100 PAGES

Radio Communication

The Journal of the Radio Society of Great Britain

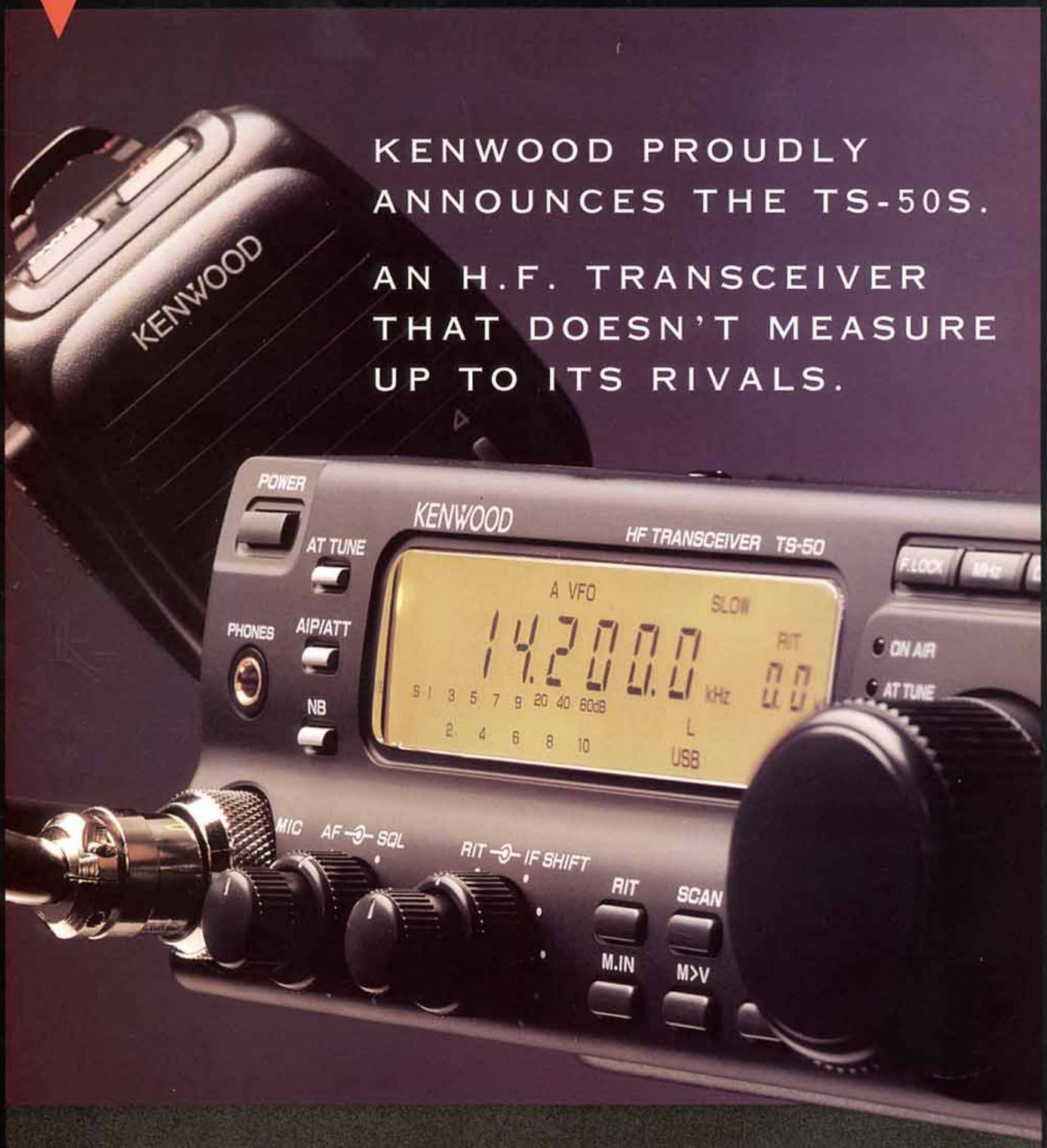
August 1993

Volume 69 No 8

THE VOICE OF AMAT DIO FOR 80 YEARS

All Set for the Balloon Race: RSGB HQ Open Day 19 June

THE THREE POINTS OF THE KENWOOD TRIANGLE REPRESENT ADVANCED TECHNOLOGY, QUALITY AND STYLE



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Radio Communication

NEWS AND REPORTS

TECHNICAL FEATURES

COVER PICTURE:

To add to the fun of HQ's Open Day there was a balloon race. Seen disentangling the strings are staff members Lynette Crawshaw and Jane Hanson. Jane (right) had something to smile about as she was looking forward to her wedding two weeks later.

Open Day colour feature page 5.

Photograph: Raymond Irons.

REGULAR ARTICLES

RADIO SOCIETY OF GREAT BRITAIN

THE NATIONAL SOCIETY WHICH REPRESENTS UK RADIO AMATEURS
Founded in 1913 incorporated 1926. Limited by guarantee
Member society of the International Amateur Radio Union

PATRON: HRH PRINCE PHILIP, DUKE OF EDINBURGH, KG

Membership is open to all those with an active interest in radio experimentation and communication as a hobby. Applications for membership should be made to the Membership Services Department from which full details of Society services may also be obtained.

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General Manager: Peter Kirby, G0TWW
Company Secretary: John C Hall, OBE, G3KVA

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Corporate Members: UK and Overseas (*Radio Communication* sent by surface post): **£32.00.** Airmail rates on request.
UK associate member under 18: £16.00. Family member: £14.00
Corporate (Concessionary): £27.00 over 65 or full time student under 25. (Applications should provide proof of age at last renewal date and/or include evidence of student status.)
Affiliated club or society/registered group (UK): £16.00 (including *Radio Commmunication*). (Subscriptions include VAT where applicable.)

Special arrangements exist for blind and disabled persons. Details are available from RSGB HQ.

Membership application forms are available from RSGB HQ

RSGB Main Switchboard:
0707-659015

The RadCom Leader

Public Relations

FIRSTLY, I HAVE TO REPORT on a very successful Open Day. Over 250 members and their families joined us for the day and it was a great pleasure to meet and greet so many people.

Thankfully the weather was kind, despite some black clouds on the horizon, because for the first time we made use of the rear yard facilities and invited local clubs to join us. The radio clubs put on some very interesting outside displays and the local Scouts provided some excellent refreshments.

Along with the guided tours of HQ, the displays were a great success and we hope next year to be able to expand the event even further. Thank you to all those people who turned up and supported us.

Public Relations plays an important role in the work of the Society. In a perfect world we would like to have a full-time Public Relations Officer based at Lambda House, but at the moment resources do not permit the Society to make such an appointment. Having reviewed the situation, I have come to realise that we all have a role to play in this important field.

I am interested to hear from anyone who has experience in Public Relations, past or present. Also from any member who works in the media – television, radio, national and local newspapers, whatever their position is within these organisations. It is my aim to establish a national chain of volunteer Public Relations representatives who will be fully supported from HQ. Such a chain will enable the Society to have points of contact up and down the country who will be able to react much quicker than we can at present to pro-Amateur Radio publicity and to counter adverse publicity in a much more positive manner.

If you are interested in joining the team please write to me at Headquarters.

Earlier this year I made a statement in *RadCom* regarding the sale of 'G' Prefix number plates. The dialogue between the Society and the DVLA continues. These plates are not yet available and the DVLA is yet to make a decision on the release date. Please be assured that when such a decision is reached I will endeavour to get the date published as early as possible.

Peter Kirby, G0TWW
General Manager

NEWS & REPORTS

● THE FIRST ALL-IRELAND International Radio and Hobbies Exhibition takes place in the Fairways Hotel, Dundalk, 9/10 October. 2000 visitors are expected, many from overseas, to see amateur and commercial TV and radio, satellites, computers, model railways, toy soldiers and much more. Attending will be the President of the IRTS Tom Rea, EI2GP, and RSGB President Peter Chadwick, G3RZP. Details John Ashe, GI8RLE, 0762 870423.

● A DINNER CELEBRATING the 60th anniversary of the Thames Valley Amateur Radio Transmitters Society will be held in October. GX3TVS will be active on HF and VHF during the celebration period. Any former members who would like to attend the dinner should contact the Chairman R D Muir, G3LHN, QTHR.

● MANCHESTER & District ARS will operate GB0BCH, 28 – 30 August. Please call in as contacts are being sponsored in aid of Boothhall Children's Hospital, Manchester.

● PRESIDENT CARLOS Menem of Argentina, who holds the callsign LU1SM, paid an official visit to ITU Headquarters, Geneva, in June.

● STOLEN TM-321S, S/N 9081415. Any information, please, to Mary Lowe, G0NZA, on 0623 755288.

● STOLEN IN LEEDS, Standard C528 Dual-bander S/N E030971. Information to W Roberts on 0532 812343.

Canadians Unite

ON 2 MAY the two Canadian national societies, the Canadian Radio Relay League and the Canadian Amateur Radio Federation, completed the long process of amalgamation. The single society, incorporating the members of both, is now called the Radio Amateurs of/du Canada. It has already been recognised by the IARU.

1993 AGM

THIS YEAR'S RSGB Annual Meeting will be hosted by the Northern Amateur Radio Societies Association. The venue is the Manchester Conference Centre, UMIST, Manchester, and the date for your diary is Saturday 4 December 1993.

Bangers, burgers and balloon racing at HQ fun day.

RSGB Shows Off New Look HQ

THE NEWLY refurbished RSGB Headquarters attracted over two hundred and fifty members to the second annual Open Day on Saturday 19 June. The members, many bringing with them their families and friends, were treated to a guided tour of the administrative offices and a chance to operate in the GB3RS shack.

There was an opportunity to linger in the newly rehoused and expanded Amateur Radio Museum and to see how the QSL Bureau works. Staff and volunteers were on hand to explain the Society's work and to answer any queries. And of course the book shop did a roaring trade. Pat Hawker was on hand to sign copies of *Amateur Radio Techniques*.

For the first time, there were stands outside the building, including a burger bar, local radio clubs (Verulam, Southgate and Hoddesdon) and a balloon race. The outside seating proved popular as a change from the crowded interior.

Since the previous year's Open Day, most of the building has been re-decorated and many visitors remarked on the new smart efficient look.

Representatives of the Press were in attendance, including a team from BBC TV researching for a feature on amateur radio to be screened in the Autumn.

If you weren't there, you missed a good day. We hope to see you at Lambda House next year.

This impressive display of awards and gifts from overseas societies is what visitors first see when entering the HQ building. Some of the many cars parked outside on Open Day can be seen reflected in the glass.

The RSGB Museum has been rehoused to accommodate more historic amateur radio exhibits.

Publicity

ON THE morning of Friday 11 June a member of RSGB HQ staff was interviewed about amateur radio by presenter Duncan Goodhew during a live broadcast on BBC Radio 5's programme *A Couch Potato's Guide to Creative Leisure*.

Positive articles about the hobby, written from material provided by the Society, have appeared recently in the *Early Times* and *What Cellular Phone*. These are part of an ongoing public relations effort by HQ staff.

RSGB Council Elections 1994

COUNCIL IS the governing body of the Society and is responsible for the conduct of its business, although a great deal of work is delegated to sub committees that administer the various technical, administrative and financial aspects of the Society's amateur radio policy.

However, the overall supervision of these committees, together with the Headquarters staff and functions, lies with Council.

Council meets on average every two months in London. In addition to attending such meetings Council members are expected to deal with individual members' queries in a sympathetic and professional manner as well as representing the Society at various functions and liaison meetings throughout the year. Elected members are expected publicly to support policies which have been decided by Council.

The Society is an extremely complex and dynamic organisation which needs Council members that are not only enthusiastic and dedicated to further the wishes of members but have the necessary business and management skills to implement them.

The indications are that there will be **four** vacancies on Council in 1994. One of these will be for an Ordinary Member. Three Zone vacancies arise – one in Zone B (South Humberside, Derbyshire, Northamptonshire, Lincolnshire, Shropshire, Staffordshire, Leicestershire, West Midlands, Hereford & Worcester, Warwickshire and Bedfordshire), one in Zone E (Wales) and one in Zone G (Scotland).

Qualifications for Election

a) A candidate for election must have been a Corporate Member of the Society for at least **three** years at the time of nomination.

b) A candidate for election must submit:
   1 Written consent to accept office if elected.
   2 A declaration of any commercial interest in amateur radio.

Nomination Procedure

a) Each candidate must be nominated by at least ten current Corporate Members. In the case of Zone candidates all nominators **and** the candidate must reside in the Zone concerned.

b) Nominators may nominate one candidate only.

c) Nominations may be made on supplied forms or a plain piece of paper. Nominators should state their address in full and sign the nomination.

Additional Information

Candidates

To assist the membership in voting, candidates may supply a statement of not more than 100 words covering their experience and qualifications in support of their candidature. The statement should highlight their involvement in amateur radio. Candidates may also supply a personal statement of not more than 100 words stating why he or she wishes to stand for Council and what he or she hopes to achieve if elected. Outrageous, inflammatory or nonsensical claims will, of course, be edited. Council is a team and elected members are expected to serve as part of that corporate body.

Nominators

Nominators may find it helpful to supply details of how long they have known a particular candidate and supply any relevant information in support of their nominee.

Vacancies

A list of those Council Members who retire and create vacancies at the end of 1993 will be published in the September 1993 issue of *RadCom*. However, those seeking nomination may apply to Headquarters now for the necessary forms to assist with their nomination.

Applications should be addressed to: **'1994 Council Elections', Radio Society of Great Britain, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.**

Starting Satellites?

AN INFORMATION pack is available for anyone interested in using the many amateur satellites now available. Just send a 9" x 6" self-addressed envelope with a 28p stamp to: AMSAT-UK, 94 Herongate Road, London E12 5EQ. A book *Satellites for Beginners* can be obtained for £1.65 (post free) from the same address.

RSGB Officers

THE NEW EMC Committee Chairman is Robin Page-Jones, G3JWI (QTHR). He succeeds Bob Peace, G8SOZ.

Professor Martin Harrison, G3USF (QTHR) is the new HF Beacon Coordinator.

Taking over from Mike Thayne, G3GMS, as Slow Morse (GB2CW) Coordinator is David Pratt, G4DMP (QTHR).

The retiring officers are thanked for their service to the Society and its members.

QTI

QTI IS A tape magazine for visually impaired radio enthusiasts. Each issue is a compilation of technical articles from current radio magazines.

The service is available to all handicapped persons for an annual voluntary subscription of £5. The QTI Tape Magazine Association is a registered charity run entirely by volunteers. It is always in need of funds and donations are gratefully received. For further information, contact: Harry Longley, QTI Tape Magazine Assn, Towers Lane, Cockermouth, Cumbria CA13 9ED.

Vacancy

EMERGENCY Communications Coordinator John Irving, G4XJT, has resigned for personal reasons. Anyone wishing to apply for the post, or to nominate another, is invited to write for details to the Chairman of the Membership Liaison Committee Clive Trotman, GW4YKL, QTHR.

John is thanked for his work as the first ever holder of this post.

The Fareham and District ARC is presenting a Wireless Exhibition on board *HMS Warrior 1860* from 21 to 30 August in the Heritage Area of Portsmouth Dockyard. Exhibits representing the advance of wireless communication from Marconi to the fifties have been loaned by *HMS Collingwood* Wireless Museum, Len Newnham, G6NZ and others. When commissioned in 1860, *HMS Warrior* was the Royal Navy's only 'ironclad' battleship. Together with *HMS Victory*, the *Mary Rose* and the Royal Naval Museum, she provides an unrivalled insight into Britain's Naval history.

More scenes from the Open Day: (upper) Being President isn't just about making speeches as Peter Chadwick, G3RZP, discovered. (lower) Finance Officer Janet Cragg shows off part of the re-furbished Accounts offices.

EMC Standards Meeting

A SECOND meeting of the EMC Standard 'ad hoc' Group was held at RSGB HQ on 10 June. The intention was to build on the work of the previous one held on 6 April (p7, *RadCom*, June). It will be recalled that this standard will apply only to commercially available amateur equipment; home-made apparatus is exempt. The Society is involved because it is highly desirable that amateurs themselves put forward a standard, before they are saddled with one generated by an interest group or authority which is not so sympathetic to amateur radio.

The main purpose of the meeting was to discuss with amateur equipment suppliers the situation regarding standards, and to solicit their views on a draft proposal. Some weeks previously, manufacturers were contacted and asked to give their views in writing, and if possible to attend the meeting. In the event, the meeting was well attended, with many well-known names represented, including five kit suppliers. A draft standard was examined clause by clause with some very fruitful discussion about the commercial significance of some requirements. Several compromises were made. The meeting was lucky in that several members were professionally involved in this type of work and were able to advise on achieving the best deal for amateur radio, while producing a standard which would be acceptable to the European Telecommunications Standards Institute (ETSI).

The application of the standard to low cost kits, particularly in relation to the Novice licence and self training, was discussed at length. It is understood that the kit manufacturers are to form a group to discuss this with the DTI.

The RSGB — Working for You

RLO Election

IN ACCORDANCE with the Society's *'Green Book'*, all volunteer officers must present themselves for election every three years. Therefore all RSGB Liaison Officers (RLOs) will need to stand for re-election this year. The elections will take place during September/October 1993. The timetable and procedure are as follows:

1) Nomination forms will be available from either the appropriate Zonal Council Member, Headquarters or the Chairman of the Membership Liaison Committee.
2) Completed forms to be returned to the Zonal Council Member by 27 August. Any Nomination received after that date will not be accepted.
3) The October issue of *RadCom* will contain the nominations, and a voting form. If an election is required, valid votes must be forwarded to the Zonal Council Member by 29 October. Any votes arriving late will not be counted.
4) The results will be announced in the December issue of *RadCom*. Newly elected RLOs will take office on 1 January 1994.

A short synopsis of the duties and responsibilities of an RSGB Liaison Officer appears on this page.

All current RLOs (see *At Your Service*, p91 May/June and *News and Reports*, p5 July) are eligible for re-election.

RLO Job Description

Clubs Activity

- To maintain contact with each club, and to visit each club several times each year as appropriate.
- To encourage activities in clubs which foster and promote amateur radio in their area, in particular:
  - Activities of interest to newcomers, especially the young.
  - RAE and morse classes.
  - Providing advice and assistance to amateurs in their area.

Reporting Activity

- To provide summaries of club activities and the effectiveness of the Society's activities at local level, via the Zonal Council member, prior to each meeting of the Membership Liaison committee.
- To feed views from members back to the MLC via the Zonal Council member.
- To encourage clubs and individuals to input news to the HQ news department.
- To become familiar with the operation of the Society and arrangements for its activities at local level, so as to be able to direct members' questions to the correct person. These include:
  - GB2RS and news
  - EMC advice
  - Planning advice
  - Slow morse transmissions
  - Emergency Communications
  - Training
  - QSL bureau
  - Repeaters
  - Beacons
  - Morse testing
  - Clubs
  - RAE/Morse training
  - The Society's Committees
  - Membership Services

Public Relations

- Will encourage public relations activities by:
  - Explaining how the RSGB and clubs can promote amateur radio.
  - Encouraging specialists to give talks.
  - Co-ordinating dealings with the local media.
  - Ensuring that clubs have copies of relevant RSGB literature.

Expenses

- RSGB Liaison Officers may claim reasonable out-of-pocket expenses. However, before committing themselves to any significant expenditure they should seek agreement through their Zonal Council member.

1994 President

AT ITS MEETING in June, the Council elected Ian Suart, GM4AUP, President for 1994. Ian is currently Zone Council Member for Scotland and Chairman of the Data Communications Committee.

YAOTY Deadline

THE DEADLINE for nominations for the 1993 Young Amateur of the Year Award is **31 July**. Full details of this prestigious award, and the associated prizes, can be found in the April edition of *RadCom*.

Zone D RLO Training Day

AT THE END OF March, RLOs from all parts of Zone D (South-West England) together with a heavyweight contingent of Council Members gathered in Wiltshire for the 5th Annual Zone D RLO Training Day. The proceedings were opened by the new Zonal Council Member Julian Gannaway, G3YGF, who then handed the meeting over to the organiser, President Peter Chadwick, G3RZP.

The morning session was presented by Lynne Harper, G4FNC, who drew on her experience as a qualified trainer of Girl Guide leaders to describe techniques for communicating with groups of people - a situation commonly encountered by RLOs. Subjects covered included how to structure a talk and prepare simple but effective visual aids. Lynne's message was re-enforced by a series of practical exercises, undertaken by splitting those present into groups who then had to present results to the entire assembly. Her final message to remember was: Most people remember 10% of what they hear, 60% of what they see but 90% of what they do.

After lunch, Company Secretary John Hall, G3KVA, outlined his duties which fall into three categories: his legal role as Company Secretary, his financial task as credit controller and the important task of managing the QSL Bureau. The point was made that whilst the Bureau was never intended to provide a rapid exchange of cards, it is still not unusual to see cards going through for contacts made 10 or even 20 years ago!

Tim Hughes, G3GVV, then described the work of the Society at an international level. Something often not appreciated by UK-based amateurs is the enormous respect and prestige that the Society holds world-wide. It is probably the dominant national society in world amateur radio matters, and its advice and support is sought by many other countries. Our network of permanent specialised committees is unique and gives us an authoritative voice on most subjects.

John Bazley, G3HCT spoke about his work as Chairman of the Licensing Advisory Committee. The point was made that even apparently simple changes to licensing regulations are frequently the result of years of patient and careful negotiation with the DTI/RA. In recent years, great progress had been made in the arrangement of reciprocal licences with many countries, all of which would be threatened if the UK unilaterally abandoned the Morse test.

General Manager Peter Kirby gave an account of his first nine months in office, something of a 'baptism of fire'. Besides the routine matters of managing day-to-day activities at HQ, he had implemented a redecorating programme for Lambda House, and had spent much time on the high-profile subject of scanner abuse by what the media insists on terming 'radio hams'.

In each case where radio amateurs had been misrepresented, he had taken the matter up with the editor concerned. However, his efforts would be made more effective if members would telephone or write to offending newspapers or radio stations.

Finally, Membership Liaison Committee Chairman Clive Trotman, GW4YKL spoke about matters directly affecting the RLO scheme, for which he is responsible. During 1993, further measures would be undertaken to improve the flow of information to RLOs. This will enable them to undertake the task more effectively, and to be able to answer members' queries without having to refer so often to other Society Officers.

Your local RLO is your first point of contact if you have any queries about amateur radio or the Society. You will find his name and telephone number on your membership renewal, so why not give him a call soon?

RAE & Morse Courses

● **Brighton** College of Technology is running an **RAE** course Mondays, 1800 – 2030 from 13 September. On Wednesdays, another class features **Morse** and practical project building. Details from T F Strickland, G4EOA, 0273 667788 x 433 or 730.

● A 28-week **RAE** course is starting at Oaklands College, **Borehamwood**, Herts, in September. Contact the Head of Surveying and Engineering Technology on 081 953 6024.

● David Bowman, G0MRF, is the tutor for an **RAE** Course at **Merton** College in Surrey. Enrol in first two weeks of September. Course is Wednesdays 1900–2130, Sept to early May. Call David on 081 640 3001

● **RAE and Morse** classes start at the Whitehill Centre, **Chesham**, Bucks, mid-September. RAE is on Mondays, RAE Tuesdays, and tutors are G4HES and G3NCL. Call 0494 776420 for further information.

● **Southgate** ARC is running an **RAE** course at Pickets Lock, North London. Further details from instructor Steve White, G3ZVW, on 081 882 5125.

● Commencing 21 September is an **RAE** class, Thursdays 1900 – 2130, at Hertford Regional College, **Turnford**. Enrolment details on 0992 466451.

● The Sixth Form College, **Farnborough**, has a 30 week **RAE** course starting on 23 September. Contact Sally Rogers on 0252 26096.

● Weekly evening classes for the **RAE** start 1 October at **Hailsham**, Sussex, run by the Southdown Amateur Radio Society. **Novice RAE** and **Morse** are also offered. More info from John Vaughan, G3DQY, on 0323 485704.

● Commencing in early September is an **RAE** course at the City of Westminster College (formerly known as **Paddington** College), which will be run concurrently with a **Morse** course. An **advanced Morse** (25WPM) course is planned. Contact Ann James on 071 723 8826.

● Both the December 93 and May 94 **RAE**s are catered for by a course at Sony Broadcast International in **Basingstoke**. Leave your details on Stephen Harding's answering machine, 0256 483103.

● South Notts Amateur Radio Club announces **RAE**, **NRAE** and 5/12 WPM **Morse** courses Tuesday/Thursday evenings, 1900 – 2100 at Fairham Community College, Clifton, **Nottingham**. The college operates a 'pay as you learn' scheme. Further details from Carole Ponberth on 0602 213606.

● An **RAE** course starts 23 September at North Oxford College, **Banbury**. Call Margaret Evans on 0295 252221 for details.

● Redbourne Community College, **Ampthill**, Beds, has a 28 week **RAE** course on Monday evenings starting 27 September. Details from tutor Eric Elsley, G3YUQ, on 0234 768120.

● **RAE and Morse** classes will be run this year by the Midland Amateur Radio Society in **Hockley**, Birmingham. The classes, which are aimed at the beginner, will run until May 94. Further information from John Crane, G0LAI, on 021 628 7632.

● North Cheshire Radio Club have an **RAE** course on Sunday evenings starting on 19 September near **Wilmslow**, Cheshire. The club boasts a very good percentage pass rate and expert tutors. Contact Jill, G0OZJ, on 061 485 5036 for more information.

● A range of courses, including **RAE**, **NRAE**, Radio Servicing Theory and Practical Introduction to Digital Communications, are run by **Kingston** College, Surrey. Telephone 081 546 2151 x 2066 for further details.

● An **RAE** course is to be run at **Doncaster** College from September, Tues 1800–2000. It is hoped to run a 5WPM **Morse** class. Enquiries to 0302 322122 x 287.

See *RadCom*, July, page 8, for more courses. Some of the above also run their own examination centres and welcome external students. For details of **Novice RAE** courses near you, contact Sylvia Manco at RSGB HQ, on 0707 659015.

Farewell Helpline

DUE TO THE success of the EMC Co-ordinator scheme and the Society's new EMC manual, *The Radio Amateurs Guide to EMC*, the EMC Helpline has been found to be no longer needed. It will, therefore, be closed down. If you have EMC problems which you cannot resolve contact your local EMC co-ordinator (see this month's *At Your Service* page). If a problem cannot be dealt with by the co-ordinator he or she will call on the advice of a committee member who specialises in that particular type of problem.

● THE FIVE RADIO amateurs aboard Space Shuttle STS-56 contacted 17 schools and 200 other stations during their April flight. A 2m QSO was made on 11 April with the Russian *Mir* space station, a first which was reported in the *New York Times*.

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SNAP UP AN IC-W2E DUAL-BANDER FOR JUST £369!*

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- **C**all now for our daily-updated list of second-hand equipment.
- **P**robably one of the best technical back-up & service departments in the country.
- **H**AMSTORES stock AEA, AKD, Alinco, AOR, Barenco, Comet, Cushcraft, Davis, Dee Comm, Diamond, Icom, JRC, Kenwood, Lowe, Microset, MFJ, RSGB books, Toyo, Yaesu and Yupiteru gear.
- **A**ll Radio Hamstores are linked to the Herne Bay mainframe computer, this enables us to tell you if that elusive piece of gear you have been searching for is available in any of our stores.

