whilst Jim G0OFE worked/heard HC2FG, HC5K, VE1YX, WA1OUB, W4DR, TR8CA (JJ40) & 9L1US. G4UPS worked ZC4MK at 0850UTC on the 11th and then heard the 5B4CY beacon peaking 559 prior to the USA opening in which he worked 15 stations. At 1516UTC, ZS6WB was worked 559 bothways. There was propagation to the south-east during the morning of the 12th with G6HKM working YO2IS and others working ZC4MK. Around mid-day the band opened up to South America with HC2FG & HC5K putting a good signal into southern England. At 1230UTC, **Ken Taylor G4GAI** (LNH) heard the HC8SIX (EI59) beacon on the Galapagos Islands but no other amateur activity. Brief, geographically selective openings continued to be heard throughout the UK. Although not definitive, the following list will give you some idea of the coverage. 6W1QC (IK14) and 9L1US on the 14th, HC2FG, HC5K, HC8SIX and KP2A on the 16th, TR8CA, VE1 & W1 on the 17th, HC8 and VE1 on the 18th, HC1BI (FI09), VO1MUN, 3X1SG, 6W/JA8RWU (IK14) and 9L on the 19th and 3X, 6W and 9L on the 21st. And you thought the band was closed!

The 70MHz Band

Conditions during November were predictable - ghastly! In addition, the unfortunate trend of a reduction in activity, especially in the narrow band modes section, didn't help at all. The aurora on November 27, which covered the UK, went unnoticed by virtually all operators.

Dave Lewis GW4HBK (GWT) reports hearing the GB3BUX (70.050) and GB3ANG (70.060) beacons fully auroral on November 27 but despite calling and listening from 1705-1820UTC, he was unable to raise anyone. Dave mentions that he could also copy some eastern European broadcast stations on a beam-heading of 50°.

In the January issue of *PW* I mentioned the promotional special event callsign GB4MTR. **Roger Banks G4WND** (SFD) has provided further details. To qualify for the GB4MTR award certificate you must work a specific number of stations on 70MHz, either direct or cross-band. There are three levels that may be attained, 100 stations for the Bronze award, 125 stations for the Silver and 150 for the Gold. Each level must include at least one contact with an operator using GB4MTR. This callsign will be operated by 13 stations each for a 28 day period, conveniently fitting into the whole of 1991. The first stations to use the callsign GB4MTR will be G4WND from January 1-28 and myself from January 29 to February 25. I will certainly be airing it during the 70MHz cumulative contests on February 10 & 24 but don't forget that GB4MTR can be used on any band that the operator is licensed for - and you may well hear it on any band from 1.8MHz upwards.

The 144MHz Band

Tropo conditions during November were generally poor, although there was a flurry of activity during the period November 5-8. The Marconi Memorial c.w. contest and the ARRL e.m.e. contest, both held on November 3-4, generated a reasonable amount of activity as did an aurora on November 27. The Taurid and Leonid meteor showers which peaked during the month also aided to increase activity, albeit from the specialists.

Ralph Sachs G2CZS (ESX) sent in a resume of DX worked in October and November. Using an FT-290R and 80W from a BNOS amplifier into an 8-element J-Beam Yagi, contacts, on October 1, were made with DC6CY, DJ0PY, DL1EAP, DL1EFJ, all in JO31, and with Y25JI/P in JO51. On November 5, he heard FC1ADT/P (JN15) but couldn't make a QSO of it but on the 16th, Ralph worked FC1FAW/P in the same locator square.

Bob Ibbotson G0DVY (LCN) found the tropo conditions on November 6-7 to be quite good, working DK9OY (JO52), DL7AKA (JO62) and OK1VEI/P (JO70) with his 100W to a 14-element Parabeam Yagi.