*Finance not available on special offers.

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We had quite a laugh the other day, looking at one of our competitor's latest attempts at selling the benefits of his "service department". There's only one sure way to check out a service department and that is to go and see it. We're more than happy to take customers around our service department — to see the level of technology needed to keep your gear working — to see the thousands of spares we stock, on the shelf — to see the level of skill demonstrated by our seven, full-time expert technicians. (To be fair, I haven't counted our R&D staff!) Whilst I'm on the subject of people, make sure that whoever is going to repair your hard earned rig has professional qualifications and really is a full time employee of the company, otherwise his motivations for doing a proper job may be different, and to ensure that your legal rights are not compromised. After all, you can hardly expect someone whose daytime job is mending false teeth to be fully conversant with the workings of a TS950SDX — the circuit's over 33 feet long! Proper after sales service does cost money and it is impossible to provide with continual price cutting.

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Newcastle upon Tyne
NE20 9DF
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Tony G4CYE at
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Bristol
BS12 5JQ
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Cumbernauld,
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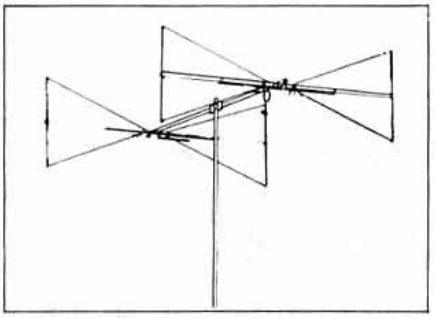
"KIRK TO ENGINEERING — THERE'S ONLY ONE THING WE CAN DO ...

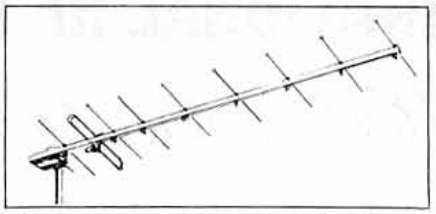
BEAM ME UP SCOTTY!

Butternut's super HF5B is back in stock offering superb value for money. You get a full five bands in a very compact design, making it ideal for those with restricted space. At only £309.00 it even suits those with a restricted wallet!



Don't forget Butternut's super range of HF multiband verticals — more bands for less pounds than many competitors. Ask for our Butternut brochure today and see what you're missing out on!

We might think the French have some funny ideas about agriculture and fishing but there are three things they do get right — food, wine and antennas!



This season we've added the Tonna range of vhf and uhf beams. Tonna have been around for years and represent incredible value. The quality of construction is very good and they are mechanically sound despite the light weight. Also you can get on the air straight away without fiddling about with gamma matches and the like — with a Tonna, you just plug in and go!

Of course with any beam you really need to be able to turn it around and there's nothing better than with our world famous Emotator rotators. Starting at only £199.00 Emotator have something for everyone, solid engineering, long life and great reliability. We've an excellent Emotator catalogue, full of very useful information and tells you how to apply the technical data associated with wind loading of antennas and rotator power then you'll be able to answer to the question of whether to buy the rotator to suit the antenna or the antenna to suit the rotator! A word of advice from someone who's been there, — *the purpose of a rotator is not to turn the beam but to keep it pointing in the direction you want.*

Of course once you've got that meaty new rotator and some shiny new beams, you might need some other bits of hardware to go with it. You don't need to trek round galaxy for all of this — each of our many branches (11 of 'em now!) carries a full range of Barenco antenna hardware — antenna clamps, mast couplers, T and K brackets, chimney lashing kits and many other items. We also carry genuine British made coax — you know, the stuff with proper braid, rotator control cable and nearly all the connectors you are ever likely to need. Boldly go to one of our branches today and talk about a package deal on a new beam and rotator — it may not cost as much as you think! We're one Enterprise that really cares about our customers. (PS — A quick safety first message: When installing antennas, don't forget to Kling-on tight!)

HF NEWS

JOHN ALLAWAY G3FKM
10 Knightlow Road, Birmingham B17 8QB

IT WAS certain to happen – sooner or later but this is the first time that I have had real evidence! George, G3HB, had a contact with HV3SJ on 28.023KHz at 1415 on 3 December 1990 – and has received his card. However – *he has also had a QSL from ZS9Z/1 for a QSO on 28MHz CW at 1414 on the same date!* There were obviously two adjacent pile-ups and he 'worked' both at the same time . . . .

CHINA

I RECEIVED A most interesting letter from Tom Tang, BA4AC (pictured opposite), who has been a member of the RSGB since 1990. He says that since 22 December 1992 personal licenses have been issued to individual operators. There are four classes – BA (first class), BB (second class), BC (third class) and BD (fourth class). Tom also has the call BZ4CWM which can only be used at the club station. He also holds the call VK1CWM which he used for a year while staying with his son who is a computer scientist. There he met G3VIR. There are now ten personal callsigns in Shanghai, BA4's AB, AC, AD, AE, AF, AG, AH, CA, CH, and BD4AA (who is a YL). All are members of the Shanghai Electronics Institute Club station BY4AOM. In Beijing there are BA1s BA, CO, CR, CT, CY, GYS, KS, RA, ST, and personal callsigns issued so far in Kwangchou are BA7s KA, KC, KE, and KQ.

SEANET'93

This year's SEANET Convention will be held in Dhaka, Bangladesh, from 19 to 21 November. It will take place in the Hotel Sonargaon. SEANET participants will be met at the airport and Biman (Bangladesh Airlines) has agreed to give 25% discount to participants – this increases to 33% if five or more travel together. There will be an exhibition of electronic, amateur, and professional products. Registration costs US $100 per participant. On Friday there is a welcome dinner, on Saturday a half-day picnic on a special pleasure boat, and in the evening a cultural display. Sunday will see presentations on important amateur radio issues. I have a small supply of brochures which contain registration forms and full details – if you are interested please send me an SASE.

QTH CORNER

BZ4DHI	(direct only) to I1YRL, Via S Martino 11, I–10091 Alpignano, Italy.
CH8MNP	(with IRC) CARA, Box 592 Stn M, Calgary, AL, T2E 5J6, Canada.
E35X	via LA6ZH, Ruth Tollefsen, Box 17, N–0617 Oslo, Norway.
F1ODK/HB0, FD1RZK/HB0, FD1NZO/HB0	Pascal Sotty, Grandchamp, 71130 Chassy, France.
KH9 Expedition	OKDXA, Box 88, Wellston OK 74881, USA.
T5HLL	Bertil Hell, Rorg 32, S–85240 Sundsvall, Sweden.
VE3CNE	P O Box 307 Stn H, Toronto, M4C 5J2, Canada.
5R8DS	Box 404, Antananarivo, Madagascar.

DX NEWS

THE DXCC DESK has confirmed that cards from 4N4 and 4O4 stations will be acceptable for DXCC credit for contacts made before 11 May 1993. Contacts with **Bosnia-Herzegovina** since then must have been with T9 stations. At the time of writing stations in **Macedonia** were still using the 4N5 prefix but it seems that the prefix block Z3A-Z3Z has been allocated to that country by the ITU. There have also been stations using the S5 prefix. A *DXCC News Release* from ARRL lists recent documentation received and approved, and dates

1993 WARC BANDS TABLE

	10MHz	18MHz	24MHz	Total
G3KKJ	106	**154**	**133**	**393**
G3IAR	**107**	123	74	304
G3IZD	74	123	106	303
G2AFV	79	77	46	202
G0MHC	44	88	51	183
G4XRV	76	–	51	127
GJ4GG	25	43	34	102
G4MUW	–	58	34	92
G3IQF	40	29	13	82
G0KDS	1	54	2	54

BAND REPORTS

Many thanks to the following who sent in information for this section: G2s AFV, HKU, G3s GVV, IJD, KKJ, YRM, G4s DJC, MUW, G0s GCW, KDS, GW4KGR, G4s MHC, NXG/M, RS 30144 and 33761, and the UK DX Packet Cluster courtesy of G4PDQ. As usual the callsigns of stations on CW are given in italics:

1.8MHz
0000 *E35X, EA8AB, TK/IK4CIE/P.*
2100 *C31SD, OY/G4XRV, Z21HS, 9H3RJ.*
2300 *VQ9AC, ZA/OH6XY.*

10MHz
0000 *FG/DL8SCC/P, VK6HD, VQ9AC, DL4ZB/6Y5.*
0300 *FY5FY, HC1CK, ZL2CT.*
1900 *PA3CXC/ST0, T71CE, ZA1E, G4SMC/9M6.*
2100 *A71CW, C91J, TA2BK, 4K2MAL, 7P8SR, 7Q7XX, 9M0S.*
2200 *D44BS, FH/DK5WL, FY5FP, ZD8DEZ.*

14MHz
0600 CE0YFL, E35X, FO4OK, FO0FER, VR6JJ, W6–W7, ZK1AJJ, 3C1TR, 3D2DM, 5W1GC.
0700 A35AP, CE0ZIS, KH6FKG, KH8/JA1WPX, KL7HAE, TJ1JL, VK9ND, VR6TC.
0800 FO5s IW, NL, FW/HB9TL, KH6XT, VE8KM, 3D2KW.
0900 A35TL, T32O, 3B8FT, 3D2QB.
1500 FR5ZU/G, JTs 1BG, 7AA, KH2FG, T30ZH, VQ9IO, ZS8MI.
1600 EP2AG, ET3SID, XU3UN, XX9AW, YI/F1PGP, 9M8BL, 9M0S.
1800 AP2SD, D2BG, HS0/G4UAV, 5W1CW, *G4AAL/6O.*
1900 BA4CH, BT2000BJ, D2/N6QHO, JAs, ZD9BV, 5X1DX.
2000 BY4SZ, J25AK, *P29KH,* 9G1MR.
2100 A61AF, JT5AA, PA3CXC/ST0, V2/G3TTC, G4SMC/9M6.

18MHz
0700 FR5DX, KH6CD, NL7J, T5HLL, 5W1GC.
1000 JT1BY, T30XP, *3D2QB.*
1200 V73C, *VQ9AC.*
1600 ET3MC, *JT5AB, PA3CXC/ST0, DL1VJ/T5, V85KX, 9M0S.*
1700 *XU5SE, XU8DX.*
1800 C56/DL7UTA, *HV3SJ, JT5DX,* S79LL, TU5DX.
2100 *A71CW, J5UAI,* KB1WN/T5, ZL2CN.
2200 *C6AFP, S92SS, XQ0X.*

21MHz
0700 C91AI, FO4OK, JT1BY, S21B, YJ0ATL, 9L3BM.
0800 BY9GA, E35X, KH6ALF, *JT1BH/5,* 3D2DM.
1000 FO4OK, KH0AC, P29VR, T20AA, V63OM, 3D2CC, 5X1C
1200 H44/HB9TL, JH1MAO/JD1, TL8MS, TZ6NU, VP8ML.
1400 *FR5BT, HS7BBG,* JU5DX, XX9AS, YC8TCR, YI9OMR.
1500 ET3YU, *S21ZG,* VP8COI, 3C1TR, 8Q7AA, 9M8MA, 9V1WW.
1600 EP2MHB, ET3SID, S21A, *V85KX,* 7Q7JL.
1800 D2SA, HS0/G4UAV, TR8KPJ, ZD9CO, 9M6BZ.
1900 E35X, *FY5YE,* JW5NM, VP8COD, ZD7s AY, DP.
2100 CE0ZIS, D2SA, *FS4GL,* HC8KU, TJ1AD, 5X1A.
2200 ET3SID, VK2XT, VQ9ET, VY7JA, *XQ0X.*

28MHz
0800 FH/DK5WN, VK6BL.
0900 VQ9CE, 4S7EF.
1600 S79MD, VP8COD, 9M2AM.
1700 CE0ZIS, N2QHO/D2, E35X, TR8GG, 5X1DX.
2100 CE0ZIS, TR8CC.

on which authorised operations began: S21ZK (from 6.3.93), T53UN (20.3.93), 6O/G3KOX (14.12.92), T5/KF6BL (26.12.92), T55FO (6.1.93), T5CB (31.1.93), T5/K3OQF (21.2.93), YI9CW (July 1992), 5X1A (4.3.93), 5X1B (12.3.93), 5X1C (29.4.93), 5X1XT (26.4.93), and 9G1AA (24.3.93). The latest *DXCC News Release* from ARRL states that the backlog of unprocessed DXCC applications at the end of May was 278 (48,803 QSLs). Applications being sent out at the end of May were received 5.9 weeks earlier. During the first five months of 1993 the DXCC Desk received 22% fewer applications than for the same period of 1992.

According to EA2JG, KA3KJH/S0 has no proper permission to operate from **Western Sahara** and in fact is believed to be located outside that territory. The only currently legal stations are S0RASD, S01A, S01B, and S01MZ. *DXpress* says that TZ6VV was due to leave **Mali** at the end of June for a period as KB0VV but he expects to return in June 1994. 5T5CJ, who was in **Mauritania**, and made thousands of contacts, has also left. TJ1AD, in **Cameroun**, is now using the WARC bands and FD1SDC has also been worked as TJ1JD. SM3HLL has been heard from **Somalia** as T5HLL and John, PA3CXC, has also been there and using the callsign KN4NL/T5. 5R8DS is a Dutch amateur who works for the Dutch relay station on **Madagascar**. He is on a long term assignment. Andy and Lorraine, ZD9BV and ZD9CO, are the only amateurs on **Tristan da Cunha** and Andy has been worked near 21.313Mhz at 1800 and on 21.260MHz at 1830. Alain, ZD9CQ, left Gough Island last November but a pirate is using his callsign on CW – a mode which is not used by the real ZD9CQ. N6QHO/D2 closed down at the beginning of June after a year of operating from **Angola.**

VR6BB and VR6JJ closed down on 15 May. PNGARS – **Papua New Guinea** – is marking the 18th Anniversary of Independence of the country by having a special "activity week-end" on 18th and 19th August. Look for P29s around 3.530, 3.590. 3.800, 7.030, 7.090, 10.080, 14.030, 14.240, 18.080, 18.140, 21.030, 21.190, 21.240, 24.900, 24.940, 28.030, and 28.440 MHz. QSOs will help in working for the 'Bird of Paradise Award'. If you are anxiously waiting for your AH1A card the *Long Island DX Bulletin* says that K1ER has reported that the design has been approved, Apple Computer of Europe is sponsoring the printing (in Belgium), and they should be ready for mailing in September. However – you may already have received yours if ON6TT's information to *RSGB DX News Sheet* was correct because he said that mailing would begin in July. LU1ZV, at Esperanza Base in **Antarctica** has been heard on 14.300MHz at around 1945. T20JC is a new amateur in **Tuvalu** and has been found near 14.247MHz.

According to *RSGB DX News Sheet* 9D2CW, in **Iran**, should be there for about two years. 9D2 calls are being issued to foreigners and EPs to nationals. The same news source says that VS6WV visits **Cambodia** regularly and operates as XU6WV. VK2KS may be active as XV2A by the time this is reaches readers. He has asked for the callsign 3W1C.

There are two new operators on **Jan Mayen** – LA6MY is now JW6MY and mainly heard on CW, and LA6LIA is JW6LIA. Some callsigns have been changed in **France** and those with FC1 prefixes are now F1, FD1 and FE1 have become F5, in other words there are no longer any second letters in prefixes. A and B will remain for a short time before becoming F0.

The Canadian National Exhibition will take place in Toronto from 18 August until 6 September and there will be a special station on the air using the callsign VE3CNE. 7.025, 7.075, and 14.015MHz have been listed as frequencies to be watched but as SSB is also to be used there must be another 14MHz frequency!

DXPEDITIONS

THE **MELLISH REEF** expedition is now expected to take place from 19 to 28 September. The team consists of G3WGV, K5VT, P29DX, V73C, VK2BEX, VK2BJL, VK4CRR, and WA4DAN. Five HF stations and one on 50MHz will be on the air simultaneously on all bands using CW, SSB, and RTTY. They will use monoband beams on 14, 21 and 28MHz, and a dual-bander for 18 and 24MHz, plus various wires and verticals.

A big expedition to **Wake Island** is being planned to take place from 31 August until 10 September by the California Poly State University ARS. Operators will include AB6EV, AH6ML, AH6MM, AH9B, KC6CEX, and NH6UY. They will use CW, SSB, and RTTY and will place special emphasis on the WARC bands, satellite, and possibly moonbounce operation.

The projected visit to **Tunisia** by 3W3RR may take place this month and it is said that it will be a multi-national effort with operators from Spain, Italy, Japan, Bulgaria, and the USA.

The Kyoto ARC is planning a visit to **Belau** between 8 and 13 August. Activity will be on all HF/LF bands (including WARC and 50MHz) on CW, SSB, FM and RTTY, and callsigns will be KC6IJ (JR3OFX), KC6IL (JF3PLF), KC6IM (JK3AOG), KC6KY (JB3BVB), KC6LJ (JB3DBJ), KC6OG (JB3OFX), KC6TZ (JH3TXR), and KC6UP (JH0XUP). All QSLs go via JA3OIN.

Tom Tang, BA4AC: See 'China' story opposite.

Although already history the Norwegian expedition to **Eritrea** seems to have been a great success. About 20,000 QSOs were made with about 125 countries. It consisted of JF1IST, LA1EE, LA6VM, LA7XK, and LA9DL and some local trainees also operated. The team donated equipment provided by Ham Radio Outlet/ICOM America for the Bouvet Island expedition as well as a new beam provided by INDEXA. The funding came from

continued on page 16 ▶

NEVADA

EVE

SCANNING RECEIVERS

NEW – MVT-7100,

Set to be *THE* handheld of 1993. This radio must be heard to be believed. It provides effortless reception of SSB and CW signals using **TRUE** carrier injection with 50Hz resolution. It can even (with accessories) be hooked up for FAX and DATA reception.

- 100KHz–1650MHz
- 1000 memory channels
- All mode reception (incl. SSB & CW)

Each set is supplied with all accessories including: UK Charger, NiCad Batteries, Earphone, Telescopic Antenna, Original Yupiteru English Manual..... **PRICE £449**

YUPITERU MVT 7000 HANDHELD

- Receives 8 to 1300 MHz 100kHz-1300MHz (at reduced sensitivity)
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Each set is supplied complete with:-

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New software for IBM/clones. Gives logging, monitoring and control of AR3000..... **£59.95**

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Covers 500kHz-1300MHz receiving NFM/WFM/AM and SSB.

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FT767GX HF + VHF/UHF modules	£1660.00
FT650 Tri-Bander HF 6/10/12m	£1200.00
FRG8800 Digital S/Wave Receiver	£610.00
FRG9600m 60-950MHz Scan rec	£585.00
FT290R2 2m M/Mode Portable	£516.00
FT690R2 6m M/Mode Portable	£505.00
FT790R2 70cm M/Mode Portable	£610.00
FT5200 2m/70cm Dual band mobile	£657.00
FT26 2m FM Handheld	£272.00
FT76 70cm FM Handheld	£295.00

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G-400 Bell type Rotator	£187.00
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★ Twin VFO's ★ Selectable AGC ★ Passband Tuning ★ Timer Function ★ RS232 Interface ★ Built-in Pre-Amp ★ Dual Noise Blanker ★ Non-Volatile Memory ★ 100KHz – 30MHz Wide Coverage

Options

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Kenwood TS50

Just arrived. This new "micro" 100 watt HF mobile rig is in short supply because of its popularity. We have purchased large quantities – call for info or part exchange price on your old HF rig..... **£999**

Kenwood Radio

R5000 S/Wave Rec 150KHz – 30MHz	£939.00
TS-950SDX HF Trans auto ATU & DSP	£3475.00
TS-850SAT HF with auto ATU	£1695.00
TS-450SAT Mobile HF with auto ATU	£1400.00
TS-690S Mobile HF & 6m	£1400.00
TS-140S Budget HF Transceiver	£845.00
TM-732E 2m/70cm Twin Mobile	£629.00
TR-751E THE BEST 2m M/Mode	£705.00
TH-78E Twin Band Handheld	£440.00
TS-790E TriBand Base 2/70/Op. 23cm	£1690.00

Kenwood Accessories

PS-52/53 Mains PSU Full Duty	£269.00
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AT-50 Matching Auto ATU for TS50s	£279.00
SM-230 Station Spectrum Display	£795.00
HS-5 Deluxe Comms H/Phones	£45.00

Kenwood Microphones

MC-50 Desk Mic	£84.95
MC-60A Desk Mic (Pre-Amped)	£99.95
MC-80 Electret Desk Mic	£59.95
MC-85 DeLuxe Desk Mic	£119.95
MC-43S Dynamic H/Mic	£22.95
MC-44E H/Mic Prog. Func	£29.95
MC-45E H/Mic Multi Functions	£29.95
MC-44DME H/Mic DTMF	£45.95
MC-45DME H/Mic DTMF	£49.95

ADONIS MICROPHONES

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Built-in Compressor **£99.95**

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MAIL ORDER:- 189 LONDON ROAD, NORTH END, PORTSMOUTH PO2 9AE

HF NEWS

continued from page 13

Japanese amateurs, INDEXA, and NCDXF, and the team members themselves. It included amateur radio introductory seminars – one of which was held at the Telecom Authority of Eritrea office (15 participants) and the other at Asmara Technical School (with about 35 participants), and the setting up of the Asmara Technical School Radio Club (which has an elected chairman and 26 members).

The Calgary ARA will be visiting Cameron Island (100 km from the **North Pole**) between 18 and 25 August. Their callsign will be CH8MNP and their IOTA reference NA-009. They will operate on all bands 1.8 to 50MHz and two stations will be in operation. Frequencies include 3.760, 7.060, 14.260, 21.260, 28.460, and 28.560MHz on SSB and 5kHz up from bottom edges of bands on CW.

EXPEDITION

NORTHERN LIGHTHOUSE Weekend is 28/29 August. Scottish and Isle of Man amateurs will establish stations at eleven lighthouses in their area on this weekend. They will be as follows: Ardnamurchan (GB2LA), Buchan Ness (GB2LB), Dunnet Head (GB2LD), Mull of Galloway (GB2LG), Tiumpan Head (GB2LH), St.Abb's Head (GB2LK), Lismore (GB2LL), Muckle Flugga (GB2LM), Brough of Birsay (GB2LO), GB2LT (Turnberry) and Point of Ayre (GD3FLH). A special award is available to those who work/hear at least seven (UK) or four (outside the UK). Send log extract with £2, US$3, or five IRCs to Northern Lighthouse Weekend, P O Box 36, Prestwick KA9 1AL.

CONTESTS

WAE DX CW CONTEST

1200 14 August – 2400 15 August

3.5 – 28MHz. Single-operator all band, multi-operator single and multi-transmitter and listener sections. Single operator entrants may only operate for 30 hours – the rest may be taken in up to three sessions and must be clearly marked in the log. Work stations outside Europe and exchange RST and serial number from 001. The multipliers are DXCC countries which count one on each band. Multipliers on 3.5MHz should be multiplied by a factor of four, on 7MHz by three, and on 14, 21, and 28MHz by two. Extra points are gained by exchanging 'QTC traffic'. If you intend to enter seriously I suggest that you send for a detailed copy of the rules (SASE please). Listeners may only log a callsign once per band and both callsigns and at least one of the exchanges recorded. Each station logged counts one point, and each QTC one point. Logs go to WAEDXC Contest Committee, P O Box 1328, D-8950 Kaufbeuren, Germany, to arrive no later than 15 September.

LZ DX CONTEST

1200 4 September – 1200 5 September

CW only. 3.5 to 28MHz following IARU Region 1 bandplans. Single-operator multi or single band, multi-operator, and listener sections. Exchange RST and ITU zone. QSOs with LZ count six points, with other continents three, and with own continent one. Own country allowed for multiplier only and a station may be worked once on each band. Listeners earn two points for logging both callsigns and numbers and one for two callsigns and one number. Multiplier is the sum of ITU zones on each band added together. Mail within 30 days to BFRA, Box 830, 1000 Sofia, Bulgaria. In the 1992 event **G3URA** was world third in the 14MHz section with 665 points. **G3IAR** entered the multi-band section and scored 11,563 points

THE 34TH ALL ASIAN DX CONTEST (PHONE)

0000 4 September – 2400 5 September

1.8 to 28MHz (no WARC bands). Single operator single and multi-band and multi-operator multi-band sections. Exchange RST and two numbers indicating age. YLs send '00'! QSOs with Asian stations count 3 points on 1.9MHz, two on 3.5MHz and one on other bands. The multipliers are the number of different Asian prefixes worked on each band. Logs must be sent before 30 September to: JARL, All Asia DX Contest, P O Box 377, Tokyo Central, Japan. If you are entering seriously I suggest sending an SASE to me for a copy of the full rules.

AGCW STRAIGHT-KEY PARTY

1300 – 1600 4 September

7.010–7.040MHz CW *using hand keys only*. Call 'CQ HTP'. Classes:– A up to 10W input, B – up to 100W input, C – up to 300W input, D – SWL. Exchange RST/serial number/class/name/age (YLs = XX). Points: Class A with A = 9, with B = 7, with C = 5. Class B with B = 4, B with C = 3. Class C with C = 2. I can supply copies of the rules (SASE please). Listener logs must include both callsigns and at least one complete report for each QSO. Deadline is 30 September and logs go to F W Fabri, DF1OY, Wolkerweg 11, D/W-8000 Munchen 70, Germany.

AWARDS

OLD CAPITAL AWARD

This commemorates two special events which will be taking place in Kyoto, Japan, during 1994. One is the holding of one of the ITU's Plenipotentiary Conferences from 19 September until 14 October, and the other the 1200th anniversary of the old capital. To obtain the award it is necessary to compose the phrase 'Kyoto 1200th Celebration' using any letter or digit forming the callsign of a station successfully worked and QSLd. QSOs between 1 June 1993 and 31 December 1994 are valid. Send full details plus US$5.00 or 10 IRCs to: Secretariat of Heian-Sento 1200th Celebration, P O Box 1, Kyoto-Nishi, Kyoto 616, Japan.

VYTIS AWARD

For contacts and reports since 1 October 1989 with seven members of the Vytis Radio Club (only five needed by non-Europeans). A list of members is available from A Albrechtas, LY2BQQ, PO Box 1, Siauliai-10, 235410 Lithuania in exchange for an IRC and SAE. Applicants send certified list plus ten IRCs (or equivalent) to J Lekesys, G4BYW, 4 Gleneagles Way, Fixby Park, Huddersfield HD2 2NH.

GB2LH will be at Tiumpan Head Lighthouse, Isle of Lewis, 28/29 August.

PROPAGATION

THIS MONTH G8KG says: "Daily solar flux peaked at 140 sfu at the end of May but was down to only 82 by the middle of June while by the end of the third week in June the 27-day average solar flux was again down to 110 sfu, having been below 120 for 70 days and still looking to be moving slowly downward. This is not to say that there will not be further upward movements from time to time but their amplitude will probably be less than in recent years and it certainly looks as though the average activity has now moved off the "plateau" which began in May of last year. Nevertheless we are still seeing monthly sunspot numbers in the 60 to 70 region which is more than half way up the 'average' cycle – but this may be thought to be poor consolation when on the down-slope of a pair of very high ones!

For the most part geomagnetic activity was quite low except for a major disturbance in the first week of June. HF band conditions were typical of those to be expected in summer with the present levels of solar activity but the higher bands were enlivened by a period of very good Es propagation coinciding with the thundery weather in the second week in June."

THANKS

TO ALL WHO wrote in with news items and to the editors of the *Lynx DX Bulletin* (EA2KL), *DX'press* (PA3DZN), the *Long Island DX Bulletin* (W2IYX), *RSGB DX News Sheet* (G4DYO), and the *Boletin EA DX* (EA1RF). Please let me receive everything for the **October** issue no later than **19 August.**

VHF/UHF NEWS

NORMAN FITCH G3FPK
40 Eskdale Gardens, Purley, Surrey CR8 1EZ

SEVERAL READERS began their letters with: "What a month!" and June 1993 certainly was eventful. While there were several periods of fine tropospheric propagation, the most significant phenomenon was the spectacular Sporadic-E on the 10th. Up to the beginning of July, this has been the best year for Es on 144MHz since 1983 when, according to my records, Es occurred on nine days in June.

PUBLICATIONS

ISSUE 2/1993 of *DUBUS* magazine includes a comprehensive, 13-page article on an unconditionally stable low noise amplifier (LNA) for 70cm by Rainer Bertelsmeier, DJ9BV. It uses an MGF1302 FET and achieves a noise figure (NF) of 0.35dB over the 430 – 440MHz band. These measurements were made with a HP8970B Noise Figure Meter and a HP346A Noise Source. Kits and parts are available from Rainer Jager, DC3XY. Another DJ9BV article is 'Myths and Facts about Preamp Tuning' written as a follow-up to the discussion at the last Martlesham VHF Round Table. The UK agent for *DUBUS* is Keith Hatton, G4IZW, who is QTHR.

Noise figure measurements are discussed in a letter from Mike Dorsett, of MuTek Limited, in the May issue of *The VHF-UHF DXer* published by Dave Hardy, G8ROU. John Regnault, G4SWX, has a '144MHz No-tune Preamp Revisited' article. There are the usual brief band activity reports.

The July issue of *Six News*, the journal of the UK Six Metre Group (UK6MG or UKSMG), includes a design for a solid state 450W PA for 6m [UK readers please note licence conditions – *Ed*]. This power is achieved by combining the output of two amplifiers using the Philips BLW96 device. The article by Chris Gare, G3WOS, is well illustrated with diagrams and photographs. As usual, editor Neil Carr, G0JHC, has produced a well-balanced magazine.

For computer buffs, The Public Domain and Shareware Library has published Supplement 2 to Issue 15 of the *IBM PC Software Reference Guide* detailing new releases from its large archives. The CD Rom section lists the 'QRZ Ham Radio Collection' which contains the complete FCC Callbook of USA amateurs. Made in May, this CD contains hundreds of Megabytes of amateur radio programs and utilities, all for £25. Major disk updates include PAKET, GEOCLOCK, and STSORBIT for satellite users. [See this month's PDSL advert for their address – *Ed*].

EURO MATTERS

PRESS NOTICE 93/3 from the European Radiocommunications Office states that the ERO has been operating under a Memorandum of Understanding since its opening in 1991. On 23 June, a Treaty, known as the Convention for the Establishment of the ERO, was signed by members of the European Radiocommunications Committee (ERC). This puts the ERO on a firm legal footing.

The ERO is managed by the ERC and has a staff of nine persons in the Copenhagen office; the Head of the ERO is David Court (G3SDL/OZ3SDL). The ERC operates within the framework of the CEPT and deals with radiocommunications matters. CEPT membership comprises 34 European countries and the managing administration is currently Germany.

REPEATER PROPOSAL

TO QUOTE from a press release from Chris Lorek, G4HCL (HPH): "A steering group comprised of G4MYS, G4HCL and G0AFF has been set up with a view to putting a 70cm repeater on air to provide 'blanket' portable coverage of the communities of Southampton, Eastleigh and Chandler's Ford . . . ." The call GB3EA and channel RB8 have been requested. Further information, including coverage maps, can be obtained from The South Hampshire Repeater Steering Group at P O Box 73, Eastleigh, Hants SO5 5WG. (Tel; 0703 262105 (home), 0703 255111 (work) or fax 0703 263429).

PACKET RADIO

THERE IS a constant demand from some packet radio operators for more frequencies in the 144MHz band. In the June issue of *RadCom*, VHF Committee chairman Peter Burden, G3UBX, published three suggestions considered by the Committee, inviting users' comments. So far, the reactions have been very mixed, but the S8/S9 idea got a complete thumbs down. Some even reckoned there should be *less* spectrum space for the mode on this band. If you have any ideas, please refer to page 6 of the June *RadCom*.

ZB0T QSLS

MIKE ADCOCK, GW8CMU (GNS), learned from DL1SDN on 21 June that Dieter has all the logs from Mark, ZB0T. He is putting all the entries into a computer and promises that all QSOs will be confirmed by QSLs via the bureau. Mark should be working in Germany now.

DXPEDITIONS

IN ADDITION to those listed on page 17 last month, Jim King, G6JIM, and Iain Philipps, G0RDI, are planning MS operation from Andorra (JN02TO) 10-13 August, if their licences come through in time. Failing that they will use F/Own call in France (JN14DB). 400W to four 9-ele Yagis should be very effective. Listen out for F/G0RDI on 14.345MHz from 2 August if you want to arrange a sked.

Martin Dale, G6ABU, and Richard Gardner, G4WKN, plan Orkney and Shetland activity in August. Their likely schedule is IO89 (OKE) 2-7 and IP90 (SLD) 9-19. They will be QRV on the 20m VHF net throughout using the Derbyshire Hills Contest Group's call, GM4ZAP/P, which will also be used on 2m. Most MS operation will be on SSB but a few limited CW skeds will be taken via 20m; no advance skeds will be arranged. QRGs: 144.444MHz SSB MS, 144.260 SSB tropo, 144.055 CW tropo. QRO operation with four Yagis on 2m. Gear will also be taken for 6m, 4m and 70cm but 70cm operation will only occur if conditions are favourable. They won't be operating 24 hours a day and not at all if conditions are no good. For further details contact Martin on (0602) 626018 or 486806, via packet @ GB7BAD or the DX Cluster network.

Clive O'Hennessey, GW4VVX (GWT), will be heading north again to IO78WA and plans to reactivate GB2XS, 9-21 August. The site is 600ft ASL and about 30 miles from the sea. At least 140W and a single 9-ele Yagi at 30ft should prove effective as the take-off to the south and east is very good. In previous expeditions he has used 144.222MHz. He will have 6m capability and be QRV on the 20m VHF net throughout August.

MOONBOUNCE

NEWS

In his June *432MHz and above Newsletter* Al Katz, K2UYH, reckons that this summer is giving summer time conditions a bad name since perigee, high lunar declination and low sky noise never seem to line up. Even so, the 29/30 May sked weekend produced truly superb conditions at times. He reports that A22BW (KG38SU) is now QRV on 70cm with 500W and four 19-ele Flexa Yagis; his QTH is Box 772, Francis Town, Botswana.

ACTIVITY

John Hunter, G3IMV (IO91), is now finding it difficult to work new stations. With two 17-ele Yagis, he is up to 122 'initials' in 30 countries on 144MHz. He is undecided whether to double up this array or give 432MHz a whirl.

Mark Holloway, G4YRY (IO90), now runs 400W on 2m from a pair of 4CX250Bs with four 9-ele Tonna Yagis. He wrote: "I have been surprised at the regularity of hearing my own signals at apogee, perigee and in between." He puts this down to his coastal location and 'sea gain' at low lunar elevation. Edward Allely, GW0PZT (IO72), listened on the 26/27 June sked weekend and heard RA8YS and VK3AMZ about an hour after moonrise.

After an agonizing seven weeks wait, John Regnault, G4SWX (JO02), finally got the parts with which to repair his rotator. With the help of Andy Cook, G4PIQ, he was back in action on 29 May working SM5MIX, OK1MS, SM0FFS and IK1HWG for initial no. 229. Echoes were poor on 7 June and nothing was heard from 9H3XX; the same happened on the 12th.

Following an Es session on the morning of the 13th, John contacted ON4ANT at 1247 for number 230. Between 1945 and 2057 on the 25th, he completed with IK1MTZ (1kW/4-Yagis), W7HAH, DL5MAE, LA8YB, I2FAK and K2GAL. Others heard included EA3DXU (2-Y), 9A1CCY and DJ5RE. Echoes were weak next day and nothing was heard from EA3MD (1kW/2-Y) but he did complete with JA4BLC, SM5MIX, VK3AMZ, OE5EYM, W5UN and WA3HMK between 1200 and 2000. DL1KS was number 231 on the 27th, with

VK3AMZ and IK2EAD worked later.

The next sked weekend is 14/15 August. The VK3UM Moon program calculates that at moonrise on the 15th the declination will be +19.6 degrees and the 144MHz sky temperature 418° K. The 14th is seven days after apogee, so the signal degradation will be –0.96dB at Saturday moonrise, falling to –0.59dB at moonset next day. The September sked weekend is 11/12.

50MHZ

THERE ARE rumours that the permitted 50MHz power levels in Britain are soon to be increased. The fact is that the RSGB, through its VHF and Licensing Advisory Committees, is preparing a submission to the DTI/RA for increased power levels. You may rest assured that we will present a sound case for more transmitter power and the removal of antenna restrictions. These things take time, so don't expect any early announcement – please be patient!

PROPAGATION

The Six and Ten Reporting Club's May report, prepared by Ray Cracknell, G2AHU (HWR), states that the 12 May Es event was reckoned to be the finest day of 50MHz Es ever experienced. The band was open from early morning to late evening. There was an opening from Brazil to southern Europe and TEP was operative across Africa with Es extensions into the Netherlands.

Ray comments: "It is very difficult to account for the events of 12 May. The period 7-10 was one of considerable solar activity. The sunspot number rose to 132 on the 10th, declining slightly .... to 126 on the 12th, which was still very much above the predicted mean of 60 for May 1993. The geomagnetic field varied from active to minor storm levels on the 8th to the 10th, then fell to very quiet on the 11th and rose again sharply to unsettled on the 12th. This may upset some of the over-simplified theories of Es formation.

"Although Whitehead's windshear theory does not stipulate where the supply of charged particles comes from before being swept up, it must originate from the Sun and arrive via the solar wind, entering the magnetosphere on the dark side of Earth. There would have been a very plentiful supply during the period 8-10 and the quiet field on the 11th probably aided the entry very considerably.

"The second consideration is that a flat, smooth Es layer is unlikely to support 50MHz propagation, and certainly never 70 or 144MHz. For these frequencies to be propagated it needs to be roughened considerably to cause variations in electron density and the requisite gradients to refract the higher frequency signals. It seems that the 12th met both these requirements admirably."

The fantastic Es propagation on 10 June was something else. To quote from parts of the *GB2RS* news broadcast on 20 June: "A massive solar wind shock wave hit Earth on the 10th. Major magnetic storms were forecast but did not materialize, but very widespread Sporadic-E occurred. Openings on 50MHz took place to VE and all over Europe, together with many parts of the Middle East." More of that later.

NEWS

In his June *Information* pages, Ted Collins, G4UPS (DVN), reports the first Es opening of the season to North America was on 31 May when HK1BDN worked into Spain around 2200. VE1ZZ was heard in IO70 on 3 June at 2015 and Ted heard Jack from 2139 on the 5th. EH8ACW (IL28), the *only* Canary Islands station with a 50MHz permit, enjoyed his first UK opening on 1 June.

From Jan Mayen, JX3EX (IQ50) has been operating regularly from 13 June and has worked many northern UK stations; QSL via LA5NM. A new Portuguese beacon, CT0SMB, has appeared on FSK on 50.100MHz; CT1WW thinks it is in the Lisbon area running 10W. T95VO is ex-4N4VO in Bosnia, who told Ted that his QSL manager is 9A3KK. With the general release of the band in Greece, SV9ANJ in Crete, a separate DXCC country, is reported QRV.

ACTIVITY

According to G4UPS's seven page June report the only non-Es day up to the 26th, was the 23rd. Such detailed lists of who worked what, and when, are invaluable as they provide essential data for later analysis. Reports from other contributors average one page since most cannot operate all day, every day.

As we approach sunspot minimum, summertime E-layer propagation on 6m will probably be a daily occurrence, particularly in June. There seems little point in listing every Italian or Spanish station heard or worked in a three hour opening. My main aim will be to record the general picture; eg an opening from GM to IT9 and 9H from 0900-1100. What is important is to report unusual phenomena since it is sometimes these which may provide vital clues to propagation puzzles. Your explanations of such observations are always welcome as they initiate discussion among the experts. If new stations appear, perhaps from a country thus far unrepresented on the band, we would all like to know. Try to get their essential details but don't take so long that you deny a dozen others the chance of a rare QSO.

The 10 June Es event really merits a whole article – perhaps at a later date; as G4UPS wrote: "This day is one for the record books!" He noted strong Italians and the S55ZRS beacon at 0630. At 2330 he gave up. Had he stayed up a little longer, he would have discovered an aurora. Ela Martyr, G6HKM (ESX), mentioned it and heard beacons OZ7IGY and GB3SIX tone A at 300 degrees. From Shetland, Ian Brown, GM0ILB, worked into EH3, I3 and SP5 on the 10th but most of his QSOs were very short skip, such as G0MZZ (IO93) at a mere 730km.

Paul Baker, GW6VZW (GWT), made 173 QSOs, most from his CQ calls, with stations in 32 countries and 67 squares. He highlights CR5CMP (IM69), SV7CO (KN20), YO2IS, OM3PC (JN98), HV4NAC (JN61), UC2AA (KO33) and his first legal HB9s. John Fitzgerald, G8XTJ (BUX), was pleased to contact OY3JE (IP62) at 2245; nobody else mentioned that one.

There were some incredibly short-skip QSOs made this day, suggesting that the MUF was extremely high. For example, there were strong TV signals from countries still broadcasting in Band 3, so it is possible that Es propagation was sustainable up to 200MHz. Perhaps some of the longer distances worked, eg GW to SV7, were actually two short hops? At 1757, G4UPS heard 4X4IF at S7 and the 5B4CY beacon at S5. At the time PAs were

LOCATOR SQUARES TABLE
STARTING DATE: 1–1–1979

Callsign	50MHz	70MHz	144MHz	430MHz	1.3GHz	Total
GJ4ICD	598	–	264	121	68	1051
G0JHC	500	–	48	–	–	548
GW4LXO	440	23	261	108	48	880
G6HKM	438	–	240	118	57	853
G6HCV	435		246	–	–	681
G3IMV	428	7	501	125	52	1113
GW6VZW	361	–	143	6	–	510
GU7DHI	329	–	106	5	–	440
G4TIF	310	28	207	112	–	657
G0HVQ	299	–	71	–	–	370
G0MGA	249	–	216	–	–	465
G1SWH	245	33	179	63	9	529
G0EVT	230	12	249	65	1	557
G1UGH	217	–	122	–	–	339
G4DEZ	201	–	255	71	62	589
G0FIG	200	–	174	44	–	418
G8LHT	196	20	202	93	17	528
G4MUT	186	25	158	97	34	500
GM1XOG	181	–	–	–	–	181
G8XTJ	176	–	126	–	–	302
G4RGK	167	–	319	182	58	726
G0NFH	133	26	101	51	18	329
G6MXL	110	23	115	64	28	340
GI1CET	88	–	29	3	–	120
G4SSO	80	–	269	99	–	448
G7CLY	70	–	60	2	–	132
G0GMB	66	–	216	108	–	390
G7EWL	54	2	79	6	–	141
G4OBK	21	1	45	–	–	67
G0HDZ	11	–	67	–	–	78
G3FIJ	1	24	80	25	3	133
G3XDY	–	–	224	153	100	477
G0CUZ	–	–	375	80	–	455
G4SWX	–	–	404	–	–	404
G4RRA	–	–	299	80	–	379
G4YTL	–	38	279	37	–	354
G1GEY	–	–	179	125	35	339
GW8JLY	–	–	275	36	–	311
G0EHV	–	35	187	81	–	303
GW4VEQ	–	–	267	–	–	267
G3FPK	–	–	246	–	–	246
GW4FRX	–	–	235	–	–	235
G4DOL	–	–	226	–	–	226
G7LIJ	–	–	153	–	–	153
GW0PZT	–	–	149	–	–	149
G6ODT	–	3	57	62	–	122
GM0GDL	–	–	122	–	–	122
GU4HUY	–	–	81	–	–	81
GM0NXP	–	–	69	–	–	69
G7JAF	–	–	53	3	–	56
G3UOL	–	–	43	–	–	43

No satellite, repeater or packet radio QSOs. If no updates received for a year entries will be deleted. Next deadline is **26 August**. Band of the month 50MHz.

thundering in so are we looking at triple-hop to the Eastern Mediterranean? I look forward to G2AHU's June report with great interest.

During the rest of June, notable Es DX worked included C31HK, CT3FT, CU1EZ (HM76), EH8ACW, EH9IB and EH9MH (IM85), EV5M (KO42), EV8A and EV9A (KO43), RU1A (KP40), SV5TS (KM46), T95VO (JN74), UA2F/DK2ZF (KO04), UB5BW (KN39), YO4BZC (KN45), ZB2IB and 4Z4TT (KM72). In spite of the tragic civil war raging in parts of what used to be Yugoslavia, there is a surprising amount of activity from the region, including Bosnia.

OTHER MODES

Among all this European Es, there were openings elsewhere in June. On the 3rd, G6ION (IO70) heard VE1ZZ on CW at 2015. G4UPS worked VE1XDX on CW at 2142 on the 5th. VE1s, W1s and W2s were copied/worked from 1740 on the 11th but were drowned by colossal Euro-Es signals. Ted heard many Ws from 1920 on the 12th in their contest, all the way up to 50.300MHz, but couldn't break in. Beacon VO1ZA was up to S5 for two hours from 1944 on the 14th. On the 25th, 1920-2135, there was propagation to VE1, VE3, W1 and W2. 7Q7LA was copied at 1722 next day.

From Jersey, GJ4ICD reported a 7Q7 opening in the evening of the 7th, a big USA/Canada opening on the 11th from 1800 with WA1OUB S9+40dB for over two hours and W1-4 stations all very loud. Thanks also to Darrell Moody, G0HVQ (GLR), Terry Chaplin, G1UGH (SFK) and Bob Seabourne, G7KXF (IOW), who sent reports covering this exciting month.

CONTESTS

The UKSMG event on 5 June coincided with good inter-G tropo, with brief Es openings to CT, CT3, EA, I and ZB to boost the points for the luckier participants. On the 13th, the RSGB Trophy event saw better Es activity although G4UPS reported a complete fade-out at 1155, except for SM7EYW; things livened up from 1450 with 9H, I7, IS0 and EH6 stations on. G6HKM's best DX was YO4BZC. GJ4ICD reported it as: "A fantastic day," Geoff making QSOs with UB5BW, SPs, SV5s, etc.

70MHZ

G3IMV IS NOW QRV on the band and came on for the contest on 20 June. He thought it: ". . . . a very poor showing" and doesn't think anyone worked more than 18 stations. His best DX was G3JYP (CBA). Nobody else mentioned 4m!

144MHZ

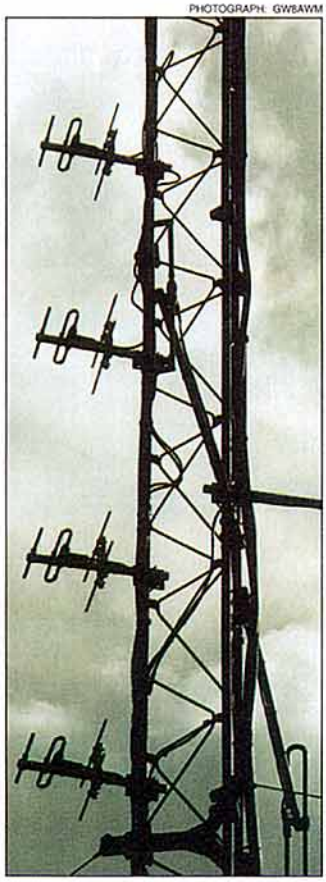
SPORADIC-E

G3UBX E-mailed a copy of the IRTS News Bulletin for 20 June, taken off the packet network. It included news that Charlie Coughlan, EI5FK in Cork, worked 280 stations in 63 squares, including 62 Is, 125 DLs, 26 HBs and 32 SPs, in the 10 June Es between 1640 and 2015 and 2150-2210.

In the same event, S Crane, G0CUH (IOS), made 117 QSOs in 44 squares from IN69. Being such a rare square, and the only 2m DX operator in the Isles of Scilly, one can imagine the pile-up he attracted. It started at 1600 and lasted two hours. Countries worked included DL, HA, HB9, I, OE, OK, S5, SP, YU and 9A.

Going back to the 12 May opening, G3IMV worked SV3KH for square no. 500. On 8 June, John contacted HA, OE, OM and 9A stations in a quarter hour opening from 0909. In the 10 June affair, 1530-1930, YO3FBL (KN24) was the only new square from loads of stations worked in EA, HA, I, LZ, OE, OK, OM, S5, SP, UB5, YO, YU and 9A. In a 20min opening from 0826 next morning he contacted some I8s and IW9CER. From 0947 to 1033 on the 12th he worked five HAs, two HGs (thought they were a thing of the past), OM3TEG, YU7AL and YO2QC/P (KN26).

PHOTOGRAPH: GW8AWM



Jaybeam Ltd donated the 4 x 3 element Yagis for the GB3BLS Bristol beacon on 432.934MHz.

Gordon Higgins, G3PXT, was out portable on 10 June and worked YO, EA4, 9A, S5, IW5 and CT1WW, but didn't mention his locator. He used 10W from an FT-480R with 13-ele Tonna Yagi, 50ft ASL. For Paul Keslake, G4NDG (DVN), the 10 June affair started at 1522 with 9A, then IT9 and OE9 until 1620. 1633-1654 propagation favoured YU1, YU7, 9A1, 9A3 and S51 areas and from 1736 it got patchy with shortening skip into DL. From 1834 it was the turn of the SPs and the last station heard was a UB5 at 1857.

G4SWX was in on the 10 June fun from 1614 making 44 QSOs, mostly to northern I, YU, HA, ending with UB5BDC (KN29) at 1916. While chatting with G4PIQ at 0946 on the 13th, HA0HO (KN07) broke in paving the way for many HA and some YO contacts till 1117. At 0719 on the 20th, John worked SV8JE then SV1BRL/A, both in KM08, followed by I2, I7, YU6 and LZ contacts.

Other Gs who caught some, or all, of these events included G4YRY, G6HKM, Karl Lamford, G6ODT (NHM) and G8XTJ, so let's look at other areas. Darrell Mawhinney, GI4KSO (DWN), enjoyed the 8, 10 and 13 June events and on the 10th had 150 QSOs in 47 squares. Countries were DL, EA, EA6, F, HA, HB9, I, OE, OK, OM, S5, TK, YU, 4N and 9A, with IC8FAX (JN70) the best DX.

From mainland Scotland, Colin Smith, GM0CLN, operated from his portable site, IO85OX, from 1622 on the 10th. He enclosed a map showing the squares worked which range from IM88 and JM78 in the south, over to KN04/05 in the SE, the closest being DK8VS in JN39. From the east coast, Arlen Pardoe, GM0HUO (IO86OI), worked very similar squares in France and Spain to Colin's, but fewer to the SE. He caught the short opening to 9A and IV3 from 1023 on the 13th.

The furthest north report was from GM0ILB (IP90HJ). Ian worked EA1/3/4/5 and EA6 and some Fs from 1640. By 1800 signals were fading and he had worked all he could hear. At 2127 he contacted F6ANQ (IN94) who was audible for 10min. Lastly to Wales and Pat Allely, GW3KJW (GDD), who worked YU7, OE3 and HA2 in a short opening at 0905 on the 8th. At 1158 on the 10th he contacted EA9IB, who was only in for a couple of minutes.

Pat's son GW0PZT then took over for the main event and worked 84 stations in 45 squares, 21 of them new. While some were around the 2,000km distance, many were much closer. EA6QB, OM3TEG and OK1SO were new countries. A nice one for GW3KJW on the 27th was CN8HB (IM63) at 2,131km. He was only there for about 90s at S3, so what propagation mode was this? Lyn Leach, GW8JLY (GNS), operated on 10 June, 1535-1914 and enclosed a map of the squares worked. Surprisingly there are no French or mainland Spanish ones, all his QSOs being to the east, centred about the 70/80 columns.

TROPO

There was good tropo propagation to LA and OZ in the evenings of 3 and 4 June and to SM on the 4th. Next day the band opened to France in the afternoon and again to Scandinavia in the evening. On the 15th and 17th, G4YRY made contacts with several EA1s in the mid-evening. Conditions were good again on the 27th but favoured western G and GW; many Fs and EAs were on. More Scandinavians were around on the 28th and 29th, mostly in the evening.

Probably the best DX happened by chance on the 29th. In a QSO with G4SWX, F5JRX (JN25) asked John what beacon he was hearing on 144.965MHz? Thinking it was Es propagation, John telephoned Andy Steven, GM4IPK (IO99), who was amazed to hear Bruno on tropo. After Andy's amplifier had warmed up a QSO was completed at RS53 each way at a QRB in excess of 1,600km.

FINALE

WHAT AN EXCITING month! I'm grateful to the Editor for allocating three pages to cover these events, although I've no room left for several topics, like ionoscatter tests, propagation tests from the MIR space station and the wonderful WW2 phonetic alphabet; many thanks to Howard Orgel, G8DUT, and Peter Whitfield for information on the latter.

The **October** deadline is **26 August** and the **November** one is **25 September**. The fax is 081-668 5582, the BTG mailbox is 76:MSX021 and the wonderful CompuServe ID is 70630,603. Internet users should call me as 70630.603@compuserve.com.

HF F-LAYER PROPAGATION PREDICTIONS FOR AUGUST 1993

The time is represented vertically at two-hour intervals GMT for each band, ie 00=0000, 02=0200, etc. The probability of signals being heard is given on a 0 (indicated by a dot) to 9 scale; the higher the number the greater the probability with 1 meaning 10 to 19 per cent of days, and so on. Additionally F-layer openings at 50MHz and 1.8MHz are indicated by a plus (+) sign in the 28 and 3.5MHz columns, with these latter bands having a probability of 9.