Two reports in one envelope gives details of activity from the Isle of Man. **Dave Brown GD4XTT** and **Joice Brown GD0ELY** both have to share the radio equipment and what little time there is to work the DX. Let's see who got the upper hand! Joice started the month off by working about 40 stations in the Marconi c.w. contest on November 3-4. Conditions were good between November 6-8, allowing Dave to work OK1KLU/P (JO456) on the 6th and SM6DWF (JO57) & SM7JUQ (JO65), around 1030UTC on the 7th. Dave then went out and Joice got on the rig, working many DL and Y stations in JD42, 43, 54 and 62. From 2000UTC, Dave was in the operating position, contacting plenty of DL, Y and OK stations in a line from JO32 to 62, 41 to 61 and JO70. On the 8th, conditions were poorer but even so, Joice worked many DL & PA stations in JO20 to 31 and DL7MAT (JN58). Dave worked a similar number of continental operators but also found stations located in JN39, 49, 58 and 59. No other DX was worked in November but Joice found time to operate in the final c.w. cumulative, on the 11th, making 15 contacts. For the sake of harmony and continued reports from the Isle of Man, I can make no judgement as to who got the better of the DX, but I must say that I am impressed with the amount of effort put into the c.w. activity!

On October 25, **Derrick Dance GM4CXP** (BDS), worked SM5BUZ (JO78) on c.w. at a distance of 1114km, but suspected that he was on the fringe of a tropo opening as nothing else was heard. He missed most of the good conditions in early November but managed to get DB8KJ in the log on the 8th. During the final c.w. cumulative period, on November 11, Derrick worked his best DX of the contest by contacting G4YRY (DOR) at 540km. On November 18, between 1615-1640UTC, the GB3LER beacon was heard to go auroral, but no other signals were copied at this time.

Jim G0OFE first detected the aurora, on November 27, on 50MHz around 1705UTC, but switched quickly to 144MHz to work GM3NHQ (GRN) 52A 56A. He heard a number of DL stations at 41A but very little else. The event faded out with him around 1945UTC. Jim reports that the activity from the UK was quite low.

Conditions, at my QTH, during the 6-

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hour section of the c.w. contest held on November 4 could certainly have been better. Signals were generally weak and suffered from QSB. A total of 88 QSOs in 7 countries were made, the best contact being with DL1YAP/P (JO42) at a distance of 762km. As luck would have it, conditions improved in the days after the contest, allowing a number of c.w. contacts to be made with stations located in central Germany. Murphy however, was keeping an eye on the proceedings to ensure that conditions were rock bottom for the final session of the c.w. cumulatives on November 11. In the two and a half hour contest, I made 42 QSOs, the best, but not the furthest, contact being with G0JLL/MM in JO13.

In my opinion, the event of the month was the aurora which occurred on November 27. I discovered it at 1730UTC and then went on to make 30 c.w. QSOs, mainly with stations located in Germany. Contact was also made with HG8CE (KN06) at 1802UTC, HG0HO (KN07) at 1819UTC and HG0LI (KN07) at 1838UTC, all 3 QSOs being just over 1800km. Beam heading during the event was between 50-60°, with the Hungarian stations peaking at 60°. At my QTH, most of the DX stations had disappeared by 1930UTC, although a number of GM stations were still heard at good strengths for the next hour or so.

Mark Holloway G4YRY (DOR) was prompted by the moon rise/set times, that I supplied recently, to have a listen for e.m.e. signals during the ARRL contest on November 3. Using a TR751E and 80W into two 14-element Yagis, he was thrilled to make a QSO, at 0715UTC, with W5UN. At 0730UTC, Mark called N5BLZ, who managed to get part of his callsign. On November 4, between 0710-0910UTC, signals were copied from KB8RQ, W4ZD and W5UN.

David Law G0LBK (YSS) was planning to listen during the 2nd leg of the e.m.e. contest, but unfortunately his low noise amplifier went QRT. He did manage to get things sorted out for the tropo opening, from November 5, working stations in DL, F, OK, OZ, PA and SM.

The 430MHz Band

What can I say about a band whose predominant mode of communication is via the troposphere? Even when the band is open there is very little in the way of activity. Has everyone gone onto 50MHz or 70MHz, are they operating on packet radio, or have the sun spots driven the operators onto the h.f. bands?

GD4XTT mentions that tropo conditions were good between November 6-8. During this period he worked DL4OL (JO52), OZ1KLU (JO46) and OK1VEI/P (JO70). However, the Czechoslovakian station was rather frustrated saying, "this is ridiculous, the bands are really good and there is no one out there. I think I'll pack up and go home!"