Time / / GMT	28MHz 000001111122 024680246802	24MHz 000001111122 024680246802	21MHz 000001111122 024680246802	18MHz 000001111122 024680246802	14MHz 000001111122 024680246802	10MHz 000001111122 024680246802	7MHz 000001111122 024680246802	3.5MHz 000001111122 024680246802
** EUROPE								
MOSCOW	....	.........1..	...112212 43.	...3444347 61	3146666678 96	8664433346 89	7632111124 78	53.......4+
MALTA	....	.........21.	...122222 53.	1..3555457 62	5237766678 97	9886444457 99	9963211125 78	++4.....24+
GIBRALTAR	....	....	....11...22.	....2222254 1	31.4666558 85	8657654457 99	9975322225 78	++52....25+
ICELAND	....	....	....	.....1...22.	1..1243336 74	6335554456 78	7775322223 56	5542......24
** ASIA								
OSAKA	....	....	...111111...	...1322221 11	...1321134 53	....1...1463	.........14.	....
HONGKONG	....	.....1..11..	...122223 31.	...1333355 31	1...1112477 5	1.......1475	253	..........2.
BANGKOK	.........1..	...1111123 1.	...223224 64.	..1223335 762	3...111478 6	3.......1478	1.......255	22
SINGAPORE	.........1.	...1111123 1.	..1233334 64.	..1234336 872	3...111478 7	3.......1478	1.......256	23
NEW DELHI	.........1...	...1121121 ..	..1233335 42.	1.1223336 641	421..111478 6	62......1478	4.......257	24
TEHERAN	...1111.12..	...2222234 2.	..2434435 751	1144333 46874	6451..12479 8	852.....1478	63......257	4.........24
COLOMBO	...1111.11..	...2222233 2.	..1334445 652	1122243 46884	63...112479 8	72......1478	5.......257	2.........24
BAHRAIN	...1111122 1.	...2233234 2.	1.2434446 753	3144333 46886	7551..114799	862.....1478	73......257	4.........24
CYPRUS	...1111113 1.	...2333353 1.	1.2566656 873	4247666 77886	8676545 56899	9863212 23689	8631....1368	+3........35
ADEN	...1122233 1.	...3344456 31.	2124345 57874	5344223 46887	9751...14799	973.....1478	74......257	52........24
** OCEANIA								
SUVA/S	....	....	.....1..121.	...1121124 3.	..1432113 64.	..141...142.	...1.....1..	....
SUVA/L	31	1..1.....62	3214 1.....84	2226 2.....74	.1463 1...351	..241...42.	...1.....1..	....
WELLINGTON/S	....	....	.....11...1.	...2221 1..3.	..2531111 162	..231...1341	...1.....11.	....
WELLINGTON/L	....	1.........12	32.3.....34	4325 1.....55	2346 2....164	.1341...341	...1.....11.	....
SYDNEY/S	....	....11.....	...2222 1....	..1543 321..1	1.1531 123324	...21...1463	.........25.	..........2.
SYDNEY/L	1	1	2..11.....14	31.23.....36	2115 41....75	...31...263	...1.....14.	....
PERTH	...1111.....	...2222.....	..1354 41....	1.2354 321...	4211 3111332.	3.......1462	1.......255	22
HONOLULU	....	....	.........11.	....11..2321	..1321 113 41.	..341...11..	..11.....	....
** AFRICA								
SEYCHELLES	...1122231 1.	...2344453 31	2124345 57664	5343234 46887	9751..114799	962.....1478	74......257	5.........24
MAURITIUS	...1123334 2.	...3345456 42	1.2445557 875	4.4423446 898	8451.111479 9	963.....1478	74......257	52........24
NAIROBI	...1223345 21	1..3345567 42	4225445 67876	7445233 46898	9873...14799	985.....1478	772.....257	54........24
HARARE	...1224455 21	1..3345677 53	5115445 67986	7446333 46898	9875 1.113799	9962....1478	874.....157	55........24
CAPETOWN	....2234552.	...2445677 4.	...5655678 73	1..7644 46896	53.6311 13799	8834....1478	7851....157	552.......24
LAGOS	....2245563 1	1..1435678 62	5314644 57986	8636532 36898	9976 2...3799	8974.....478	7851....157	452.......24
ASCENSION Is	....2112353.	1...4334576 1	32..6534 6885	65..6422 48898	9943 41...2689	9974 1....378	7751....157	552.......24
DAKAR	....2123354.	1...4345476 1	32.2644 45885	6525632 23797	9976 41...589	9974 1....278	8851.....47	552.......4
LAS PALMAS	....1111.22.	....2223254 1	2..2555657 73	4214776 76896	9757665 55799	9986432 22489	8863 1...258	++3.....25
** S. AMERICA								
Sth SHETLAND	.....2335 2.	.....4557 4.	.....1556 872	.....2346 884	3....1113 688	8542 1....457	7751.....135	452.......2
FALKLAND Is	.....2324 3.	1....1354 661	31...3456 885	6311.3345 787	9864 2111 3578	9974 1....247	8851.....15	552.......2
R DE JANEIRO	....1132 43.	....3343 651	32...4454 785	6421 1433 3587	9864 321..379	9974 1....48	7751.....17	542.......4
BUENOS AIRES	....1121 33.	....3343 551	31.1.4454 674	6424.4343 577	9866 1211 1268	9974 1....37	7852.....4	552.......2
LIMA	.....1.11.	121231	2...2133 2354	52.1423 32246	8745 4211..16	8574 2....3	6852.....1	352.......
BOGOTA	.....1111.	.....1112 31	2...1323 2344	42.1343 32236	8634 4211..16	7974 2....3	5852.....1	252.......
** N. AMERICA								
BARBADOS	....3...11.	1121231	2...2333 2354	52.1443 22257	8745 421...37	8974 2....5	7852.....2	452.......
JAMAICA	.....1.....1.	.....1.121	1....1222 1233	41..1222 1235	7523 3211..15	6864 2....2	4752.....	.52.......
BERMUDA	.....1.....1.	121	1....2221 243	31...322 1256	7523 221...26	7864 2....4	5752.....1	252.......
NEW YORK	.....1.	1	1.....1111 33	3....1221 235	6411 1111...25	6863 1....3	3752.....	.42.......
MEXICO	.....1.	1	.....1111 122	2.....2211 23	5312 1.11...1	3764 1.....	1552.....	.22.......
MONTREAL	.....1.	1	.....1111 22	2....1221 235	6311 1111 1125	6853 1....3	3651.....	.32.......
DENVER	1	1	11112	1.....1111 2	4211...111..2	2553 1.....	.351.....	..2.......
LOS ANGELES	1	1	11112	1.....1111 2	2111...12..1	1453 1.....	.251.....	..2.......
VANCOUVER	1	1	1	1	2112 1...21.1	1353 1.....	.141.....	....
FAIRBANKS	.....	.....	.....	....111.....	1.1331 12211	.134 1...11..	..11.....	....

The provisional mean sunspot number for June 1993 issued by the Sunspot Data Centre, Brussels was 49.1. The maximum daily sunspot number was 105 on 1 June and the minimum was 8 on 14 June. The predicted smoothed sunspot numbers for August, September and October, are respectively: (classical method) 57, 55, 53; (SIDC adjusted values) 40, 37, 35.

IARU

JOHN ALLAWAY, G3FKM
and
TIM HUGHES, G3GVV

WE SAID last time that the IARU was founded in 1925. In 1947, RSGB was represented at the Atlantic City ITU Conference by the President, G6LJ, and secretary G6CL who attended as observers. The amateur service emerged from this in better shape than expected with the retention of top band as a major success. However, pressure from the broadcasting lobby resulted in a reduction of the width of the 7MHz band. This is a situation which is still very much under active review because our ultimate aim is for 300kHz in the vicinity of 7MHz to be available in all three Regions. At WARC 92 it was recognised that harmonisation of the amateur allocation at 7MHz was desirable and a recommendation, put forward by Mexico and adopted by the Conference, said that this matter should be considered by "a future competent conference".

It was in 1950 that it was agreed that representatives of IARU Region 1 should meet on a three yearly basis, and RSGB was invited to operate the Region 1 Bureau now called the Secretariat. The Society has provided a secretary since then. The first was John Clarricoats, G6CL, followed by Roy Stevens, G2BVN, Eric Godsmark, G5CO, and then G3FKM who took over in 1984.

The global IARU Headquarters (the International Secretariat) is located at ARRL Headquarters in Newington, Conn. It acts as a focal point for all activities and issues periodical 'Calendars' containing news items and is accompanied by voting sheets when new societies have applied for membership. All aspiring member societies have to undergo this voting procedure and there has been a lot of activity in this direction recently with a spate of applications from Region 1 Croatia, Lithuania, and Slovenia (recently elected), and Bosnia Herzegovina, Macedonia, and the new Czech Republic and Slovakia all undergoing the election process at present. Estonia has recently been re-admitted following restoration of it's independence. There was no vote in this case because ERAU was already a member before Estonia lost it's independent status during WW2.

NEWS ITEMS

IARU PRESIDENT Dick Baldwin, W1RU, will be holding another two courses on Amateur Radio Administration later this year. The first will be in Beijing in October and the second in Taiwan immediately after. Dick's courses are intended for administrators and have in the past been held in many countries. They are usually arranged in cooperation with the ITU and through them the amateur services have made many friends; some of the recent relaxations in Africa have been a result as has the official recognition of amateur radio in Bangladesh.

Asia Telecom 93 took place in Singapore in May. It was the largest event of its kind ever to take place in Asia and attracted more than 32,000 visitors and officials from 90 countries including 31 ministers and VIPs. IARU was offered space for a small stand free of charge by the ITU. This contained amateur radio exhibits from many countries. It was organised and manned by the Singapore Amateur Radio Transmitting Society. A highlight was a visit from Deputy Secretary General of the ITU, M Jean Jipguep, who will be opening our Region 1 Conference next month in Belgium.The Region 3 Conference next year will also be organised and hosted by SARTS.

IARU REGION 1 CONFERENCE

THE BELGIAN Radio Society UBA is the host society for this triennial Conference, which will take place in De Haan (near Ostend) during the third week of September. It will be officially opened by M Jean Jipguep, Deputy Secretary General of the ITU. M Jipguep comes from Cameroon and we are particularly honoured and pleased to have him present at a time when much progress is being made to encourage the development of amateur radio on the African continent.

More than 40 Member Societies have said that they will attend and at the time of writing it seemed that there will be more than 150 delegates present. They come from Europe, Africa, and the Middle East, and it is hoped that, for the first time, representatives from the Czech Republic, Croatia, Egypt, Estonia, Lebanon, Lesotho, Lithuania, Mongolia, Slovakia, and Syria will take part. There will also be members of the IARU Administrative Council present. These will include IARU President Dick Baldwin W1RU; Vice President Michael Owen, VK3KI; Secretary Larry Price, W4RA; Dave Sumner, K1ZZ; Alberto Shaio, HK3DEU; Tom Atkins, VE3CDM; Pedro Seidemann, YV5BPG; David Rankin, 9V1RH; Fred Johnson, ZL2AMJ and quite possibly Masayoshi Fujioka, JM1UXU.

The work of the Conference is considered by Committees and Working Groups each of which has before it papers or documents which have been written by member Societies and submitted months in advance; these papers have therefore been scrutinised and opinions sounded within each Society prior to the Conference *[see page 78 this month – Ed]*. The main Committees are the Finance and Credentials, Administration, HF, and VHF/UHF/SHF Committees and specialised Working Groups which deal with for example EMC, ARDF, and Common Licensing. Meetings begin usually at 0900 and end at 1800 but there are many ad-hoc groups that continue to work well into the night and it is definitely not a holiday!

The RSGB delegation will consist of Tim Hughes, G3GVV (delegation leader); Malcolm Appleby, G3ZNU; John Bazley, G3HCT; David Butler, G4ASR; Mike Dixon, G3PFR; David Evans, G3OUF and Ron Glaisher, G6LX. RSGB President, Peter Chadwick, G3RZP, will attend as an observer, as will Graham Shirville, G3VZV, representing BATC at no cost to RSGB.

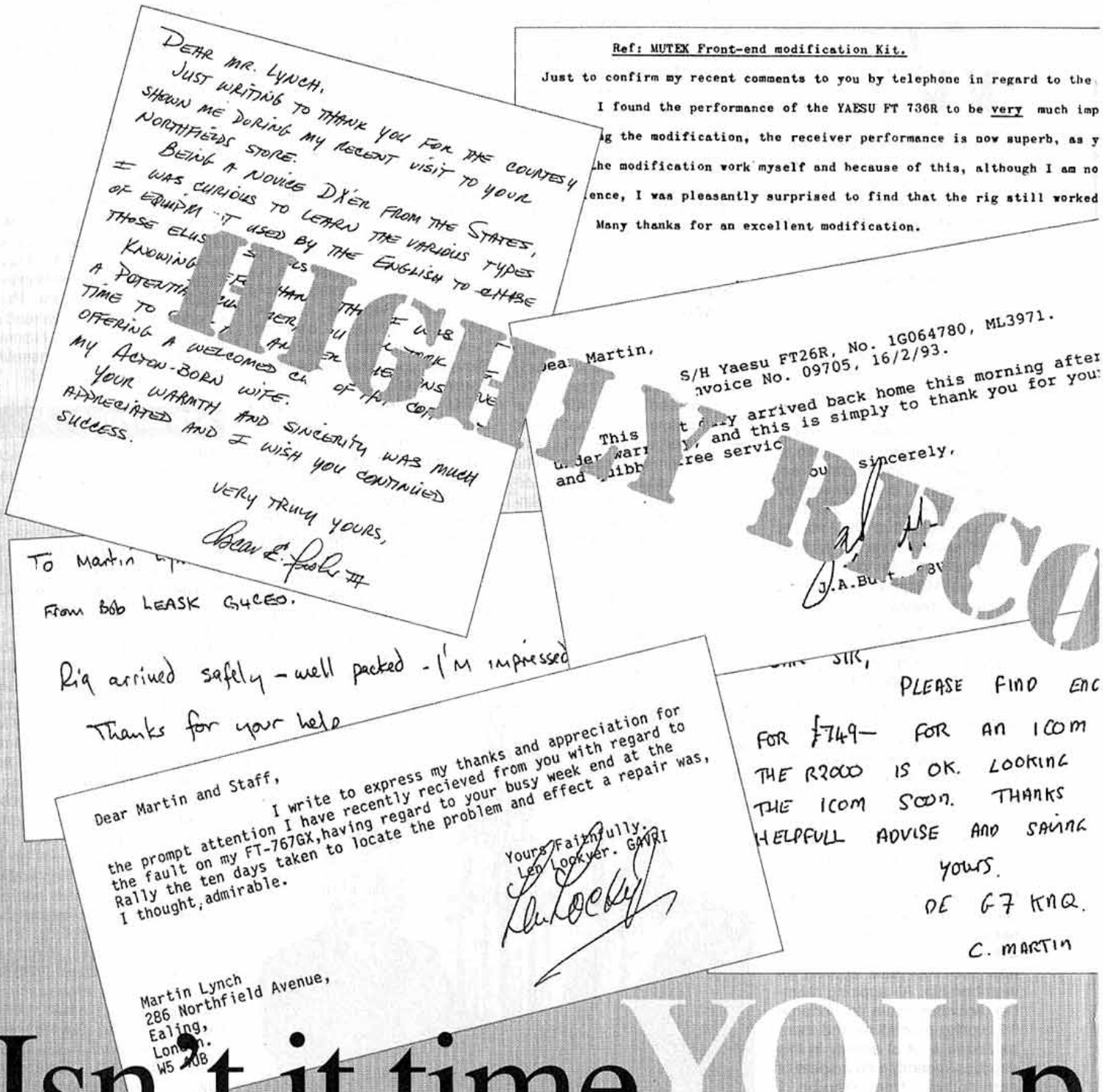
STRUCTURE

THE THREE Regions exactly match the ITU Regions geographically and each holds its own Conference every three years - it was the turn of Region 2 last year and it will be Region 3's turn in 1994. Each Region is administered between Conferences by an Executive Committee or Board of Directors which is elected at the appropriate Conference for a three year period. At present Region 1 has a Chairman (PA0LOU), Vice-Chairman (SP5FM), Secretary (G3FKM), Treasurer (I1RYS), and three members LA5QK, YT7MM and 7X4MD. Each member has to come from a different Member Society. Due to increasing activity, particularly in Africa, the number of members will be increased to five in September, hopefully to allow more non-European participation. Region 2 has a President (HK3DEU), Vice-President (VE3CDM), Secretary (YV5BPG), Treasurer (VP9IM), and members at large (each responsible for an area) W4RH, XE1NJ, YS1FI, OA4PQ and LU2AH. Region 3 has a Chairman (9V1RH), Secretary (JM1UXU) and directors JA1KAB, VK3ADW, ZL2AMJ and 9M2SS. It is very important to note that members of these bodies are there to exercise an overall position for the good of **all** radio amateurs. They are not representing their own countries.

Two IARU Region 1 Secretaries: Roy Stevens, G2BVN (right) and John Allaway, G3FKM. The occasion was the presentation of the 1965 Long Island DXCC Trophy to G3FKM for a world maximum score of 286 countries worked and confirmed during one year! G2BVN was the 1966 RSGB President.

When you're sa

We're delighted!



DEAR MR. LYNCH,
JUST WRITING TO THANK YOU FOR THE COURTESY SHOWN ME DURING MY RECENT VISIT TO YOUR NORTHFIELDS STORE.
BEING A NOVICE DX'ER FROM THE STATES, I WAS CURIOUS TO LEARN THE VARIOUS TYPES OF EQUIPMENT USED BY THE ENGLISH TO ENABLE THOSE ELUSIVE [illegible]
KNOWING [illegible]
A POTENTIAL [illegible]
TIME TO [illegible]
OFFERING A WELCOMED CHANGE OF PACE, COMPARED TO MY ACTON-BORN WIFE.
YOUR WARMTH AND SINCERITY WAS MUCH APPRECIATED AND I WISH YOU CONTINUED SUCCESS.

VERY TRULY YOURS,
Bob E. Leask III

HIGHLY RECO

Ref: MUTEK Front-end modification Kit.

Just to confirm my recent comments to you by telephone in regard to the
I found the performance of the YAESU FT 736R to be very much imp
[illegible]g the modification, the receiver performance is now superb, as y
[illegible]he modification work myself and because of this, although I am no
[illegible]ence, I was pleasantly surprised to find that the rig still worked
Many thanks for an excellent modification.

[illegible] Martin,

S/H Yaesu FT26R, No. 1G064780, ML3971.
[illegible]nvoice No. 09705, 16/2/93.

This [illegible]t [illegible]ly arrived back home this morning after
[illegible]der warr[illegible]y, and this is simply to thank you for you
and [illegible]ibb[illegible]ree servic[illegible]

[illegible]ou sincerely,

J.A.Bu[illegible]

To Martin [illegible]

From Bob LEASK G4CEO.

Rig arrived safely - well packed - I'M impressed

Thanks for your help

[illegible] SIR,

PLEASE FIND ENC
FOR £749- FOR AN ICOM
THE R2000 IS OK. LOOKING
THE ICOM SOON. THANKS
HELPFULL ADVISE AND SAVING
YOURS.
DE G7 KNQ.
C. MARTIN

Dear Martin and Staff,

I write to express my thanks and appreciation for the prompt attention I have recently recieved from you with regard to the fault on my FT-767GX, having regard to your busy week end at the Rally the ten days taken to locate the problem and effect a repair was, I thought; admirable.

Yours Faithfully.
Len Lockyer. GAVRI

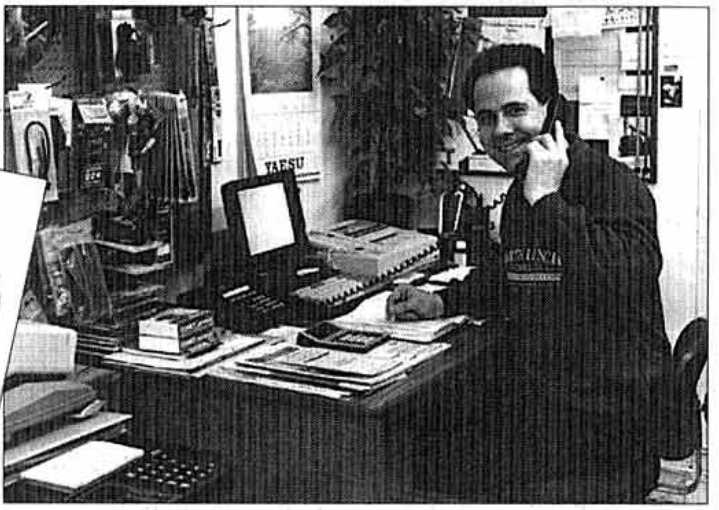
Martin Lynch
286 Northfield Avenue,
Ealing,
Lon[illegible].
W5 [illegible]UB

Isn't it time YOU p

286 NORTHFIELD AVENUE, EALING, LONDON W5 4UB

tisfied...

MARTIN LYNCH
G4HKS
THE AMATEUR RADIO EXCHANGE CENTRE



Martin Lynch started in Amateur Radio twenty four years ago and has been selling equipment for almost as long. Other companies may try and copy his ideas but they never emulate his dedication to customers. He does not offer day trips around service departments, which is probably why his turn-around & servicing rates are the best in the U.K. A team of devoted enthusiasts offer advice based on experience, six days a week, under one roof. **MARTIN LYNCH.** Just an up-to-date & successful business with traditional values.

Martin Lynch
Ealing
That Icom Power lead
many thanks for lead – it arrived this morning
I knew I could count on you!
When I get bored with this rig I'll be back to you for a bigger one!!
Martin
G7OCV

Dear Martin,
Please find enclosed a cheque for £19 in payment for a second hand YH-2 Vox headset (£15 + £4). It was sent to me 29 [illegible] after a telephone call. [illegible] service. [illegible] companies when I know I'll get a better [illegible] & better service from you! Once again thank you.
C. Lee

ut Lynch to the test?

Tel: 081 566 1120 FAX: 081 566 1207

SWITCH Access VISA RSGB

SWL NEWS

BOB TREACHER BRS 32525
93 Elibank Road, Eltham, London SE9 1QJ

SO FAR DX this summer conditions on the HF bands have been rather mixed. At times only 14MHz provided anything of note, but Sporadic-E on 28 and 24MHz gave some good openings around Europe with most reporters catching some interesting stations.

SPORADIC-E

BOTH 50 AND 144MHZ provided some good conditions during early June, the traditional starting point for such openings. Looking at 144MHz first, 10 June between 1602 and 1649 provided YO3ACX, YO3JW, LZ2AB, HA3UU, YO2BBT, YO5CFI, 9A2WA, S59AX, HA8MV, IK3TPP, S53AC, IV3BBR and IV3HWT into London. In Harrogate David Whitaker, BRS25429, heard between 1618 and 1653 YU/SM7KOJ, YU7ON, S53FI, LZ2CM, YU1EV, YU1WP, YU1VG, I7CSB, IK6HCX, I3VIP, IK4CDJ, IK2DDR, IW6BLH and S51OT. On 13 June, HA0DG/P, HG8RG and HA7PL were heard in London between 1019 and 1030. At the same time in Blackpool Martin Parry, BRS52543, was hearing OE3RRA, YZ7MJU, YU7FF, YU7EW, YU7GS and YU7BW. These reports show how stations in different parts of the country can be hearing totally different stations.

On 50MHz three serious listeners have, between them, notched up a few new countries in the shape of T97M (the new prefix for Bosnia), UC2AA, C31HK, EH9IB and EH8ACW. There has been a great deal more European DX on the band. The first Double Hop E opening of the year occurred on 11 June between 1825 and 1915 when four Ws in the 1 call area were logged. A late night listening stint at this QTH logged S59AM calling K8WFZ at 0011 on 12 June. So far this year David Whitaker has heard 48 countries and 162 squares on 50MHz.

HF DX NEWS

IT IS MOST pleasing to welcome several new reporters to the page this month – notably, BRS95210 and RS95145. It is also good to hear again after long absences BRS20249 and BRS90281. Having so many reports during fairly unfavourable conditions is most pleasing. These reports, and those from the 'regulars' have enabled me to compile this snapshot of the best DX to have been heard in May and early June.

24MHz: D44BS, FR5ZU/G, HB0/DJ0SL, T95X, 9V1ZB, 9Y4GR.

21MHz: AP2JZB, C9LCK/P, E35X, ET3SID, BV5EA, OD5ZZ, T5HLL, TZ6VV, VU2DK, V63DJ, YI1MH, 5X1AA, 5Z4JD, 7Q7ZZS.

18MHz: FG5GI, KH8/JA1WPX, JD1AMA, P49T, S92SS, T9/OH6XY, V47WC, V85PB, 5X1XX and 9K2ZZ.

14MHz: BT2000BJ, EP2AG, FO5NL, HK0TCN, KH6FKG, VR6BX/DI (Ducie Is), T93M, XF3/XE1L and 3C1TR.

7MHz AP2AGJ, JA1BRK/DU1, E35X, JT1BR, Z21HJ, 7Q7XX and 9M0S.

Several interesting snippets of information came from your letters this month. It seems that TI2JJP is planning an expedition to TI9 in November or December. Secondly, although many licensed fellows are getting rather anxious about their QSL from P5RS7, it seems that at least three SWLs received their cards direct several months ago. It is worth remembering, however, that until the DXAC accept the paperwork, it does not count for DXCC nor has P5 been added to the DXCC list.

CHALLENGE

AS PROMISED earlier in the year, I will now unveil details of an 18MHz challenge as there now appear to be sufficient listeners interested in the band to promote even more listening.

The Challenge will run from 0001 on Saturday 7 August to 2359 on Saturday 28 August. One point can be claimed for each European country and two points for each DXCC country heard. The final score is the sum of these points multiplied by the total number of DXCC countries heard. There will be no incentive to win, it is simply an exercise to see how many countries can be heard during the period and to encourage more listeners to monitor the band.

FINALE

MATERIAL FOR the **October** issue should be received no later than **11 August**.


ALINCO
ELECTRONICS
ALINCO EA0024
DJ-180
V/M
SCAN
CALL
OFF SET
STEP
APO
LAMP KL.PL
MONI H/L
TONE MW
ALINCO
ALINCO DJ-580
VHF/UHF FM TWIN BAND
elf
RENAULT
Labatt's
canon
5

QSL

JOHN HALL, G3KVA
Corfe Lodge, Ipswich Road, Long Stratton, Norfolk NR15 2TA.

● John May, G0CDB, tells me that the South Devon Radio Club's mailing address for calls G4SSD and G7FDC is P O Box 4 Brixham, Devon TQ5 8QH, and not as printed in the RSGB *Call Book*. Cards sent to the *Call Book* address get there eventually but delays are inevitable. The club likes to respond promptly to QSL cards received so please use the correct address.

● When ordering new QSL cards try and remember to get some printed with all the details on one side. It really does make them easier to sort and the award managers say it makes life much easier for them too.

● New QSL Bureaux exist for the following countries: Slovakia Republic, Ukraine, Serbia, Croatia, Slovenia, Bosnia and Macedonia. The girls at the Bureau have the addresses if anyone requires them - just ring and ask for Doreen or Jan and they will be only too pleased to help.

● One or two bureaux have closed down for the time being. They may or may not be re-opened. They are: C9 Mozambique, D2 Angola, VP2M Montserrat, XY Myanmar, 9G Ghana, 9O Zaire.

● It is worth mentioning again that stamps bearing the words 1st or 2nd Class last indefinitely whatever price was paid for them, and that's official. so it is better to use such stamps on envelopes you send to your Sub Manager because then he will not get into any difficulty should postage rates change at any time.

● P Whitchurch, G3SWH, has written to let me know he is the QSL Manager for the recent Alderney expedition by Bristol Contest Group. The call was GU6YB/P and the route for the cards is to G3SWH and no-one else.

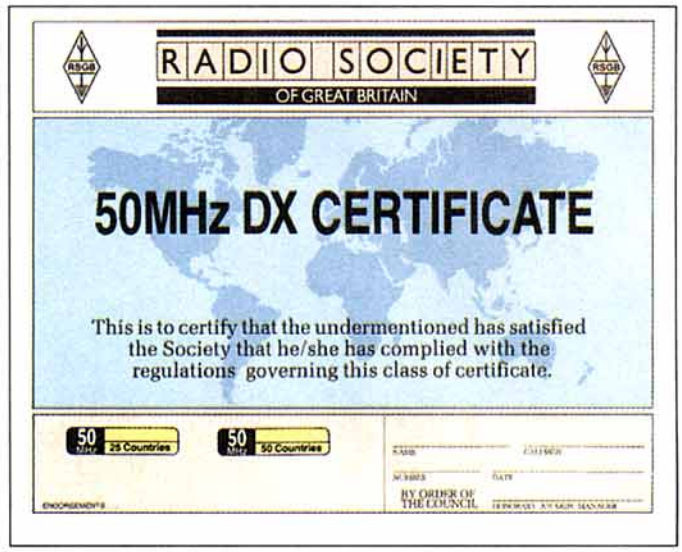
● Nice to see so many of you interested in the Bureau on the recent RSGB Headquarters Open Day and I hope those of you that braved the M25 to come down to Potters Bar found the journey worthwhile.

● Brian Jones, G0PLW, says he has received a QSL card from HL0AGE for a SSB contact at 1047GMT on 21MHz on 13 October 1991. However, Brian did not make the contact and he says that if the person who did recognises the details, he will send the card on to him.

● Kwong Li, G0TOY, has sent an example of his personally designed QSL card which is reproduced below. He went to a great deal of trouble with the artwork using Microsoft PowerPoint. He asked a number of QSL card printers as well as other commercial printers for a quote for 2,000 cards and received bids ranging from £500 to £900 plus VAT! He eventually went to a local print shop in Barnet and got a quote of £290 inc VAT for 2,500 cards. He also had to pay a royalty payment to London Transport for use of the map. However, his message is - don't write off local print shops as they may be able to provide a good quality product at a very competitive price.

● Ryzard Grabowski, SP3CUG, President of the Polish National Society PZK, has written to say that the PZK Headquarters Office has moved address to Sekretariat ZG PZK, PO Box 61, 64-100 Leszno 1, POLAND. The Polish QSL Bureau remains at the same address which is PO Box 320,00 - 950 Warsaw 1, POLAND.

● Will members who send envelopes to their Sub-Managers please remember that he or she needs to have envelopes with callsigns as well as a name and address on them!



AWARDS

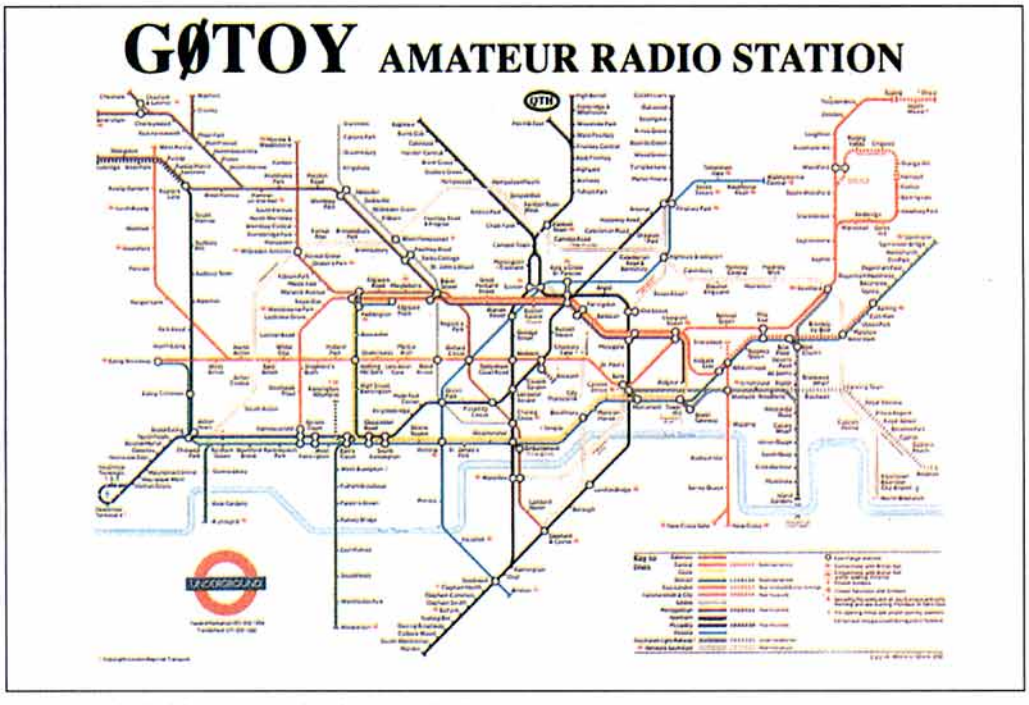
ANOTHER VHF AWARD is the RSGB 50MHz DX Certificate, reproduced on this page. The award takes into account the considerable potential for cross band working when transmitting in the 50MHz band. There is therefore no stipulation on the band to be used for the incoming signal. The initial qualification is confirmation from 25 countries of a successful QSO with a transmission from the applicants country on the 50MHz band. However, stickers are available for every additional 25 countries obtained.

General Rules are as follows:

1 All contacts must have been made after 1 June 1987
2 QSL cards submitted as proof must be arranged in alphabetical order and a checklist enclosed.
3 The award is available to fixed, temporary location or portable operation but *no* mixed categories are allowed.
4 The fees and entry details are shown on page 3 of the current RSGB *Call Book*.
5 Applications should be sent to: Ian L Cornes, G4OUT, 6 Haywood Heights, Little Haywood, Stafford ST18 0UR.

Don't forget that if you want your QSL cards returned safely, enclose a self addressed envelope with adequate postage on it with your application.

Ian tells me I may have confused the matter of paying by cheque for Society awards. Foreign cheques are out but UK amateurs may pay by cheque providing the cheque is made out to the RSGB and *not* the award manager. Sorry about that.



Recipients of this QSL card from G0TOY can easily find their way around London!

THE THREE POINTS OF THE KENWOOD TRIANGLE REPRESENT ADVANCED TECHNOLOGY, QUALITY AND STYLE

KENWOOD APPROVED DEALERS

AVON
AMDAT, 4 Northville Road, Northville, Bristol. Tel: 0272 699352

Lowe Electronics, 79 Gloucester Road, Patchway, Bristol. Tel: 0272 771770

BERKSHIRE
Lowe Electronics, 6 Cherwell Close, Langley. Tel: 0753 545255

BUCKINGHAMSHIRE
Photo Acoustics, 58 High Street, Newport Pagnell. Tel: 0908 610625

CAMBRIDGESHIRE
Lowe Electronics, 162 High Street, Chesterton, Cambridge. Tel: 0223 311230

DERBYSHIRE
Lowe Electronics, Chesterfield Road, Matlock. Tel: 0629 580800

South Midlands Communications, 102 High Street, New Whittington, Chesterfield. Tel: 0246 453340

DEVON
Reg Ward & Co, 1 Western Parade, Axminster. Tel: 0297 34918

DORSET
Lowe Electronics, 27 Gillam Road, Northbourne, Bournemouth. Tel: 0202 577760

ESSEX
Coastal Communications, 19 Cambridge Road, Clacton. Tel: 0255 474292

Waters & Stanton, 22 Main Road, Hockley. Tel: 0702 206835

Waters & Stanton, 12 North Street, Hornchurch. Tel: 0708 444765

EIRE
Intronic Ltd, Windsor Hall, Glounthaune, Cork. Tel: 010353 2135 4422

HAMPSHIRE
Nevada, 189 London Road, North End, Portsmouth. Tel: 0705 662145

South Midlands Communications, S M House, School Close, Chandlers Ford Industrial Estate, Eastleigh. Tel: 0703 255111

HUMBERSIDE
Peter Rodmell, Field Head House, Leconfield. Tel: 0964 550921

KENT
ICOM UK, Sea Street, Herne Bay. Tel: 0227 741741

Lowe Electronics, "The Corner House", Chatham Road, Sandling. Tel: 0622 692773

LONDON
A R E, 6 Royal Parade, Hanger Lane W5A. Tel: 081 997 4476

Radio Hamstore, 11 Watford Way NW4. Tel: 081 202 0073

Martin Lynch, 286 Northfield Avenue W5. Tel: 081 566 1120

MERSEYSIDE
Amateur Radio Communications, 38 Bridge Street, Newton le Willows. Tel: 0925 229881

MIDDLESEX
Haydon Communications, 132 High Street, Edgware. Tel: 081 951 5782

Lowe Electronics, 223 Field End Road, Eastcote. Tel: 081 429 3256

NORFOLK
Eastern Communications, Cavendish House, Happisburgh. Tel: 0692 650077

NORTHUMBERLAND
Lowe Electronics, Newcastle Airport, Woolsington. Tel: 0661 860418

NORTHERN IRELAND
GM Electronics, 1 Evelyn Avenue, Belfast. Tel: 0232 671876

Tyrone Amateur Electronics, 44 High Street, Omagh, County Tyrone. Tel: 0662 242043

NOTTINGHAMSHIRE
R A S Nottingham, 3 Farndon Green, Wollaton Park. Tel: 0602 280267

SCOTLAND
Lowe Electronics, Cumbernauld Airport, Cumbernauld, Strathclyde. Tel: 0236 721004

Jaycee Electronics, 20 Woodside Way, Glenrothes, Fife. Tel: 0592 756962

WEST MIDLANDS
Dewsbury Electronics, 176 Lower High Street, Stourbridge. Tel: 0384 390063

Radio Hamstore, 963 Wolverhampton Road, Oldbury. Tel: 021 552 0073

South Midlands Communications, 504 Alum Rock Road, Birmingham. Tel: 021 327 1497

Ward Electronics, 422 Bromford Lane, Birmingham. Tel: 021 328 6070

WEST SUSSEX
Bredhurst Electronics, High Street, Hand Cross. Tel: 0444 400786

YORKSHIRE
Lowe Electronics, 34 New Briggate, Leeds. Tel: 0532 452657

South Midlands Communications, Nowell Lane Industrial Estate, Nowell Lane, Leeds. Tel: 0532 350606

Alan Hooker, 42 Nether Hall Road, Doncaster. Tel: 0302 325690

WALES
P M R Limited, Industrial Estate, Gwaelod-y-Garth, Cardiff, South Glamorgan. Tel: 0222 810999

KENWOOD

HOME AUDIO, CAR AUDIO, COMMUNICATIONS EQUIPMENT, TEST AND MEASURING INSTRUMENTS, TELECOMMUNICATIONS

NOVICE NEWS

MRS ESDE TYLER, G0AEC
43 Nest Est, Mytholmroyd, Hebden Bridge, W Yorks, HX7 5BH

TONY GALVIN, G0BDD instructed a Novice class consisting of five air cadets (including one young lady) and one adult Instructor. Ian, G6TSW, the temporary secretary of Denby Dale ARC rang to tell me their results – a 100% pass rate. This was Tony's first Novice class. Congratulations to all concerned.

Tony, as Chairman of the club, was the organiser of the Youth in Action weekend which has been held for the past two years and was reported in this column. This was an event designed to introduce youngsters to the hobby in a very enjoyable way.

Club members worked with Scouts, Guides and members of the ATC spending a weekend in August constructing simple projects, learning Morse, listening and logging at the station GB2YIA among other activities. Tony worked hard and enjoyed every minute.

Amateur radio was Tony's second hobby. His first concerned horses and each year he rode a section of the annual re-enactment of the Pony Express run across America.

Tragically he died very shortly after finishing this year's ride. This sad news reached me just as I was preparing this column. I felt that I should still report his Novice class's achievement as a tribute to him. He had already started the Morse tuition and the Novices are determined to achieve the 'A' licence to complete his work with and for them.

The events he had planned for this year will go ahead, GB2YIA will be on the air 20-22 August but Tony will be sadly missed. I am sure that you will join me in sending condolences to his widow and son.

KIDLINK '93

UP TO THE time of writing this column Peter, G0GTE, had not received many reports from Kidlink stations – possibly due to the disappointing conditions.

The youngsters involved had firm ideas on improvements they would like to see in their future world. Their personal ambitions were varied – from pop star to Prime Minister – but their hopes were remarkably consistent. No wars, cruelty or violence and no pollution. Care for humans, animals and the environment. Many children saw a need for recycling as much as possible to save resources and many wanted to see less litter. This could be achieved now of course if we all did our bit.

Because of Peter's involvement with Kidlink, GX0OCA, the station at the Day Centre for the disabled at Stevenage has been active in other projects with youngsters. The Pentland South Pole trek across Antarctica captured their imagination and the Day Centre followed the progress of Sir Ranulph Feinnes and Mike Stroud through Morag, GM4MSS (GB4MSS/VP8), the expedition radio officer.

On 10 May, Sir Ranulph gave a talk to the National Geographical Society where Johanna (daughter of Geoff, G0RPZ) congratulated him on behalf of all the youngsters world-wide who had followed the progress of the pair. She read a selection of poems and tributes written by Kidlink children before presenting him with the book.

NOVICES IN SUFFOLK

IN MAY I told of David's progress from being 'interested' to becoming a 'Novice' and have since received a letter from the Senior Instructor Morris, G6MCB, who ran the course at Lowestoft.

Nineteen students came forward – obviously too many to accommodate, so a class was formed with another to follow. Of the twenty students sitting the December exam, 15 were from Lowestoft College and five more from Lowestoft and Pye Radio Club. There were twenty passes. Eight previous successes brings the number of new entrants to the hobby in that area to 28 in a year. These included three young ladies, ten of school age, ten in their working years and five senior citizens proving once again that amateur radio appeals to a wide range of people.

Congratulations to all of them – and congratulations too to their Instructors. Morris was ably assisted by his wife Mo, G7BYI, and Paul, 2E1AMM, at the College and Alan, G4KDL, was Pye Radio Club's Instructor. It is gratifying to note that a Novice is involved in the training of others.

With new courses planned for September – both RAE and NRAE, there will be many more. The sixteen registered Instructors are going to be busy as the word spreads!

The final word must come from David who wrote again. His callsign is 2E1BPP and a birthday brought him a handheld 70cm transceiver which he uses with an external antenna. His contacts into Holland have given him great pleasure – as have his more local ones. Isn't that what the hobby is all about?

REVISION QUESTIONS

UP TO NOW Novice Instructors have had to invent their own practice questions for their students to prepare for the NRAE. But this is no longer necessary.

Modesty forbids me from mentioning the name on the cover, but a new book, *Revision Questions for the Novice RAE* should supply enough material to cover every aspect of the syllabus to ensure that students have the relevant knowledge to tackle the examination with confidence. The price is reasonable – £4.25 for members and £5.00 for non-members (see pages 93-94 for ordering details).

The photograph shows Peter G0OTE, Sir Ranulph and Johanna with her script.

Kathryn Worthington (2E1BAM) receiving her pass certificate and a cheque from the Prince's Trust from Paul, G0OVY.

NEWS FROM MANCHESTER

SCOUTS AND GUIDES in Manchester are becoming radio-minded with several Novices among them. Paul, G0OVY, successfully ushered his first three Novices through the exam last year. Scout Raymond (2E1AZM), Guide Kathryn (2E1BAM) and Group Supporter Ron who continued to study for the RAE. Kathryn's success helped her to gain the Baden-Powell Trefoil – the highest award for a Guide. A cheque from the Prince's Trust provided her with equipment to continue her studies.

A second course with Scouts Gareth, Martyn and Barry, Guide Hazel and Air Cadet Corporal Mubdi followed. Assistant Scout Leader Roy became G7OPE and despite helping Paul is still finding time to study for his 'A' licence.

Dave, G6DHI, was awaiting the results of the June exam when Paul wrote. Guide Tracey and her Captain, Wendy were joined by a non-Scouting father and son in the class, so JOTA and TDOA stations in that area should have lots of capable operators in the future!

PACKET HELP

DO YOU want to use packet but don't know much about it? Would you like to learn more? You will find everything you want to know in *Using Packet Radio* (Novice Information Pack 1), which was written for Novices by a Novice.

The guide could be yours if you send £2.50 which will cover postage, c/o Sprite, Thomas Street, Sheffield S1 4LE and mark the envelope 'Attn Steve Jackson'.

Contest Exchange

ANDY COOK, G4PIQ
Fishers Farm, Colchester Road,
Tendring, Clacton-on-Sea, Essex,
CO16 9AA

ONE OF THE most common questions I am asked is: "Is my station big enough to do contests with?" My answer is always a resounding "yes" *and* "no". Whatever station you have will enable you to compete in a contest at your own level, and contesting is all about setting your own targets and trying to better them. On the other hand, if you are trying to reach the top of the tables, whatever you have will never be big enough and you will always be looking at your tower to wonder if you have enough bottle to squeeze another couple of yagis onto it!

Of course, for most people, reality is not quite as flexible as that, and there are always unfortunate artificial constraints upon antenna systems imposed by, for example, neighbour or family considerations. In these cases, it is worth considering what sort of antenna you should be aiming at in order to achieve a competitive, although not necessarily top-line contest score. Like all the best questions, this one does not have a simple answer.

VHF AND UHF

AT 2M OR 70CM, a good compromise is to try and put up a single long yagi, horizontally polarized of course. By long yagi I mean one perhaps of the order of 6m boom length on 144MHz - e.g. a 13 - 19 element; or at 70cm say a 4 - 5m one - eg a 21 element. Even going down to one of half this length such as the ubiquitous 9 or 19 element Tonna would not be a major disaster.

It doesn't really matter what make or design you choose - in electrical terms there is not much difference between the various manufacturers - and for most terrestrial work you won't be able to detect 1dB differences easily. Also, it isn't primarily the number of elements which determines how much gain an antenna has, but boom length. A 4.5m long 16 element should not be better than a 7.5m long 14 element for example, no matter what fancy feed arrangements it may have! At a fixed location try to get the antenna up above roof height to reduce absorption and reflections to a minimum and to help reduce TVI problems; and feed it with good quality feeder such as Westflex or better.

Last month I said that a good contest station was basically the same as a good DX station, but the antenna system is one area where this statement flawed. The overall aim of a VHF/UHF contest antenna system is to put as big a signal as possible over as wide a geographical area as possible. This is different from what is required of a DX antenna which is to put a big signal into a relatively small area, and to suppress QRM coming from other directions. This basically means that, for contesting, there is a compromise to be made between forward gain and having a wide horizontal beamwidth, and indeed it may be quite advantageous to have an antenna pattern which bears a close resemblance to a squashed hedgehog.

If you are lucky enough to be able to put up more than one antenna, try and stack them vertically rather than horizontally so that you maximise your horizontal beamwidth. eg although the forward gains of 2 x 9 el and 1 x 17el yagi are fairly similar, the 2 x 9 would be a superior contest antenna since it will make you equally loud, but over a wider area than the 17 would. People have stacked up 8 x 2m yagis vertically, but eight aerials imply around 60ft between bottom and top antenna and you do need to be sure you have everything right before you tackle such an adventurous task - see the March '93 *RadCom* cover for what can happen when you get it wrong!

Some stations take this a stage further, and often have two or more antenna systems per band, each one pointing in a different direction. They then split their transmit power between the arrays, and receive on all at once. Most people do this by using separate masts for each system, but if you are limited to one support and are prepared to make some compromises it can still be done.

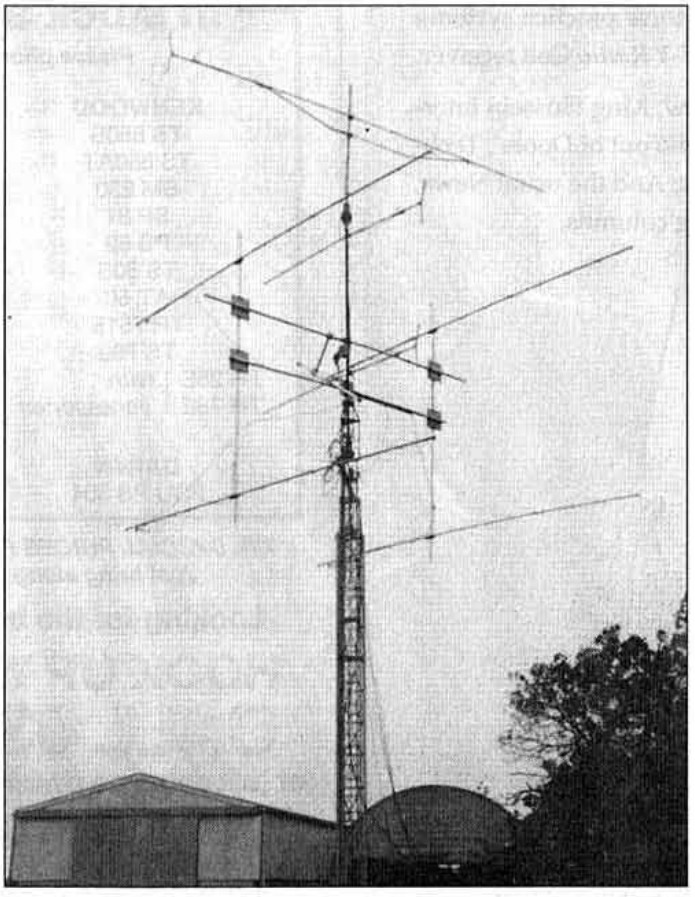
LF AND HF

FOR GENERAL LF contests on 40/80/160 such as AFS or the LF Cumulatives where the bulk of QSOs come from within the UK, something as simple as a dipole is perfectly adequate. On 80 and 40 in particular, it does not have to be very high, and the high angle radiation from a dipole at 35ft may well mean that a low antenna will outperform a high one for inter-UK working. On these bands multi-band antennas such as G5RVs and trap-dipoles will also perform adequately. Of course, the more DX-oriented contests will benefit from more sophisticated loops, verticals, beverages and beams if you want to be at the top of the tables, but you will still work a lot with simple dipoles.

On the higher bands, generally a beam will give you the edge you need to do well. This may only be a small tri-bander; but the people at the top of the tables are likely to be running either big tri-banders or monoband beams. On these bands, antenna height starts to become more important in order to get the angle of radiation down, and in general it is worth trying to get the beam as high as possible. However, if you can't manage a beam, don't despair. The HFCC is now printing a coding system in the results which indicates what equipment people are using - see Jan '93 *RadCom*, page 65 for details. This enables the 'Little Pistols' (those who aren't the big guns!) to see how they are doing against other similarly equipped stations and this shows just how well some of the people with verticals and wire antennas are doing. Also, at HF, there is real potential to do some quite interesting and effective things with just fixed wire arrays if you exercise a little imagination.

Of course, even on the higher bands, not all contests are suited to beams, and a prime example of this is HF NFD. It is quite normal in this event to see the stations in the Restricted Section (who are limited to a wire antenna at up to 35ft) doing comparably well against Open Section stations with monoband beams and a 60ft height limit. The reason for this must be in part the need to work the many European portable stations whose signals arrive at higher radiation angles than those for which the beams are optimized. This is just another example of where forward gain is not the be-all and end-all of contest antennas, and a little careful thought could pay dividends.

September is approaching, and during the first weekend in September there is HF SSB Field Day (rules Jul '93, p81) and the 2m Trophy Contest (rules Feb '93, p67). Both of these events give good levels of activity and a chance for the local club to go out and have a play. The 2m event also offers the option of doing the event from home of course. Why not have a think about how you could get on for these fun events.



My two-metre system for last September's trophy combined 4 x 15el, 2 x 11el and 1 x 19el, all on a single heavy duty 60ft tower.

IAN WHITE, G3SEK
52 Abingdon Road, Drayton, Abingdon, Oxon OX14 4HP – or @ GB7AVM

THIS MONTH'S ENTIRE COLUMN answers questions about installing VHF and UHF yagi antennas. The same questions keep turning up, so I have tried to arrange them into a sequence.

WHAT POLARIZATION?

WHAT POLARIZATION should I use? What will be the loss in signal from the other polarization?

THE CORRECT POLARIZATION for VHF and UHF antennas is simply the same as everyone else uses for that particular operating mode. In other words, horizontal for SSB, vertical for mobile, repeaters and packet, and probably circular polarization for satellite working.

Cross-polarization – horizontal polarization instead of vertical, or left-hand circular instead of right-hand – will lead to very large losses in received signal strength. The theoretical loss due to cross-polarization is infinite: you should receive no signal at all! The only reason you hear any signal is because scattering and reflections along the propagation path will introduce some cross-polarized component to which your antenna will respond, but the cross-polarization loss in practice can easily be 20dB or worse. Thus you should regard any antenna as being virtually useless on the opposite polarization. You certainly aren't giving a new mode a fair trial unless your antenna has the correct type of polarization.

STACKING DISTANCES

I WANT TO TRY SSB on 50MHz, 144MHz and 432MHz. Can I stack two or more yagis onto one rotator? If so, how is it done?

YES, YOU CERTAINLY CAN. Many people stack different antennas for all bands from 50MHz up through microwaves, all on the same mast. Here's how to do it.

Ideally you would mount the antenna for the lowest frequency at the top of the stack, the largest possible number of wavelengths above ground. But in practical terms that is usually impossible because it places the weight and wind-loading too far away from the rotator. This is why most people opt for the 'Christmas tree' arrangement, with the largest antenna just above the rotator and the smallest at the top of the mast.

To work out suitable stacking distances, you need to understand the concept of **capture area**. Consider a satellite dish antenna:

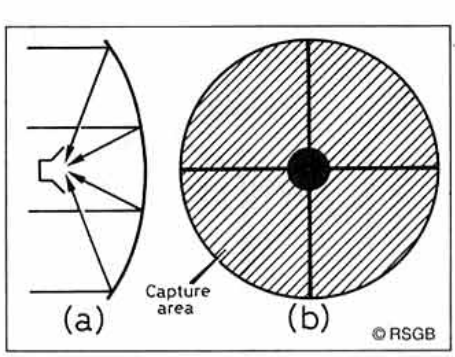


Fig 1: (a) A dish antenna collects all the incoming signal power that falls within its frontal area, and focuses it into the feedhorn. (b) Its capture area (shaded) is almost equal to the frontal area, though minor blockages (solid black) are acceptable.

it's easy to visualize how the dish intercepts an incoming signal and focuses all the collected RF energy into the feedhorn (**Fig 1a**). The bigger the dish, the greater the signal power it can collect, and the 'capture area' of the dish is almost identical to its frontal area. Obviously you would try to avoid obstructing any part of the frontal area, though minor blockages such as the feedhorn and its support struts may be acceptable (**Fig 1b**).

It's very similar with a yagi. Although its physical frontal area is very small, you can think of a yagi as 'sucking in' received signal from a rather larger capture area around it (**Fig 2a**). Although this area has no exact physical boundaries, the performance of a yagi is degraded by large metallic objects anywhere within its capture area, especially if those objects lie along the plane of polarization.

On the other hand, metallic objects running through the centre line of the yagi and at right-angles to the plane of polarization will be virtually ignored. Another aspect of capture areas is that two identical yagis in a stacked array would need to be separated so that their capture areas only just touch (**Figs 2b and 2c**); any closer spacing would produce less stacking gain and might lead to unwanted interactions.

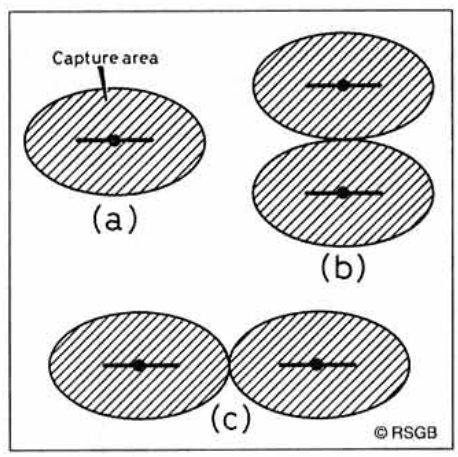


Fig 2: (a) The capture area of a yagi is roughly elliptical, and much greater than its physical frontal area. (b) Optimum H-plane stacking of two identical yagis, so that the capture areas are just touching. (c) Optimum E-plane stacking of two identical yagis, further apart than for H-plane stacking.