Pavel OK1VEI was using only 35W and a single 14-element Yagi, to produce S-9+ signals bothways. Additionally it is worth beaming towards the Isle of Man, especially on Wednesday nights around 8pm, a time when XYL GD0ELY puts out calls on 432.200MHz.

John Arnold G4NPH (CBE) reports on the good tropo conditions which existed on November 8. He heard GM0HBK (WIL) for over two hours but was unable to make a QSO despite persistent effort. However, contact was made with GM1SZF, GM8AFF and GM8GCY, all located in northern Scotland.

Another operator to work GM1SZF on the 8th, was G0DVY. His contact, with 100W and two 23-element Yagis, was most unusual, insofar that he was calling CQ on a beam heading of 95°, into central Europe, when GM1SZF replied at S2. On turning the antennas towards Scotland the signals disappeared. Moving the beams back to 95° brought the signal back up and the QSO was completed. Conditions were also good on the previous evening, with OK1VEI/P (JO70) being worked at 0028UTC following a QSY from the 144MHz band.

G1SWH contacted OZ9ZZ on November 6, for a new country but reports very little else. The contact with OZ was in his worst direction, over the Pennines.

Ela G6HKM, considered that the activity during the cumulative contests was very poor but on November 18, she worked into GD, GI, GW and DL.

The Microwave Bands

GD4XTT has recently obtained a Microwave Modules MM1296 transverter but has no antenna yet. He managed to work G4MTR (CBA) with his 430MHz Yagi, but wonders if it is worth the effort to get a proper system in the air?

The *Microwave Newsletter*, edited by G3PHO and G8AGN, reports on the activities by the South Birmingham Radio Society during the IARU contest on October 6-7. Using the callsign G3OHM/P, the group were active on both 3.4 and 5.7GHz. The gear on 3.4GHz consisted of an FT-726 and transverter, driving a travelling wave tube amplifier to 20W output into a 1.2m dish antenna. An ATF10135 low-noise amplifier was used on receive. Contacts were made with G4LRT/P (42km), G8KPB/P (47km), G8IFT (52km), G8NTD/P (122km), G6DER (164km), G4EQD (174km) and G4PMK (192km). Contacts on 5.7GHz, with 10W to a 600mm dish, were made with G4LRT, G8KPB, G4ZFP/P (69km) and G6PHJ/P (122km).

Paul Gaskin G8AYY reports on his 10GHz operation during the cumulative contest in October. Operating from the Lickey Hills, contacts were made with GW3ATM/P and GW4ZVQ/P, both on the Black Mountains (PWS) at a distance of 89km. Paul finds he can obtain a big improvement in S/N ratio, by using a Howes audio filter to process the audio from his 10GHz wideband receiver.

Another operator out for the October contest, was **Barry Chambers G8AGN**. He had a really good time on 10GHz narrow band, working 11 stations. These included three contacts over 200km, G3FYX/P and G3KEU/P at 171km and G3JVL at 270km. The contacts were made on c.w. using the send/receive switch on the IC-202. Barry 'learnt' the Morse during the contacts, as he had never done the numbers before!

The Southern Microwave Group are holding a microwave round table at the Rutherford Laboratories, Harwell, on Sunday February 24. To obtain details on entry you must contact Ted Jewell G4ELM, 12 Patricks Copse Road, Liss, Hampshire GU33 7DL.

Beacon and Repeater News

A proposal has been submitted for a 10GHz beacon to be installed near Port Talbot (GNW). The callsign suggested is GB3RPE, in memory of Dain Evans G3RPE, the previous RSGB Microwave Manager.

At the request of the Radio Interference Service section of the Radiocommunications Agency, the service area of the south London repeater GB3SL has been drastically reduced. This modification is expected to remain in force until mid-January. If you have any comments or observations regarding the coverage of the repeater you should contact Douglas Davis G3PAQ.