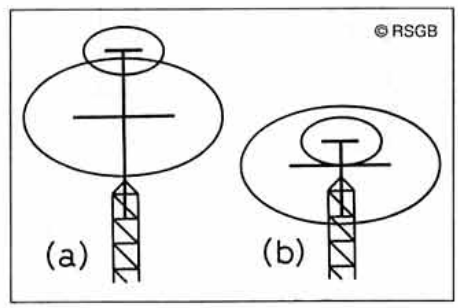


Fig 3: (a) Idealized stacking of yagis on a tower, with no obstruction of capture areas. (b) The minimum-height compromise involves some obstruction by the tower, and by antennas for shorter wavelengths.

Most manufacturers' specifications include recommended stacking distances for two identical yagis, and you can use these as a guide to the size of the capture area. One-half of the stacking distance for two identical antennas can be regarded as the minimum distance to avoid interactions with other large metal objects. Note that recommended distance for stacking two antennas above each other (sometimes called 'H-plane' stacking, assuming horizontal polarization) is less than that recommended for stacking two antennas side by side ('E-plane' stacking, Fig 2c). Generally speaking, side-by-side mounting of horizontally-polarized yagis is not recommended unless it involves mounting four yagis in a square array.

The ideal way to stack horizontally-polarized yagis for different bands on a vertical mast would be to place each antenna in isolation, with no unwanted metal objects inside its capture area (**Fig 3a**). Unfortunately such a spindly structure would probably snap the mast in the slightest breeze. In order to keep the array in the air, we have to make some practical compromises – and the trick is to know which compromises will still allow each of the antennas to perform well.

We begin by placing the largest antenna (for 50MHz in this example) just above the rotator or head unit for mechanical strength (**Fig 3b**). The rotator and mast-head fittings will be inside its capture area, but the interaction with the horizontally-polarized antenna will be small because the rotator and head unit are predominantly vertical in aspect. Also the vertical support mast will have little effect on antenna performance, provided that it is slim and mounted close to the boom of the yagi.

Ideally the next yagi up the stack (for 144MHz) should be mounted entirely outside the capture area of the 50MHz yagi, ie separated by at least half the manufacturer's recommended stacking distance for two of the 50MHz yagis as shown in Fig 3a. Such wide stacking may be possible if the mast is strong enough, but a quite acceptable compromise is at least half the recommended stacking distance for two of the 144MHz antennas. This will still place the 50MHz yagi outside the capture area of the 144MHz antenna (Fig 3b), avoiding any significant degradation on 144MHz.

Although the 144MHz antenna is still within the capture area of the 50MHz yagi, hopefully the 50MHz performance won't be too much degraded because the higher-frequency antenna represents a relatively small blockage.

And so on up the mast: determine the recommended stacking distance for two of your 432MHz yagis, and mount your single antenna at least half that distance above the 144MHz antenna. Finally, note that the compromise arrangement shown in Fig 3b represents the **absolute minimum** height of stack for satisfactory performance on all bands.

ROTATING MASTS

WHAT SIZE OF MAST should I use above the rotator?

IF YOU WANT IT to stay up, use at least 1.5in diameter aluminium alloy tubing with at least 16 guage wall for the rotating mast – sometimes called a 'stub-mast'. Alloy scaffold-pole (49mm diameter) is very robust, but too heavy for most rotators without additional support from a cage-type head unit.

The effect of the stub-mast on the performance of a yagi antenna becomes harder to ignore as the wavelength decreases. I wouldn't recommend running a mast of larger than 1.5in diameter up through a 432MHz yagi, and would also take care to use a clamp which has a very small sideways stand-off from the boom. Always tape the coax feed line along the centre line of the boom, on the opposite side from the elements, and then in a straight line down the 'rear' of the mast, rather than down the side where it would increase the effective thickness of the mast.

Light-wall tubing may not be strong enough to support a large 'Christmas tree' of antennas in a high wind. The point of failure is almost always just above the rotator clamps, or at the head-unit bearing if used. The tubing can be greatly strengthened by a snugly-fitting hardwood dowel about 0.5m long, inserted where the bending stress is greatest (**Fig 4**). If you don't know a friendly wood-turner, it's almost equally good to start from a square-section piece of suitable size and carefully plane off the corners to make a roughly octagonal cross-section. Don't worry about a precise fit; even if the dowel is a sliding fit when installed, it will swell to a permanent tight fit after a few days outdoors. A round dowel requires a cap on the top of the tube to prevent water collecting inside, whereas the hand-planed type is self draining.

HOW HIGH?

WHAT IS THE MINIMUM effective height for mounting VHF and UHF yagis?

IT DEPENDS WHERE YOU ARE. As a minimum, you should aim to get the antennas clear of any local obstructions: roofs, TV antennas, trees etc. Higher is obviously better, if possible, though I worked a lot of 144MHz DX using a 16-element yagi mounted only about 6ft above the roof level. Being clear of my own roof, the antenna was also clear of anything else on the same housing estate. On the other hand, a 70MHz antenna mounted just above the roof-line was rather ineffective in comparison; and a 50MHz yagi at the same height would have been worse still, being only 1.5 wavelengths above ground.

ROTATORS

CAN YOU RECOMMEND a rotator that would take all this antenna system?

ALMOST ANY 'AMATEUR RADIO' rotator rated for 'small VHF antennas' will handle medium sized 144MHz and 432MHz yagis. The very small 'TV' rotators may work when new but may not be up to the job in the long term. Even for VHF/UHF antennas, it's a good idea to invest in a rotator that is bigger than you feel you need right now, eg a mid-range unit rated for 'small HF beams'.

For small VHF/UHF arrays, most rotators will be more than adequately rated in terms of ability to withstand rotational wind-loading and support the vertical weight of the array. But if your array is very tall you cannot expect the rotator alone to support the 'overturning' wind load which is trying to snap the rotator in two like a pencil. To remove the overturning load from the rotator itself, consider using either a cage-type head unit or a mast-head bearing with the rotator mounted on an offset platform below.

VERTICAL AND CROSSED YAGIS

I HAVE A MULTIMODE radio with both SSB and FM. Since SSB is horizontally-polarized and FM is vertical, would a crossed yagi be the best choice?

NOT NECESSARILY. The horizontal yagi will work OK, but it is very difficult to mount a vertically-polarized yagi on a vertical metal mast. If the mast runs up through the middle of the yagi, in the same plane as its elements, it will spoil the antenna's performance. Rather surprisingly, computer modelling shows that the beam pattern is not totally destroyed, but the forward gain can be reduced to that of a yagi half the size. To put it another way, half the weight and wind-loading of the antenna can be wasted by incorrect mounting! If you use a fibreglass mast but still run the coax feed line down it in the conventional way, the effect will be much the same.

For optimum performance, a vertically-polarized yagi must be mounted so that neither a metal mast nor the coax feed line interferes with the elements. For short yagis the whole antenna can be mounted from the rear, so that the mast has only a minor effect as an additional reflector. The feed line must run backwards along the boom to the clamp, and then down the mast. Longer yagis have to be mounted at the centre of gravity, on a fibreglass pole, and the feed line must somehow taken out backwards away from the rear of the yagi. **Fig 5** shows these two options, both of which have mechanical disadvantages. Another alternative, also shown in Fig 5, is to mount two vertically-polarized yagis on a metal cross-boom. This will also work with two yagis for different bands, although the cross-boom would have to be mounted off-centre to balance the load. Even then, the cross-boom would need to be long enough to keep the vertical main mast outside the capture area of either antenna.

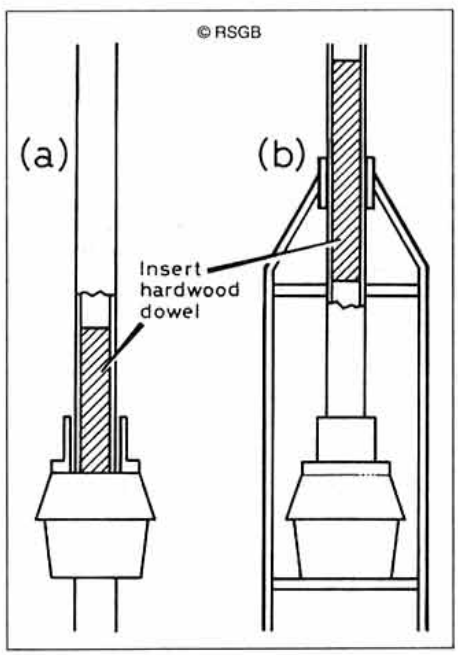


Fig 4: To strengthen a rotating mast, insert 0.5m of hardwood dowel at the point of greatest sideways stress.

WHAT ABOUT crossed yagis?

AS YOU SEE, almost all crossed yagis – as normally installed – don't work properly! The horizontal array works OK, but the vertical one doesn't (**Fig 5a**). Crossed yagis are often used for satellite working with circular polarization, but this requires two identical antennas. With a metal mounting pole or coax feed line in the plane of polarization of one antenna but not of the other, the two antennas are no longer identical and there is no possibility of generating true circular polarization. Rotating the entire crossed yagi by 45° (**Fig 5b**) is sometimes proposed as a compromise solution, since it is thought to affect each yagi to the same extent; but this is not true if the two yagis are staggered along the boom by a quarter-wavelength, because the location of the pole relative to the elements is different for each yagi. There is still no substitute for fibreglass support poles and running the feed line way from the rear.

UNTIL NEXT MONTH . . .

IF YOU HAVE NEW QUESTIONS, or any comments to add to this month's column, I'd be very pleased to hear from you by mail or by packet (see head of column). But please remember that I can only answer questions through this column, so they need to be on topics of general interest.

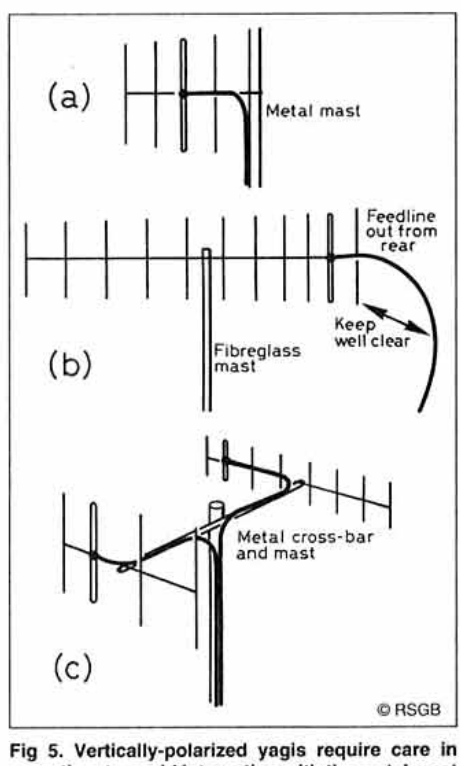
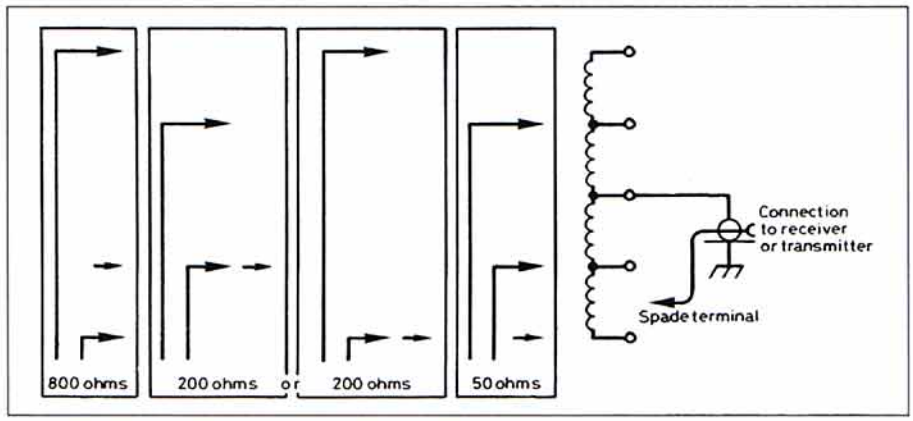


Fig 5. Vertically-polarized yagis require care in mounting, to avoid interaction with the metal mast and feed line, and may also cause mechanical problems due to off-centre loading.

Novice Note Book

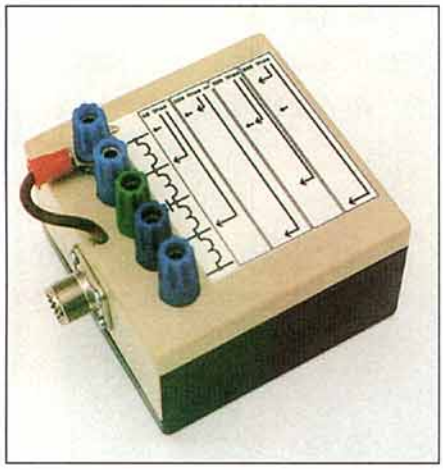
IAN KEYSER, G3ROO
Rosemount, Church Whitfield, Dover, Kent CT16 3HZ



The transformer can match a range of antenna impedances to 50Ω or 75Ω.

DAVID STOCKTON, GM4ZNX, has come up with a nice little unit which I immediately realised would be a very useful unit for either the HF Novice or the Class A licence holder. Many of us are now starting to use twin feeder as an alternative to coaxial cable, especially on the HF bands. However, there are good arguments for using 50Ω coax on VHF due to its very low loss.

Experimenting with antennas can be fascinating, especially in the modern garden where space is sometimes restricted. Often, we have a dipole cut for one band but wish to use it on several others. The problem here is that the impedance presented by the antenna to the AMU (Antenna Matching Unit) is either too high or too low to enable matching to the transmitter. This is especially so in the case of commercial AMUs (including automatic types). David's little transformer allows you to select a ratio to help the AMU effect a match between your antenna and receiver or transmitter.



TERMINAL TAPPINGS

THE TRANSFORMER consists of a quadfiler wound transformer (four wires twisted together) mounted in a plastic enclosure. Tappings are brought out to terminal posts for ease of connection. The coaxial unbalanced side has its earth connection permanently made to the electrical centre of the transformer. The inner connection is brought out to a spade connector so that it can be clamped under a terminal post. The feeder is plugged into the terminal posts to give the transformation required and ratios of 1:1, 4:1 and 16:1 are available in the balun (balanced to unbalanced) mode, but it can also be used in balanced-to-balanced mode by ignoring the coax input and using the transformer windings to match (say) 50Ω to 200Ω, or 75Ω to 300Ω.

As you can see from the photo I've used a thin PTFE covered wire, but for ease of construction I would suggest four wires of different colours about half a metre long with thin PVC covering. Neatly twist these wires together tightly and then wind the 'rope' through the core eight times. Now for the tricky bit and the reason for using different coloured wires! We have to connect the end of winding one to the beginning of winding two, the end of winding two to the beginning of winding three and the end of three to the beginning of four. This will give us a continuous winding with a beginning, an end and three 'taps'. The taps are connected to the five terminal posts ensuring they are kept in sequence.

COMPONENTS LIST

Toroid:
Type T200-2 dust-iron — Cirkit No 55-02002
Four lengths of wire
Five terminal posts, one a different colour. Cirkit No 10-00421 (black), 10-00422 (green)
Socket type SO239 — Cirkit No 10-01013
Suitable plastic box

Cirkit Distribution are at Park Lane, Broxbourne, Herts EN10 7NQ Tel: 0992 444111. Their catalogue is obtainable from larger newsagents or direct from the company.

RADCOM CONSTRUCTION FEATURE

The BIK Simple Electronic Keyer

by E Chicken MBE, BSc, MSc, CEng, FIEE, G3BIK

WHILST THE STRAIGHT KEY is beloved of many an experienced CW operator, there remains amongst other less accomplished Morse users an air of mystique about the electronic keyer, which tends to be regarded as the exclusive province of high-speed keying experts. This simple to construct electronic keyer of basic design concept should dispel such misapprehensions.

The daunting aspects of other electro-keyers include the technological complexity of some designs published in amateur radio journals, and the relatively high cost of commercially produced keyers. The associated paddle-keys are similarly seen as costly and mechanically complex.

A basic electro-keyer produces dots when the key is pressed in one direction and dashes when pressed in the opposite direction, and nothing more.

One refinement would be the iambic-mode, which in itself hikes up the complexity (and hence cost) of such a keyer. An iambic-mode keyer can additionally produce a chain of alternating dots and dashes, or dashes and dots, when both key contacts are closed. Dots and dashes if the dot contact marginally precedes the dash contact closure, and vice-versa. Iambic-mode keying really is the province of the Morse supremo, by slightly reducing the number of key operations which aids high speed sending. It offers little advantage to the average operator, and needs the provision of the more expensive dual-paddle Morse key.

A further design refinement could be to allow a dot or dash to occur at the very instant of key closure, such as happens with a traditional non-electronic Morse key. Without that feature, there can be a very brief time-delay between key closure and keying, should the closure occur whilst a dot, dash, or space is already in progress. That effect is called operator-lead, and its non-inclusion would only be irksome to an operator already used to an up-market electronic keyer. It causes no real problem to a newcomer to electronic keyers of the basic type, such as the keyer described here.

The cost of technological refinements goes beyond finance. They can and often do make the finished electronic keying circuit susceptible to radio frequency interference from the very transmitter it is keying, causing all kinds of mis-keying mayhem!

This keyer goes back to basic circuitry, and

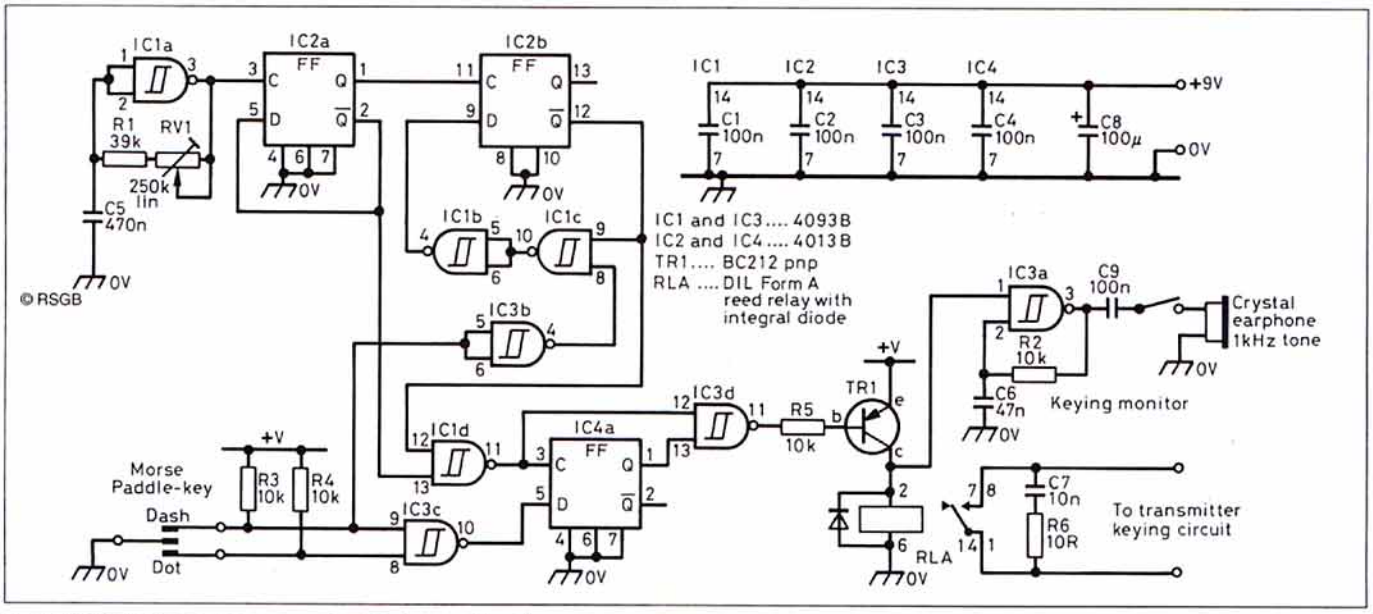


Fig 1: The G3BIK Simple Keyer uses four ICs for precision Morse.

offers a very functional performance with perfectly timed Morse characters over a speed range to suit both newcomer and veteran, ie approximately 5 – 35 words per minute.

Its modest current consumption allows the use of a 9 volt PP3 battery, and the in-built tone-sounder makes it usable either as a transmitter keyer with audible keying-monitor, or as a stand-alone Morse practise oscillator. It is, furthermore, very economical in materials cost and should be well within the constructional ability and pocket-money budget of most potential users.

A glance through amateur radio magazine advertisements will show that the cost of a Morse paddle-key suitable for use with electronic keyers is in the same price bracket as a keyer itself. For completeness, therefore, and with economy in mind, constructional details are included for a simple but effective single-paddle key suitable for use with this electro-keyer.

CIRCUIT DESCRIPTION

TABLE 1 EXPLAINS THE TERMS I will use in this description. But first a word on the timing requirements for the dots, spaces and dashes of precision Morse code symbols.

The time duration of a dot is used as the basic unit of time for the creation of spaces and dashes, so all dots must be of identical time length. Each space between successive dots or dashes, or between dots and dashes in a Morse symbol, must be precisely equal in time duration to that of one dot. A dash is exactly three dots long in time span, ie three dots conjoined without spaces.

The internationally agreed time interval between letters is equivalent to three dot time-lengths, and between words equivalent to 7 dot time-lengths. Those inter-letter and inter-word spacings are not produced by this electronic keyer, so are left to the operator's personal judgement and keying style.

Digital logic circuitry lends itself very well to the production of precision-timed dots, spaces and dashes, such as are generated automatically by this design. The keyer uses CMOS technology in the form of Schmitt-trigger NAND gates and D-type flip-flops, with a semiconductor total of only four readily available integrated circuits and one PNP transistor.

Standard 4000B series CMOS integrated circuits were chosen in preference to the 74 TTL or 74HC CMOS series, because they can function with a supply of 3 – 15 volts as compared to the nominal 5 volts required by the others. Schmitt NAND gates were chosen because a single gate can act as an oscillator with only two additional components, and its frequency is relatively independent of supply voltage.

GLOSSARY OF TERMS

Key-up	means neither the dot nor the dash paddle of the key is pressed;
key-dot	means the dot paddle is pressed;
key-dash	means the dash paddle is pressed;
High	means logic '1' or positive rail;
Low	means logic '0' or zero volt rail.

Table 1: These terms are used throughout the text.

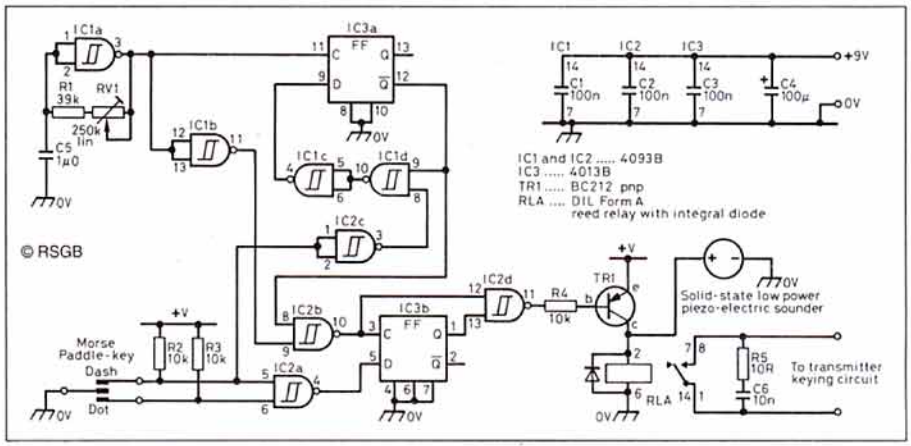
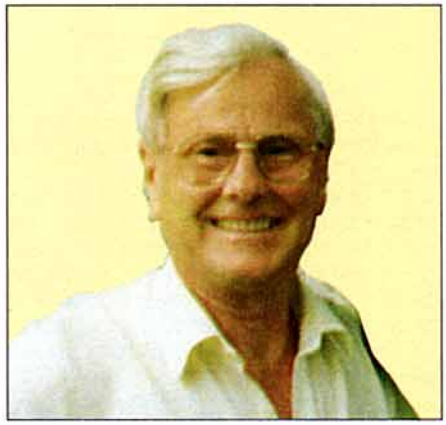


Fig 2: The three-IC version is simpler but not precisely timed.

NAND gate IC1a (**Fig 1**) functions as a free-running oscillator at a frequency twice that of the required dots per second. The oscillator frequency is then halved by flip-flop IC2a, which is configured as a divide-by-two stage by electrically strapping its Qbar and D ports.

This divide-by-two process gives a clean rectangular wave whose duty factor is precisely 1:1, ie its High and Low time periods are identical, hence the flip-flop's output can be considered as a free running string of dots and spaces. The output from IC2a is at the required dots per second repetition rate.



The author, 'Chick' Chicken, G3BIK.

Actually, the Schmitt NAND-gate oscillator itself produces a nearly 1:1 rectangular wave, so it could have been designed as in **Fig 2** to oscillate at the dot frequency without division. The integrated circuit count would be reduced from four to three, and whilst the Morse produced sounds quite excellent, in truth its timing is very slightly less than perfect, albeit hardly noticeable. For absolute precision however, the NAND oscillator plus flip-flop divider described here was the preferred option.

Morse keying speed in words per minute (WPM) for plain language English can be estimated from:

WPM = 2.4 x dots per second.

The oscillator frequency span, bearing in mind that will be at twice the required dots per second rate, needs to be about 4 – 29Hz to yield a Morse keying speed-range of 5-35WPM.

From actual measurements, the Schmitt NAND gate oscillator frequency is given approximately by (C in µF and R in kilohms):

$$f\,(Hz) = 500/CR$$
$$= 500/C5(R1 + RV1)$$

Using the component values C5 = 0.47µF, R1 = 39k, RV1 = 250k gives a Morse speed range of about 4-33WPM.

A word of caution on using the above formula which applies specifically to the standard CMOS 4093B NAND gate integrated circuit. From experience, the 4093BP version gave a frequency some five time higher than the 4093B, ie it modified the formula to approximately:

$$f\,(Hz) = 2500/CR$$

The free-running Low-High-Low train at Qbar of IC2a is fed to one input of NAND gate IC1d, whose other input is held High by the Qbar output of flip-flop IC2b. The inverted output of IC1d therefore alternates High-Low in sympathy with its Low-High-Low input derived from Qbar of flip-flop IC2a. This repetitive High-Low output persists during key-up, or during key-dot. Its output format is modified by key-dash, but more of that later.

The High-Low-High train is used to clock flip-flop IC4a, whose Q output remains Low whilst its D input is held Low. This occurs during key-up from the output of NAND gate IC3c. Both inputs of the keying NAND gate IC3c are held High during key-up via pull-up resistors R3 and R4, hence its inverted output is Low.

The High-Low-High train output from NAND gate IC1d is also fed to one input of NAND gate IC3d whose other input is held Low during key-up. Nand gate IC3d output therefore remains High until either key-dot or key-dash, so its High output during key-up biases off the PNP transistor TR1.