To speed up the handling of packet mail in the East Anglia region, Eastnet have just commissioned its first 9600 baud links operating on the 1.3GHz band. These are between GB7HXA, GB7PX and GB7DDX. This link is not only for BBS forwarding, as GB7PX-1 is also a network trunk node available to all users, via GB3PX on 144MHz. Several more 1.3GHz links are planned for the East Anglia region. You can get further details from Nick Martin G6NHK, sysop of GB3PX & GB7PX.

Meteor Showers

The following data, concerning meteor showers occurring in January, will help you determine in which direction to beam at specific times and when the shower is below the horizon.

The Alpha Aurigids meteor shower will be encountered between January 15 and February 20, with a broad peak of activity from February 5-10. Between 0100-0300UTC beam south-west or north-east, 1600 to 1900UTC beam north or south, 1900 to 2100UTC beam east or west, 2200 to 2400UTC beam north-west or south-east. The shower radiant is below the horizon between the hours of 0300-1300UTC and is therefore not usable at these times.

QRZ Contest!

A number of 70MHz cumulative contests have been arranged to run between January-March. The first two, running between 0900-1100UTC, will be held on January 27 and February 10.

A 144MHz c.w. contest is being held on Sunday January 20 from 1000-1700UTC. It has two sections, single operator fixed station and all others. Why don't you give me a call!

The u.h.f. enthusiast will have to wait until Sunday February 3 for the 430MHz fixed station contest. It is scheduled to run from 1600-2300UTC.

If you fancy putting your feet up and watching the telly, why don't you tune in to the last of the BATC fast or slow scan ATV cumulatives on January 19 & 27. Each session lasts from 1900-2400UTC and is held on any band for which these modes are allowed.

The RSGB Microwave committee have decided to run a series of cumulative contests, for all bands from 3.4GHz upwards. The contests will be held on January 27, February 24 and March 31, between 0900-2100UTC. The aim is to encourage home station operation, especially on 10GHz narrow band, but if you do not have that capability then feel free to take out the wideband gear portable.

The Scandinavian activity contests, as detailed in the January issue of *PW* will be held on the following dates. Microwaves on January 15 and February 19, 430MHz on February 12, 144MHz on February 5, 50MHz activity on January 22 and February 26.

Annual v.h.f./u.h.f. table
January to December 1990

Station	50MHz Counties	50MHz Countries	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Points
G1SWH	49	33	54	7	85	20	51	10	16	5	330
G6HKM	53	41			65	23	34	13	28	11	268
G0IMG	52	33	44	4	52	13	32	4	—	—	234
G4ASR	27	36	59	8	55	31					216
GO4XTT	36	20			75	20	18	9	1	1	180
G6MXL	14	22	26	5	41	9	24	8	13	4	166
G0NFH	40	20	21	3	48	9	11	2	2	2	158
G0FYD	20	24	1	1	75	20	11	4			156
G8PYP	27	31	2	1	49	18	21	6			155
G8ESB	9	5	18	3	48	7	36	5	15	4	150
GW4HBK	2	12	52	7			29	4			106
G0EVT	21	23			36	14	5	1			100
GM4CXP	9	6	7	3	54	13			—	—	92
G4ZTR	—	—	—	—	59	19	—	—	—	—	78
GW1MVL	2	2			43	10	11	2	—	—	70
G7CLY	—	—	—	—	60	9	—	—	—	—	69
G4SEU			62	6	—	—	—	—	—	—	68
GW7EVG			—	—	37	6	—	—	—	—	43
G7CFK	18	12									30
GM1ZVJ	1	9			2	1					13

Annual c.w. ladder

Station	Band (MHz) 50	70	144	430	Points
G4ASR	69	31	257	—	357
GD0ELY	13		237	—	250
G4OUT		48	138	—	186
G4NZU	18	5	159		182
GM4CXP	11	7	89	—	107
G0FYO	31		62	1	94
G0DJA	17		10		27
GW4VVX	3		9	—	12

Number of different stations worked since 1 January 1990

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The Derby and District Amateur Radio Society will be holding their annual 144MHz contest on Sunday March 10 from 1300-1700UTC. Using any mode, contestants must exchange callsigns, RST, serial number and county. All contacts score 2 points, except with G3ERD which counts as 10 points.

The final score is the total number of contact points, multiplied by the number of counties worked. Each country outside of the UK is scored as a county. There are two sections, full legal power and low power - 30W maximum, with both single or multi-operator groupings. Logs, showing Time, Callsign, RST, Serial number and county, must be sent to the DADARS to arrive by March 27.

You can obtain a full set of rules from myself on receipt of an s.a.e.

Deadlines

Please send your letters to reach me by the end of the month. I normally write up the column in the first few days of the following month. Don't forget that I can also receive messages via packet radio at my mailbox GB7TCM.

Photographs of your shack, antennas or any v.h.f. activity are especially welcome. Other pictorial items such as QSL cards, awards, certificates etc., are also required.

Back-Scatter

Broadcast Round-up

Reports to Peter Shore via the *PW* Editorial Office

It has been a strange couple of weeks in the world of international broadcasting, with an announcement in a news bulletin broadcast by Radio Canada International [RCI] on 23 November 1990 that budget cuts might force the station to close. The parent organisation of RCI, the Canadian Broadcasting Corporation, has had budget cuts forced on to it by the Canadian Federal Government, and the axe should have fallen in early December. Cuts to the order of Can $350 million are being called for, and with RCI costing around Can $20 million to run each year, it is a convenient way to find a proportion of that sum without inconveniencing the domestic audience too much. RCI has been broadcasting since 1945, and now offers its world-wide audience one of the few ways of keeping in touch with one of the largest countries in the world. At the end of November, RCI was urging listeners to send letters of protest to the Canadian Prime Minister, the Right Honourable Brian Mulroney at the House of Commons, Ottawa, Canada. Alternatively, anyone in possession of a FAX machine can transmit their letter directly on 0101 (from the United Kingdom) 613 957 5636. This plan seems to have worked as they have a stay of execution until the end of March 1991.

A knock-on effect of the closure of RCI would be the termination of some relay agreements with the BBC World Service which uses RCI's Sackville station for transmissions to North America. RCI has facilities at the BBC's Daventry site in the Midlands. Will World Service have to pay for the Canadian relays, and what will happen to the spare capacity at Daventry...?

The future of Radio Budapest could also be in some doubt, with a review likely during December or January. Reports from the Foreign Ministry in Budapest suggest that there is unlikely to be a complete shut down, but cuts are likely. Reader **J. M. Dunnett G4RGA**, wrote from Wellington in Somerset and seems to have taken exception to the column which appeared in December's edition.

"Your review, under 'Unification' was unusually one-sided, prompting this letter.

"The head of RBI was perfectly correct - not just his facilities but the whole of the GDR has been taken over by West Germany, giving 'reunification' a meaning I was not aware it had until now!

"I should also point out that the BBC, Deutsche Welle, VoA and so on all serve exactly the same purpose as Radio Moscow, Radio Peking, etc. They are propaganda stations, a description which sits particularly comfortably on the shoulders of VoA and RFE.

"American short wave magazines also tend to make the same false assumptions, you are not alone."

I certainly would not dispute that a good many of the world's international broadcasters serve as propaganda stations - Radio Free Europe and Radio Liberty have certainly been as guilty as the Eastern Bloc equivalents over the years - indeed what international broadcasting is not some sort of propaganda, whether it is religion from TWR or *A Jolly Good Show* from BBC World Service. But surely, it's all a question of degree, and I don't think that I would tar all international stations with the same brush - I certainly would not spend as much time listening to the programmes if I thought I was being indoctrinated the whole time.

However, up until a year or two ago, indoctrination was certainly the name of the game of the editors of stations behind the Iron Curtain.

Speaking of indoctrination, I think my postman was as surprised as I was when a magazine was delivered with the latest schedule from VoIRI, the Voice of the Islamic Republic of Iran. It extolled the virtues of the Muslim way of life for women, and I must admit it wasn't as interesting as the latest issue of *PW*!

A Soviet-Chinese protocol has been signed which provides for relays of Radio Moscow and Radio Beijing programmes on each other's transmitters. Moscow plans to transmit programmes to Australia, many parts of Asia and the Philippines over Radio Beijing's facilities, whilst China will use Moscow's stations for programmes to the Middle East and western Europe.