Transistor TR1, now being non-conducting with its collector Low, prevents reed relay RLA from being actuated hence the transmitter remains un-keyed. The Low at the collector of TR1 is also connected to the control input of IC3a tone-generator, thereby muting the keying monitor formed by NAND gate IC3a in association with the crystal earphone.

Flip-flop IC2b remains dormant during key-up, despite the continual presence of the free-running High-Low signal at its clock input, because its D input is at Low. While its D is Low, Q must also be Low so its Qbar is High.

The Low at IC2b D input derives as follows.

Inverter IC3b maintains a Low at its output for as long as the dash key-contact remains open, because its inputs are held High via pull-up resistor R3.

The IC3b output Low connects to one input of IC1c whose other input is being held High by IC2b Qbar. IC1c output is therefore High, which is inverted by IC1b to hold Low the D input of flip-flop IC2b. This pertains during key-up; or during key-dot; but not during key-dash.

From earlier discussion, a free-running High-Low-High train via IC1d is present at the clock input of flip-flop IC4a, but Q of IC4a remains Low because of the Low at its D input during key-up. This prevents gate IC3d output from going Low so preventing any keying activity by TR1.

Dots

Key-dot causes NAND gate IC3c output to go High and with it the D input of IC4a, whose Q is then taken High by the first Low-to-High clock transition following key-dot, where it remains until key-up.

IC3d now has one input presented with the High-Low-High train from IC4a clock input, which because of the High at the other input of IC3d is inverted to become a Low-High-Low train at IC3d output.

The first Low after key-dot to appear at the output of IC3d switches on the PNP transistor TR1, which activates the reed relay RLA in its collector circuit and simultaneously de-mutes the keying monitor, so allowing the dot to be both transmitted and sounded.

This keying activity continues while key-dot is held, hence a single dot or any number of consecutive dots may be keyed, complete with the appropriate spaces. If the dot key-contact is opened and re-closed whilst a dot is in progress, the flip-flop action of IC4a will ensure automatic completion of the ongoing dot before allowing commencement of a subsequent dot.

Dashes

The space between dots, dashes, or dots and dashes, must always be of time duration precisely equal to that of one dot. A dash must be of precisely three dots' duration, conjoined without spaces.

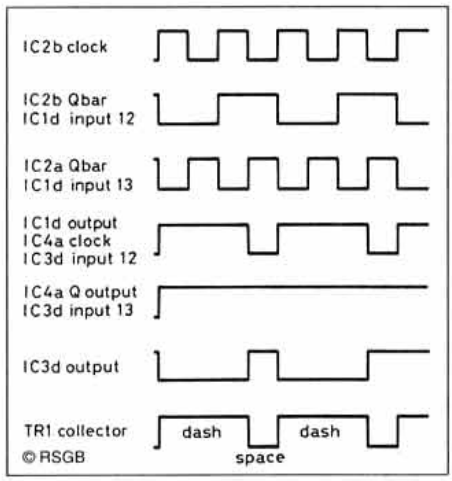


Fig 3: The dash timing sequence.

To produce a dash, the time sequence dot-space-dot is converted into a dot-dot-dot time sequence equivalent to one dash , by judicious use of logic gates whose timing sequence is shown in **Fig 3**.

At the instant of key-dash, the resultant High output from IC3c now applied to the D input of IC4a, takes High the Q of flip-flop IC4a as it did for dots, but additionally, a Low is simultaneously presented to the input of inverter IC3b. Thus one input of IC1c goes High together with its other input which is already High from Qbar of flip-flop IC2b. The output of IC1c goes Low, which is inverted by IC1b, so taking High the D input of flip-flop IC2b.

Flip-flop IC2b then functions as a frequency divide by two stage, because its Qbar and D ports are effectively connected together by the two inverters IC1b and IC1c in series.

IC2b is now clocked by every Low-High transition of the free-running High-Low-High signal at its clock input coming from Q of IC2a. This produces a repetitive Low-High-Low signal at Qbar IC2b output but at a repetition-rate of half that at its clock input.

This half-speed signal from Qbar IC2b also connects to one input of NAND gate IC1d which already has the free-running full-speed Low-High-Low signal from Qbar IC2a connected to its other input. Fig 3 illustrates how the time-phasing of these two input signals to NAND gate IC1d is such that its output goes High for a time period equal to that of three conjoined dots, then goes Low for a time period equal to one space. This signal at IC1d output is a train of Highs and Lows of timing appropriate to successive dashes and spaces.

Flip-flop IC4a is now triggered by every Low-High transition of its clock input signal, which occurs at a time interval equal to three conjoined dots or one dash. The alternating Highs from the clock input of IC4a together with the steady High from its Q output are applied to the inputs of NAND gate IC3d, whose output goes Low to switch on TR1 for the period of one dash or a succession of dashes and spaces as determined by the duration of key-dash. Low at the base of TR1 simultaneously actuates both the transmit relay and the keying monitor.

The clocking action of flip-flop IC4a ensures correct timing of spaces between dots or dashes, by delaying the commencement of a dot or a dash following key press, until the first Low-High transition in the free-running clocking signal derived from IC2a via IC1d.

Hence the term operator-lead referred to earlier, which stems from this automatic completion of correctly spaced dots or dashes even if key-press were to occur whilst a previous dot or dash is in progress. Of course, such lead-time should it occur, would only be in the order of a few milliseconds and in practice is of minor concern.

Transmitting Keying

The action of reed-relay RLA in response to the Morse paddle key, closes a pair of voltage-free contacts within the relay to activate the transmitter. The contacts of the dual-in-line Form A reed relay are typically rated at 0.5A 100V dc. Components R6 and C7 in series across the relay-contacts serve as a transmission key-click suppressor, if required.

Reed relay RLA has an integral diode which protects transistor TR1 against transient voltages caused by switching of the inductive relay-coil. The diode cathode is at pin 2 of the DIL relay which connects to the collector of TR1. It is vital that this polarity be observed.

The audio-frequency oscillator formed by IC3a produces an audible tone of about 1kHz

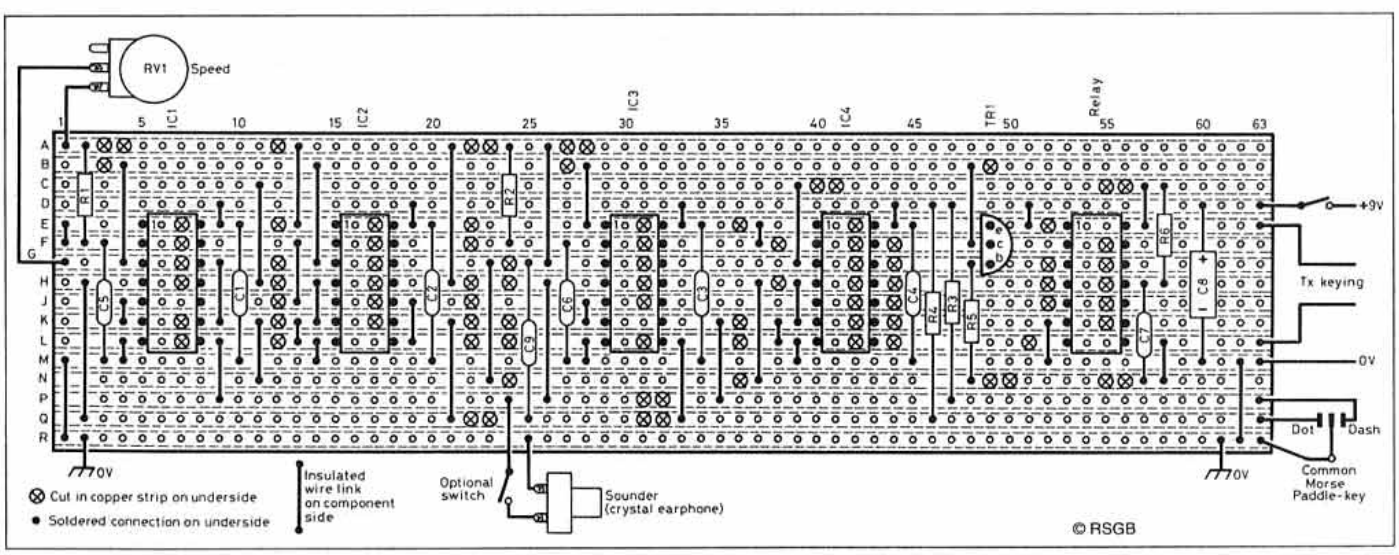


Fig 4: Construction is easy using stripboard. The component side is shown.

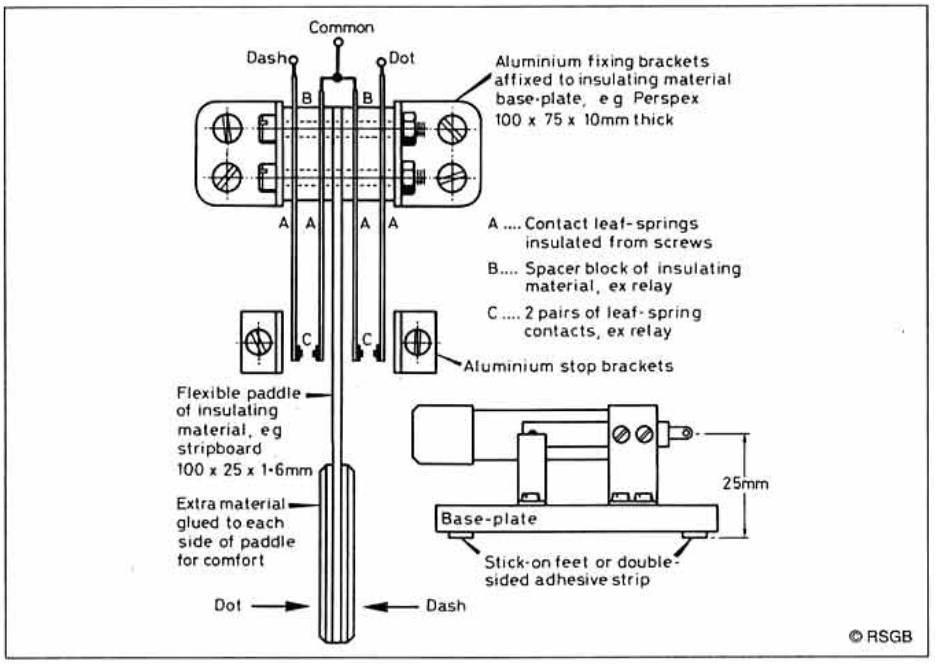


Fig 5: A simple paddle key can be made from an old relay.

in the miniature earphone, which can be either crystal or electromagnetic. Crystal is preferred because it slightly reduces the DC current drain of the keyer.

KEYER CONSTRUCTION

LOGIC CIRCUITRY LENDS ITSELF very conveniently to the use of single-sided 0.1 inch hole-pitch copper stripboard, a layout/wiring example of which is shown in **Fig 4**.

The simplicity of this keyer circuit does not really justify the design and production of a printed circuit board for a single unit. The stripboard assembly can be built from start to finish in about two hours.

Note that the layout refers to the precision keyer of Fig 1 which uses four integrated circuits. No layout is given for the three IC version (Fig 2).

The wiring scheme could be modified to use a little less stripboard, but the total cost of components and stripboard together with the awareness that not every constructor is fully conversant with wiring techniques, makes this a realistic approach to assembly. My prototype, which has seen stalwart service, was wired on the copper-track underside, with wire links soldered directly from pin to pin without problem.

A useful hint is to use single stranded wire links of assorted colours for ease of final checking. A half-metre of multi-cored telephone cable is an ideal source of suitable connecting wire.

Thin multi-stranded cable is preferred for key and power supply connections, using red for supply positive and black for negative. The use of a fine-pointed soldering iron is essential.

Although not absolutely vital, it is advisable for the experimenter to use DIL sockets for the integrated circuits and relay, the additional cost being minimal.

A linear-law potentiometer is used for the Morse-speed control RV1 because it allows the WPM speed scale to be calibrated for 5 – 35WPM by equispaced markings around its 270 degree rotation, eg 5, 10, 15, 20, 25, 30 and 35WPM at 45° intervals.

Power supply requirements are very modest. The keyer will function perfectly well on 5 – 12 volts DC, although strictly speaking the reed relay coil is rated for 10V DC maximum. Current consumption is only 15mA average on key press, so a standard 9 volt PP3 battery is suitable. An on-off switch is advisable if using a battery, even though the key-up current is only about 0.5mA.

Extreme care must be taken to ensure that the copper tracks are cut where appropriate, and also to check that the cuts are absolute. Whilst a stripboard track-cutting tool is a worthwhile investment, tracks can be cut with a hand-held drilling bit or a modelling knife but using extra care.

It is always wise to examine the finished stripboard circuit for solder splashes or inadvertent solder bridges between tracks, before applying voltage. A magnifying glass and a darning-needle are very useful for this purpose.

Before inserting the integrated circuits, an ohm-meter connected between the voltage supply leads would check for freedom from short circuit. It is then important to check that the ICs and relay are inserted the right way round.

The miniature earphone used for audible monitoring is of the type commonly provided with small transistorised broadcast radios. The crystal type is preferred for battery economy, but a low impedance electromagnetic unit would also serve. Alternatively, a low cost ceramic or piezo-electric transducer may be used.

If using an earphone, the jack-plug should be removed and the twin-cable cut short for connection to the circuit board. A piece of plasticine would hold the sounder in place on the board.

A plastic housing is adequate for use in association with low-power transmitters or as a Morse practice oscillator, but a metal case is advised for RF screening of the keyer-circuit if it is to be used with transmitters of higher power, say above 10 Watts output.

THE PADDLE KEY

MECHANICAL DETAILS ARE GIVEN in **Fig 5** of a key suitable for use with this electronic keyer, but without scaled dimensions which are left to the constructor according to availability of materials.

It uses two sets of spring-leaf contacts salvaged from a relay such as used in older style telephone systems, complete with their insulating spacers. These are bolted between two elementary metal brackets, and are centrally separated by a short length of plastic of about 2 – 3mm thickness to act as the key-paddle. An additional shorter piece of plastic is glued to each side of the paddle extremity for finger-thumb comfort.

The contact assembly is bolted to a base-plate of insulating material, then a further pair of small brackets mounted one to each side of the contact-pairs limits mechanical movement of the paddle.

Strips or pads of double-sided adhesive tape on the underside of the base could serve to hold the finished single-paddle key secure during use. The key may alternatively be fastened to the upper face of the keyer housing to make it self-contained, whilst bearing in mind the requirement for electrical insulation between the two pairs of contacts and their fixing and stop brackets.

COMPONENTS LIST

Resistors

All 0.25W carbon or metal film

R6	10R
R2, 3, 4, 5	Resistor 10k
R1	Resistor 39k
VR1	Potentiometer, linear law 250k, midget, carbon

Capacitors

C1, 2, 3, 4, 9	100n ceramic, miniature dipped
C5	470n ceramic, miniature dipped
C6	47n ceramic, miniature dipped
C7	10n ceramic, miniature dipped
C8	100µ electrolytic, sub-miniature, 16V

Semiconductors

IC1, 3	4093B (quad two-input Schmitt NAND gate)
IC2, 4	4013B (dual D-type flip-flop)
TR1	BC212L (PNP)

Miscellaneous

Miniature crystal earphone or low-power ceramic/crystal transducer

Relay dual-in-line Form A (single pole, normally open)

Copper stripboard 0.1 inch pitch 63 holes x 16 rows (160 x 40mm)

14-pin DIL sockets (five-off)

Battery press stud twin miniature PP3

Toggle switch, on-off single pole miniature panel-mounting

Enclosure, ABS plastic, 190 x 110 x 60mm, low-cost (or similar in metal – see text).

RADCOM TECHNICAL FEATURE

Antenna Modelling on a PC

An overview by Ian White, G3SEK, and what expert DXer John Bazley, G3HCT, thinks of the ELNEC program.

YOUR ANTENNA IS the most important part of your station – but how much do you really know about its gain and radiation pattern? Accurate antenna performance measurements require large areas of clear, reflection-free space extending over several wavelengths, and even at VHF this is beyond the reach of most amateurs. On HF the situation is even worse because the ionosphere brings in signals of varying strength, not only from different directions but also from a range of vertical angles. Even with a rotary antenna, it can be very difficult to gain a clear picture of the antenna's radiation pattern.

On-air tests with another station are not as easy as they might seem, either. S-meters are useless for comparative signal strength measurements unless they have been properly calibrated against a signal generator and stepped attenuator, and it can be quite difficult to measure changes of less than 2dB. Antenna measurements can also be very tedious, especially if you want to make modifications at the same time. By the time you've taken the antenna down and altered something, propagation conditions may have changed and all your measurements become meaningless.

Now there's another way to design and test antennas from the comfort of your shack. With a personal computer and a little care and skill, you can calculate antenna performance at least as accurately as you could measure it. You can develop and optimize a new design very quickly, with considerable confidence that the real-life antenna will work.

Computer 'modelling' of antennas used to need a large mainframe computer, but the advance of microcomputers has brought this technique within the reach of radio amateurs. Although 8-bit machines such as the BBC, Spectrum or Amstrad CPC/PCW aren't up to the job, having neither the speed nor memory capacity, the IBM-compatible PC (preferably with maths co-processor) can make short work of modelling most amateur antennas. Even if you don't have a PC, it is worthwhile to keep an eye on this new technique which is blowing away many antenna myths.

Ian White, G3SEK (right), and John Bazley, G3HCT, demonstrate computer modelling at the RSGB HF Convention.

MININEC

THE BEST KNOWN of these antenna modelling programs is MININEC, a simplified adaptation of the Numerical Electromagnetics Code (NEC) for mainframe computers. MININEC is available free, as a spin-off from the US defence programme, and for an experienced computer user it is an excellent introduction to antenna modelling [1]. However, if you want to do something practical with MININEC, as distinct from experimenting with the program for its own sake, you'd do better to purchase one of the enhanced versions: 'MN' from Brian Beezley, K6STI [2] or 'ELNEC' from Roy Lewallen, W7EL [3]. While retaining the good features of MININEC, these commercial offerings include many enhancements such as faster computation, high-resolution pattern plotting and the ease of use PC users have rightly come to expect. For simplicity I will continue to call the program 'MININEC' though you can assume that anything MININEC can do, MN and ELNEC will do better, faster and more conveniently.

MININEC can model rod or wire antennas, thus covering most types from HF to about 2GHz. VHF and UHF antennas are generally mounted several wavelengths above ground, so they are best modelled as if they were in 'free space' with no other objects nearby. That certainly isn't valid at HF, where antennas are often less than a wavelength above ground. Fortunately MININEC can model antennas above ground, including the imperfectly-reflecting types of ground which we meet in real life (though there are some limitations in ground modelling – see later).

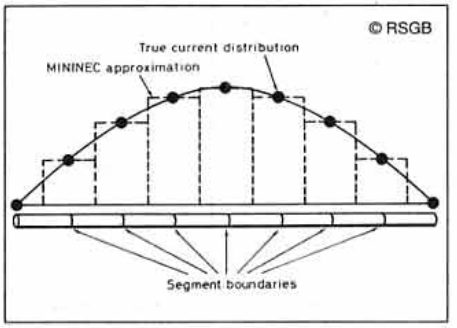


Fig 1: How MININEC divides a dipole into segments. Currents are approximated by a series of steps centred on the mid-points of the segments.

Another useful feature of MININEC is its ability to introduce resistive, inductive or capacitive loading at selected points along the wires. Thus you can model resistive losses that occur in real wire or tubing, and also model the performance of antennas using reactive loading or traps.

METHOD OF MOMENTS

LIKE ITS BIG brother NEC, MININEC models antennas using the so-called 'Method of Moments' (MoM). Without going into the mathematics, here's how it works.

The MoM begins by dividing the antenna into straight wires, and each wire into small segments (**Fig 1**), and then looks at the factors influencing the current in each segment. Segments that are physically connected end-to-end will receive current from the previous segment along the wire and will feed it along into the next, except at the end of a wire where the current must go to zero.

Equally important, the current flowing through each segment creates an electromagnetic field which induces currents in every other segment of the antenna. In short, every segment affects the current in every other segment, in a way that depends on the physical dimensions and layout of the antenna. By calculating all of these interactions, the MoM can determine the magnitude and phase of the current in each segment.

Once you know the current distribution along all the conductors in the antenna, you know everything else about it too. The electromagnetic fields from all the individual segments generate the radiation pattern of the whole antenna, and the voltage to current ratio at the feedpoint gives the feed impedance. It isn't a big step further to include ground effects. Likewise it's not difficult to take account of resistive or reactive loads where segments join together, which opens the way to modelling loaded, lossy or trapped antennas.

But it isn't quite that simple. The MoM can't tell you anything about the current distribution *within* a segment – you have to make as-

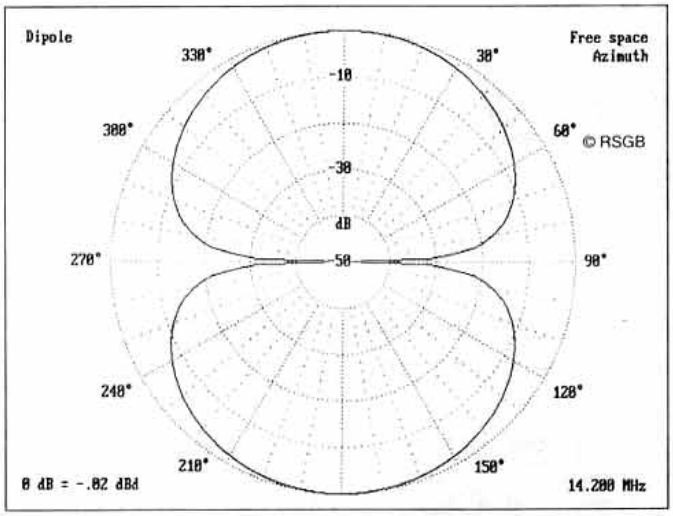


Fig 2: Polar diagram of a half-wave dipole, plotted by MN. The predicted gain and feedpoint impedance are very close to the true values.

sumptions. MININEC, assumes that the current within a segment is constant, so the distribution is modelled as a series of steps. MININEC aims to calculate the currents at the junctions between segments. Fig 1 shows these points as dots, including the zero-current points at the free ends of the wire, and also shows how the constant-current steps (called pulses) overlap the junctions of the segments. When you specify the segmentation, MININEC allocates current pulses automatically, making special arrangements for free ends and junctions between wires.

The stepwise current approximation is surprisingly accurate, provided that you use sufficient segments. Generally speaking, 10-20 segments per half-wavelength give very acceptable results, though this rule can break down in antennas which have unusual current distributions due to strong interactions between elements.

WHAT MININEC CAN DO

THE EASIEST WAY to show what MININEC can do is to give you a quick guided tour of some well-known antennas. Instead of the long tables of numbers generated by MININEC, I will use the pattern-plotting facilities of K6STI's MN program. We'll start with a half-wave dipole in free space. **Fig 2** shows the familiar polar diagram, plotted on a decibel scale. MININEC predicts the gain of the dipole correctly (ie almost exactly 0dBd) with a feedpoint impedance close to 70Ω.

Fig 3 shows something more practical – the vertical polar diagram of a G5RV dipole on 3.6MHz, 10m above 'average' ground. At such a low height, the greatest gain is at high elevation angles, so this antenna is good for local working. For 80m DX, however, its low-angle gain is poor. Would a half-wave dipole be better than the shorter G5RV? MININEC supplies the answer very quickly: there is very little difference, either for local working or for DX. The big improvements – especially for DX – come with height, not length.

What about a vertical for 80m DX? **Fig 4** shows the vertical polar diagram of a λ/4 monopole with a very extensive radial screen. To make the comparison fair, the decibel scale is the same as that for the G5RV (Fig 3). The high-angle gain is poorer than that of a horizontal dipole, which is useful for reducing QRM from short-skip signals. At angles below about 20° the gain is considerably better than that of the G5RV, but notice how the imperfect ground reflection undercuts the radiation pattern at the lowest angles. Since a full-size quarter-wave for 80m is a very tall antenna you could easily examine the possibilities for more compact loaded verticals, using the facilities in MININEC to add loading coils at various locations.

All the information above is already well-known from practical experience and basic antenna theory [4, 5]. The advantage of MININEC is that it lets you explore a wide variety of antennas for yourself, instead of having to take someone else's word for it.

QUESTIONS ANSWERED

MANY PRACTICAL questions about antennas remain unanswered because any kind of experiment would be too difficult. Sometimes the answer depends on particular circumstances, which is why different people's measurements can appear contradictory. Most of these questions can now be resolved using MININEC, as in these examples.

Do multiple dipoles fed in parallel really work?
Yes, although the non-resonant dipoles do carry some current, so they radiate a little.

Does a metal mast affect an inverted-V?
Yes, sometimes. MININEC can predict how much RF current is induced in the mast, and how that affects the radiation pattern.

If you don't use a balun with a coaxially-fed dipole, does the feeder radiate?
This can easily be modelled by adding a thick 'wire' to represent the outer surface of the feedline, connected to the feedpoint [6]. If the antenna or its surroundings are in any way asymmetrical, currents begin to flow along the feedline as well as the parts of the antenna that are intended to radiate RF.

Is the single-wire feeder of a Windom antenna really non-radiating, as is sometimes claimed?
No, it radiates quite a lot – as G6XN [4] and your own common sense would tell you!

How close can you bring two antennas before they interact?
Well, it depends on the exact circumstances . . . .but MININEC can give you an answer to such problems as the stacking of antennas for different bands, or the effectiveness of interlaced monoband Yagis on the same boom.

How much extra gain can you get from stacking two identical Yagis?
Usually less than the theoretical maximum of 3dB, but very occasionally more (if the interaction with the other antenna makes each individual antenna work better).

Can EMC problems be predicted?
Yes, to some extent. If you can devise a reasonable representation for your antenna, feedline and other nearby electrical conductors as an array of wires, MININEC can estimate the field strength in volts/metre at any chosen location. Though this assumes perfect ground and neglects the effect of buildings, it's a good start in assessing EMC potential of various antenna and feedline layouts.

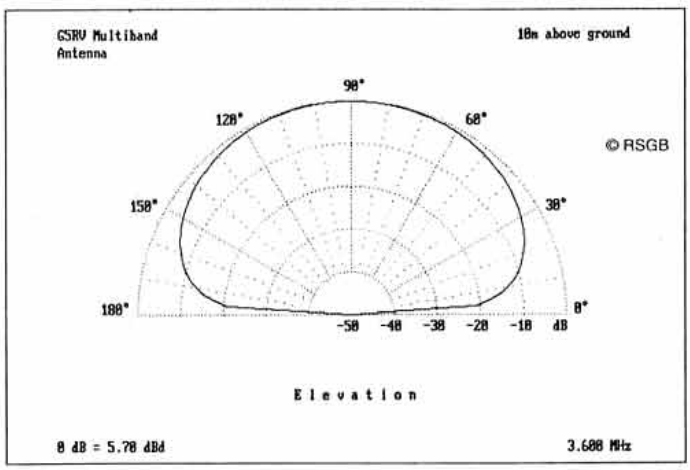


Fig 3: Vertical polar diagram of a G5RV dipole at 3.6MHz, modelled at 10m above 'average' ground. Maximum radiation is straight upwards, with gain due to ground reflection.