Reports in the US press in recent weeks suggest that Radio Free Europe and Radio Liberty could be merged with the Voice of America in coming months. This would clearly be advantageous in terms of budgetary considerations, and now that the Cold War has ended, it makes sense that the US needs only one international broadcasting organisation. More news if and when this happens.

European Stations
All times UTC (=GMT)

The Italian Radio Relay Service carries programmes from the United Nations in English on Sundays at 0830 on 9.86MHz.

Radio Netherlands has been testing its new transmitters in Bonaire which are capable of sending single side band (s.s.b.) transmissions, with 21.515MHz used at 1730 on two days in late November, and

For the very latest Broadcast News you can ring RadioLine (compiled by *Short Wave Magazine*) on 0898 654676.

Calls charged at 33p per minute off peak, 44p per minute all other times.

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more tests likely during the rest of the winter period.

A recent edition of the DX programme on Radio Vilnius provided details of the Latvian domestic radio network which may be of interest to readers for some DX work during the winter nights. On medium wave, these transmitters carry the first programme between 0400 and 2300:

Riga on 576kHz with 500kW
Kuldiga on 1.350MHz with 50kW
Rezekne on 1.422MHz with 50kW

On short wave, Riga on 5.935MHz with 100kW is on during this period, as well as the Mayak Second programme.

The Latvian Second programme is broadcast on medium wave:

Riga on 1.071MHz with 75kW
Liepaja on 1.539MHz with 7kW

Middle East & African Stations

Events in the continuing civil war in Chad made the news in early December, and it might be interesting to tune in to Chadian National Radio which uses 4.904MHz, 'variable', from sign-on in the morning at 0430 until a frequency change at 0730, and again in the evening from 1600 until close at 2200. Radio Moundou might be another worthwhile catch, and uses 5.287MHz variable during the morning from 0500 until 0800 and in the afternoon between 1400 and 1800.

Radio Bardai, a clandestine believed to be based in Libya (a country which was heavily involved in the Chad conflict), used to be heard on 6.009MHz but has been unheard for a year or so.

The VoIRI continues to be heard at 1130 to the Middle East and Asia on 11.79, 11.745, 9.705, 9.685 and 9.525MHz, with a transmission to Europe at 1930 on 9.022 and 6.03MHz. Both of these are in English.

From Liberia, a station has been heard calling itself, "ELBC broadcasting from Monrovia", noted on 7.275MHz between 0800 and 1000.

Radio Rwanda has introduced a new half-hour English programme which is transmitted at 1430 on 3.33 and 6.055MHz. The programme, which started on November 16, covers news, commentary and music.

Asian and Pacific Stations

The latest schedule to arrive from Radio Australia offers some suggestions for listening to the station here in Europe with the morning period:

0700-1500 on 21.775MHz
0800-1030 on 15.24MHz
0830-1400 on 17.715MHz
1100-1330 on 15.16MHz
1300-1800 on 17.63MHz
1530-1900 on 13.745MHz

All India Radio's General Overseas Service has English programmes at:

1000-1100 on 21.735, 17.865, 17.387, 15.335 and 15.05MHz
1800-1845 on 11.935MHz
1845-1945 on 11.935, 11.86, 11.62, 9.95, 9.73, 9.665 and 7.412MHz
2045-2230 on 15.265, 11.715, 11.62, 9.91, 9.665 and 7.412MHz

The Americas

Radio Havana Cuba is one of the few world-wide broadcasters still to have programmes in the international language of Esperanto. They are broadcast to Europe on Sundays at 1840 on 15.425, 15.22 and 11.95MHz. At 2200 there is another Esperanto broadcast on Sundays on 15.22 and 11.95MHz.

Meanwhile English from the station to Europe is heard daily with two separate programmes which run concurrently for an hour! At 1900 until 2100 the station uses 15.435 whilst at 2000 until 2100, a new programme starts on 11.85MHz. At 2200 there is another broadcast for an hour, this time on 7.215MHz.

Heard something interesting? Write to Peter via the *PW* office.
You can also leave a message on the answering machine after working hours.

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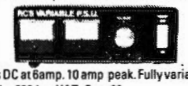

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