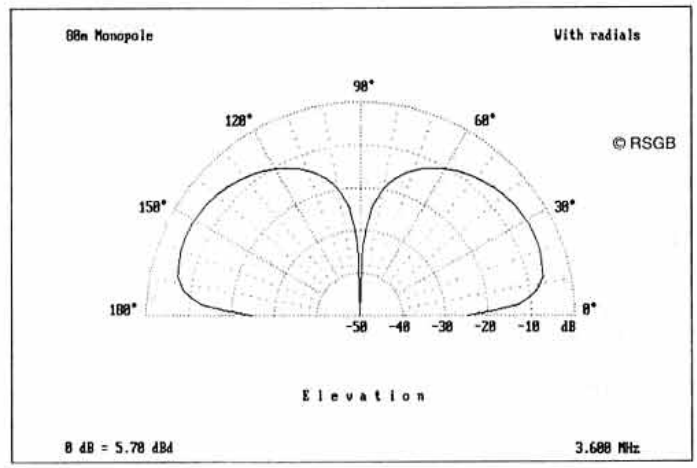


Fig 4: Vertical polar diagram of a quarter-wave monopole at 3.6MHz with an extensive radial screen. Gain is higher than the dipole at angles below 20° which are important for DX.

LIMITATIONS

MININEC IS VERY powerful, but it will only produce the right results in good hands [7]. Like any other tool, MININEC will break down unless it is used with some skill and consideration for its weaknesses. As already mentioned, it's up to you to decide how many segments to use to model each wire or rod. Too many segments, and the program takes forever to run; too few, and the results will be inaccurate. Moreover, the results do not always converge upon the correct value if you increase the density of segmentation; all too often they fluctuate around it.

MININEC has other limitations too. Antennas have to be modelled as straight sections – which creates difficulties with helical antennas, 'rubber ducks' and the like. No account is taken of the physical size of traps and loading coils, which can sometimes be quite a large fraction of the total element length.

MININEC is not all powerful. It can produce misleading and even ridiculous results if used without due care [7]. As already mentioned, the results depend on the density of segmentation, but simply using more segments is not a reliable solution; the results may fluctuate either side of the correct value.

Although excellent for thin wires, MININEC is not always successful for thicker rod elements used at VHF and UHF. With elements thicker than 0.01 wavelength, there is an apparent frequency offset relative to NEC results or accurate measurements. The actual cause is not a frequency error but inaccurate modelling of the current distribution. So instead of adjusting the frequency a more realistic method of correction for VHF/UHF yagis is to increase the element length at each open end by 25% – 40% of the diameter. MN uses it's own internal method of correction and results agree closely with NEC.

MININEC is also unhappy about sharp bends at wire junctions. G3HCT first identified the problem when computed results for HF quads failed to agree with careful measurements, and W7EL discovered the cause [7]. MININEC implicitly makes the current flow directly from the centre of one segment to the centre of the next – it jumps across the corner instead of following the wires. To reduce this error, W7EL recommended the use of shorter segments near the corner. However a difference of more than 2:1 between the lengths of adjacent segments will introduce other errors. MN has internal methods for dealing with bends without adding extra segments. It can also divide an antenna into suitable segments automatically.

For low-band DXers, perhaps the greatest limitation of MININEC is the inability to model ground losses when calculating antenna gain. MININEC calculates antenna currents assuming perfectly reflecting ground, and then makes a correction for the effects of imperfect ground reflections upon the far-field radiation pattern. This is inaccurate in two respects: imperfect ground has a slight effect upon the current distribution, altering both the feed impedance and the far-field pattern; and more seriously the program takes no account of losses in the ground itself.

Thus MININEC is optimistic about the gains of antennas such as ground-mounted monopoles which rely on the ground for a current return. The monopole whose patterns was predicted in Fig 4 falls into this category – the predicted gain is optimistic, though the advantage of the monopole for low-angle DX working on the LF bands remains clear.

An extensive radial or counterpoise system will improve not only the performance of the antenna but also the accuracy of MININEC's predictions.

Antenna Modelling with Elnec

by John Bazley, G3HCT

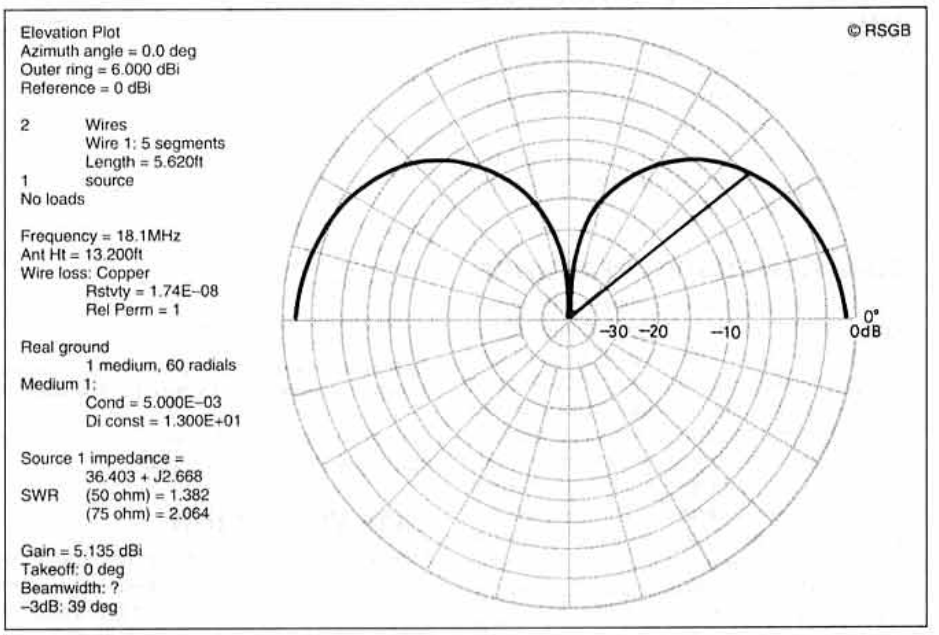


Fig 5:ELNEC 2.02 display (right) of 18MHz Ground Plane, ground mounted with 60 radials. The program produces a comprehensive list of data (left) about the antenna.

THE ANTENNA IS THE one section of an amateur station where local facilities vary so much from one installation to another. There is plenty of scope to experiment and little doubt that certain antennas appear to perform better at some locations than they do at others.

BACK TO REALITY

THE ONLY WAY to learn how to specify a good MININEC model for your antenna is by experience. You gain this experience by checking your results against other calculations, against basic antenna theory and most importantly against plain common-sense. In other words, you can't get sensible results out of MININEC if you don't really understand antennas in the first place.

Although NEC, MININEC and their derivatives promise a new era in the development and understanding of antennas, it's very easy to become seduced by the computer screen. Don't forget *the real proof of any antenna is on the air!*

The list of references can be found on page 42.

Have you been lucky enough to have obtained planning permission for a tower or even a pole? Will the neighbours accept a vertical at the bottom of the garden or on the roof? Can you somehow get a length of wire between those two trees, and when the decision has been made and the antenna installed – will it work?

A lot of 'cut and try' usually takes place but it is not always easy to be objective with the results which you believe that you have obtained. This is particularly the case with the variations in propagation that continually take place on the HF bands.

Now there is help available in the form of antenna modelling computer programs. Roy Lewallan, W7EL, modified the comprehensive MININEC computer program, originally designed for the American Navy, to try and make it more 'user friendly' and then realised that other amateurs also wished to have the use of such a tool. That was in early 1990, and since then the program has been further refined to add even more useful facilities. – Hence the marketing of ELNEC.

THE ELNEC SOLUTION

ELNEC COMES IN two versons – the first is for use with a maths co-processor, and the second for use without. If you are going to do a lot of antenna modelling, then I fully recommend the maths co-processor version and of course the corresponding chip. The calculations will be five or six times faster. Really, there should be a 'health warning' with these programs – they are *very* addictive. Having completed the modelling of your pet idea the

realization soon dawns that perhaps a small change here or there might make a big difference – and so it goes on. But it is most encouraging to design an antenna, then build it and find that it does work as predicted!

The programs are designed to run on IBM-PC compatible computers, with DOS 2.0 or higher and at least 512k of RAM. Most machines have at least 640k RAM and this amount is more than adequate for the most complex antennas. If you do not have enough RAM for an antenna that you have entered then ELNEC will not 'crash'; it will notify you before attempting to do the calculations. For plotting on screen then either a CGA, EGA, MCGA or VGA is required.

Figs 5-7 show how data can be displayed on screen or printed, for an 18MHz Ground Plane Antenna.

COMPREHENSIVE FEATURES

THE LIST IS impressive: Plotting of far field gain on ARRL or linear dB plot, forward gain, front to side ratios, F/B ratios; display or print voltage, current, impedance and SWR for 50 or 75Ω systems. Having entered the details it is possible to view the antenna graphically as a polar diagram, superimpose several patterns on a single grid to compare antennas and then save the patterns. The software can also save computed arrays, so that you can continue where you left off. There are also some useful short-cuts in entering antenna descriptions, include tilting wires and changing length.

Pattern analysis can be restricted to any range of angles when only one portion of the pattern is of interest, and the effects of wire losses can be included if required. ELNEC calculates only what it has to, so if changes are made, calculations are not unnecessarily repeated. In addition to those just described, there are many other features which experimenters will find useful.

It is very tempting to start playing with the examples immediately the disks arrive, but a few moments taken in printing out the documentation file, *and reading it*, is well worth while to appreciate fully the whole range of facilities that are available.

ENSETUP is a short set-up program for setting the printer details paths, date format and background/plot colours. Having completed the above there can be no better recommendation that following the 'Test Drive' section in the manual.

A WORD OF WARNING!

THOUGH ELNEC PERMITS you to define real ground in considerable detail, this definition is used only for the calculation of far field patterns. ELNEC uses perfectly conducting ground when calculating impedances and currents irrespective of whether perfect or real ground had been specified. If a dipole is set lower than 0.2λ above ground then the displayed impedance will vary greatly from that actually measured. This in turn can lead to some very misleading gain figures. Vertical dipoles have the same impedance over real ground as perfect ground so ELNEC results are satisfactory for this class of antenna at any height. At the end of the day one must ask 'Do the results look reasonable?' – common-

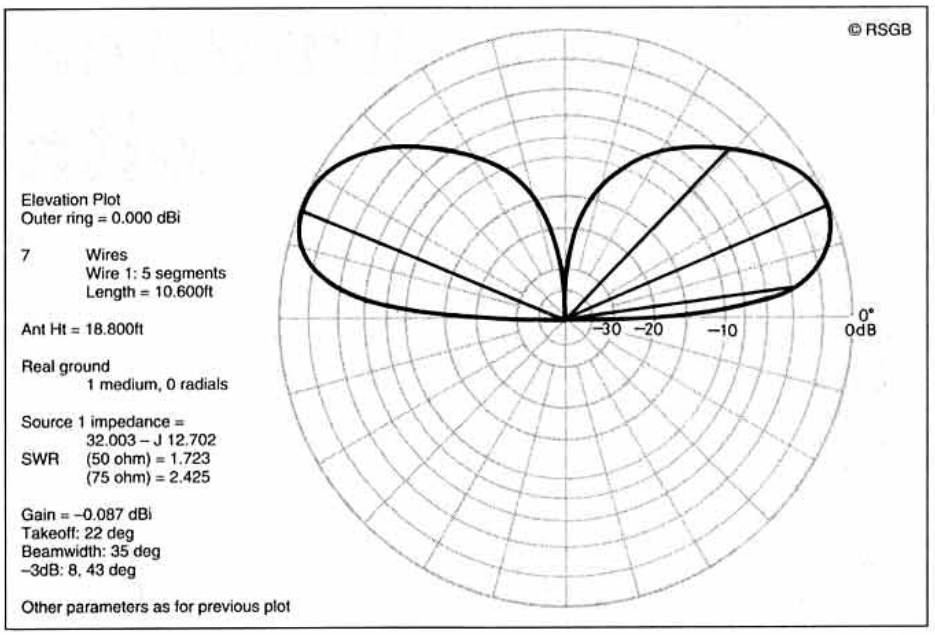


Fig 6: 18MHz Ground Plane with 4 radials mounted 5 ft above ground. Sloping the radials changes gain to 0.184dBi, impedance to 55.966+ J25.660, 50Ω SWR to 1.637, takeoff to 23° and beam width to 38°.

sense should confirm that you cannot get 20dB gain from a low dipole!

LATEST VERSION

SINCE THE ABOVE was written, a new version of ELNEC has been released (Version 3.02) [3]. This contains a number enhancements, some of which are as follows:

Frequency sweep: As its name implies, this lets the user set a range of frequencies for which the antenna parameters will be calculated. Traces can be saved in one nominated file, and other data (eg source data, load data, currents etc) saved in another nominated file.

Microsmith: Files can be created to contain data for the Microsmith program (available from ARRL) which displays in 'Smith Chart' format.

File Browse: Particularly useful to look at the data stored after a frequency sweep.

Antenna View: This enables the antenna to be viewed from any direction in a three dimensional display. The current distribution and radiation pattern can be viewed, and there are markers to show segments, wire connections and coordinates. There is also a 'Highlight Wire' section which identifies each wire and gives wire end coordinates,

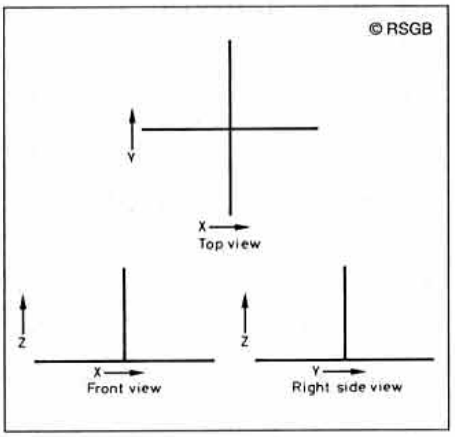


Fig 7: Ground plane antenna plan and profile views as plotted by ELNEC.

connections,length, diameter and segment length.

MaxP: Enables the user to compute the parameters for more complex antennas, with the maximum number of pulses being increased from 127 to 260. This is an extra cost option, which requires a hard disk, co-processor and minimum 640k RAM.

These changes constitute a very impressive list of additional features compared to the earlier version.

REFERENCES

[1] The MININEC program is readily available in the USA, but with some difficulty in other countries. The written report is available as – 'THE NEW MININEC (Version 3): A Mini-Numerical Electromagnetics Code'. J C Logan and J W Rockway. *NOSC Technical Document 938*, September 1986.

[2] For details of MN contact Brian Beezley, K6STI, 507½ Taylor Street, Vista, California 92084, USA. Version 4.5 is available price $55 (for purchasers outside USA). Payment by Visa and Mastercard is acceptable – state card number and expiry date. Also, state 3.5" or 5.25" disk size.

[3] ELNEC IS AVAILABLE from Roy Lewallan, W7EL, P.O. Box 6658, Beaverton, Oregon 97007, USA. Version 3.02 is available at $52.00 (for purchasers outside USA) plus $25.00 for the MaxP option if required. When ordering specify disk size and whether your PC is fitted with a co-processor or not. Payment by Visa and Mastercard is acceptable – state card number, expiry date and disk size.

[4] Les Moxon, G6XN, *HF Antennas for All Locations*, RSGB Publications.

[5] *ARRL Antenna Handbook* available from RSGB Publications [see page 94].

[6] Ian White, G3SEK, 'Balanced to Unbalanced Transformers'. *RadCom*, Dec 89.

[7] Roy Lewallen, W7EL, 'MININEC: the other edge of the sword'. *QST*, February 1991.

Pat Hawker's

Technical Topics

HF SINGLE COIL 'Z-MATCH' ATU

THE GI2FHN DUAL-LOOP indoor antenna (*TT*, February) made use of the dual-tuning technique long popularised by the Z-match ATU. This technique stemmed from its use in the early 1950s in transmitters and exciters as a means of avoiding the complications of band-switching. In its usual configuration it uses two coils and a ganged tuning capacitor. A useful feature of the Z-match ATU is that it simplifies the provision of a balanced output suitable for open-wire or 300Ω feeders, increasingly popular as a means of providing a multiband antenna covering WARC and traditional HF bands.

In the March 1992 issue of *Break-in*, T J Seed, ZL3QQ, showed that theoretically a single-coil Z-match tuner should be possible, but did not present a practical design. However, a number of prototype units were built by Ron Cook, VK3AFW, and Ron Fisher, VK3OM, who write the monthly 'Random Radiators' column in the Australian *Amateur Radio*. These have been examined and some further suggestions made by Lloyd Butler, VK5BR, who is soon to present in *AR* detailed information on this form of ATU, including a design covering 1.8 to 21MHz.

Meanwhile the February 1993 'Random Radiators' provides practical information on a single-coil Z-match ATU covering approx 3.5 to 30MHz although the range of impedances to which it will match is not specified: **Fig 1**.

The two Rons suggest that one of the big advantages of the single coil Z-match is that there is only one output link, and this does not require switching. There are now only two controls (tune and load) to cover the full range from 3.5 to 30MHz. The following component and constructional details are extracted from 'Random Radiators'.

For use with a standard 100 watt HF transceiver, the two-gang variable capacitor has a maximum capacitance of about 350pF "a 1950s style broadcast receiver tuning capacitor is ideal". For 400 watts a capacitor with wider plate spacing is needed. For 100 watts, the 20-350pF (or so) input variable capacitor can also be one of the old-style receiver capacitors.

An early version had the output coupling coil wound directly over the earthy end of the main coil. It was later discovered, however, that rather better results including a wider matching range could be achieved by winding the output link on a short section of plastic pipe slipped over the earthy end of the main coil.

The coil can be wound on a scrap piece of plastic water pipe with an inside diameter of 50mm and outside diameter of 53mm. If the coupling coil is wound separately use another piece of plastic water pipe with an inside diameter of about 60-65mm. Length of the main coil is about 100mm, and about 55mm for the coupling coil. Wind the coils with 14-18SWG tinned copper wire. The main coil requires 14 turns spaced over 80mm:

"Winding turns on to plastic water pipe is not as easy as it looks. First wind the coil on to a smaller former about 40mm in diameter. When you remove it, it will spring out to about the required diameter. Secure the top and bottom of the winding through holes drilled through the former and run some Araldite down the winding in a couple of places to hold the wire in place. If you want to experiment with the tap positions, cut a slot in the former about 50mm long and 10mm wide but otherwise we suggest you leave this out."

Vernier drives are used on the capacitors three terminals and an SO-239 coax socket are the only other components. The Australian prototypes were built on a wooden baseboard and Masonite (fibre board) front panel, although a metal cabinet would avoid the slight 'hand capacity' effect of wooden construction.

"Layout is quite straightforward but keep connections between coil and the two-gang capacitor as short as practical. While the unit will be earthed via the coax to the transceiver, we recommend a separate earth connection to your usual station earth point. This is more important if you are using the ATU to feed a single wire antenna such as the W3EDP . . . . It's a good weekend project and you will finish up with a better ATU than many commercial units costing two or three hundred Australian dollars."

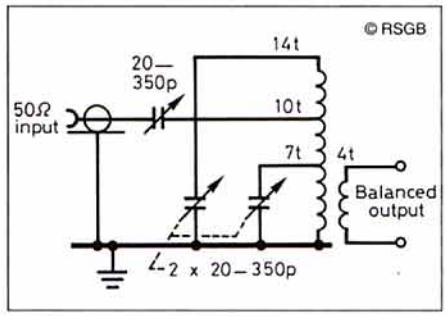


Fig 1: The prototype *Amateur Radio* 3-30MHz single-coil Z-match ATU.

LINEAR AMPLIFIER TUNING AND SUPPLY REGULATION

MIKE HALL, G3USC, noted the brief reference in the June *TT* to tuning up valved SSB amplifiers in the general comment on reducing power when this is appropriate: "For SSB there is the problem that the linearity of an amplifier is optimum when correctly adjusted for its rated output."

G3USC writes: "Nothing wrong with this of course, but it does assume that the power supply feeding the amplifier has perfect regulation. In the real world, the supply regulation is usually far from perfect, and I believe that this oft-quoted statement is misleading in many practical situations. Making matters worse, the suggestion is often made that the loading should be increased beyond that which results in maximum output in order to improve the linearity. Contrary to this view, observations of my own G2DAF-type amplifier – which I consider has a beefier power supply than many linear amplifiers are blessed with, indicate that this approach will result in excessive loading when the amplifier is driven with speech.

"The power supplies commonly used with linear power amplifiers have no regulation circuits as such and rely upon a bank of capacitors to provide good dynamic regulation. Under continuous carrier drive, however, as used for tuning up, the poor static regulation due to a scrimpy power transformer can cause the HT to drop by as much as 20% [or more if, for example, voltage-doubling circuits are used in the PSU – *G3VA*]. Adjusting the amplifier loading at its rated output, and then some more, will therefore result in heavier than optimum loading under syllabic conditions. This could be the reason why I hear so often on the air that 'my final amplifier valves went soft and I had to replace them'. Driven to the same peak voltage with SSB speech, the power supply capacitors had probably been happily crucifying these poor valves, which had been attempting to supply rather more signal current than they should. Maybe also this is one cause of so many diabolical signals that I hear on the HF bands.

"The answer to this problem is to abandon single-tone tuning in favour of a two-tone drive. Such a signal results in a much smaller drain on the power supply for a given output PEP. Beg or borrow a two-tone generator (I don't know if black boxes come equipped with them these days) and an oscilloscope, and then adjust the amplifier for its maximum linear output on each band, marking the positions of the load control to allow fast set-ability later.

"For routine tuning, it is then only necessary to set the load control to the marked position and tune the amplifier for maximum output. This can be carried out at low drive and will help to preserve the life of the valves. Unlike that of the tune control, there will be only a tiny difference in the correct setting of the load control between band edges, so one mark for each band is sufficient.

"While in possession of the 'scope, the drive settings can also be marked at the maximum drive points, ie those which just prevent flat-topping when driven with speech, or, if a powerful amplifier, the points which result in maximum legal output – 400V deflection between modulation crests in a 50Ω system. [High-power addicts may claim that the UK licence does not specify a maximum output power from the amplifier but only the RF power delivered to the radiating element, so that with a long feeder line or lossy ATU even a 1kW or more amplifier may be 'legal' – G3VA].

"My way of extracting a signal for the 'scope is simply a series 10k, 2W pick-off resistor mounted in my SWR meter at the feed end of a coax, the other end being terminated at the 'scope with 50Ω (a BNC T-piece and terminator plug). This results in a 46dB loss (x200) and provides a convenient level for the 'scope's input amplifier.

"Of course, the 'scope must have adequate bandwidth if the intention is to use it for power measurement, but if not, 10-20MHz bandwidth should be adequate for the HF bands. I do not advocate making a connection di-

rectly to the deflection plates of 'scopes as their HF compensation could be affected if the wiring is disturbed, and not least because there are some nasty voltages about.

"In place of a two-tone generator, it is sometimes suggested that either a further single audio tone be injected into the microphone socket, to be mixed with the transmitter's internal tone generator, or that a balanced modulator be temporarily unbalanced in order to allow some carrier leakthrough. With care, these approaches are feasible but, with either, it is all-too-easy for signal levels through the various stages to be higher than normal, and may cause distortion of the modulation envelope which no amount of final amplifier adjustment will remove. A two-tone generator having an output level comparable to a microphone is therefore by far the most convenient and best approach.

"A source for low-distortion two-tone generators, since I have not seen them advertised in *RadCom*, is Radio Data & Signalling Ltd, 5 Church Street, Crewkerne, Somerset TA18 7HR, priced at £30 plus VAT. They come in a small box and are powered internally by a PP3 battery. Adjustment of a trim pot supplies outputs of either one tone or the other, 1.0kHz and 1.6kHz approximately, or a mixture of the two. Normally, this pot would be used to compensate for the passband amplitude ripple in SSB filters, which otherwise has the effect of unbalancing the tones."

Details of two two-tone generators were given in *TT* in 1989. The first (*TT*, March 1989, pp35-36) was taken from the *Radio Handbook*, (22nd Edition, 1981, pp31-56) and is shown again in **Fig 2**. This generator provides a pair of linearly added sine waves with the second harmonic and intermodulation products at least 35dB below one tone. It is designed to operate from an internal 9V battery with no inductors or transformers that might induce mains hum.

Two Wien-bridge AF oscillators and associated buffer/mixer stages are based on a single LM324 quad IC. One generator is adjusted for 1000Hz, the other for 670Hz although the oscillators could be modified for other combinations. The original model was enclosed within an aluminium utility box (3.5 x 2 x 1.5in) with all components mounted on a perforated circuit board. The 9V battery was mounted below the board in a small clip. The unit provides either balanced or unbalanced output.

This prompted Jack Hollingworth, ZF1HJ, to offer (*TT*, September 1989, p39) an alternative 'quick and dirty' design using a readily available 'touch tone' generator IC (MC14410). He suggested that while the output waveforms may not be as clean as those from the *Radio Handbook* design, they should prove adequate for most purposes and the component count is much lower: **Fig 3.**

ZF1HJ wrote: "By temporarily jumpering the points indicated single tones of 697 or 1477Hz are generated, enabling the balance of the tone levels to be set using RV1. This is best done by observing the transceiver output power rather than by looking at the output level from the generator. Closing S1 produces simultaneous 697 and 1477Hz and also keys the transmitter. The output is adequate to drive most HF transceivers from the microphone input but a simple op-amp buffer amplifier could be added if desired. In some transceivers it is possible to replace the built-in tone generator by this two-tone unit, thus producing a two-tone drive whenever 'tune' is selected.

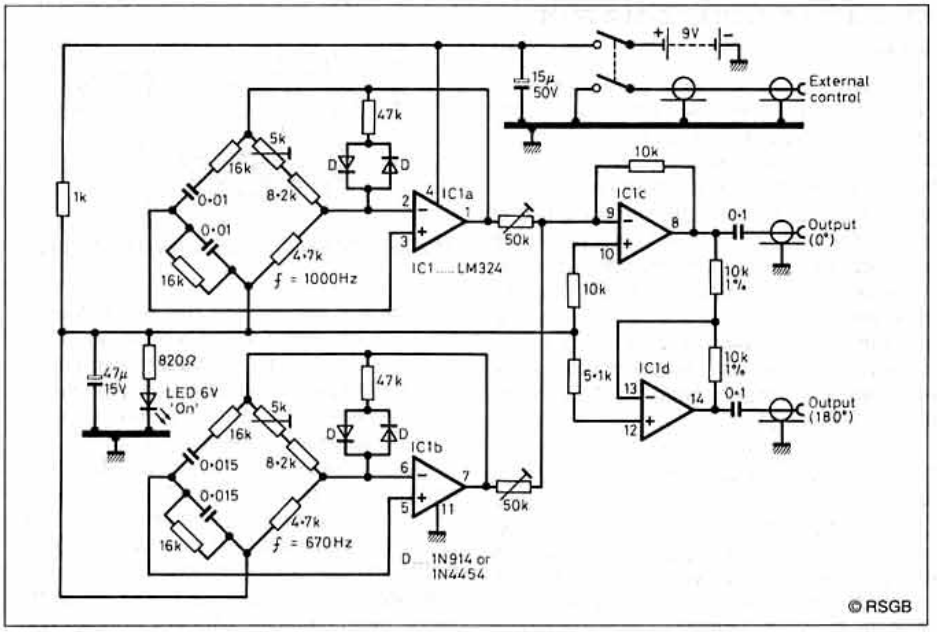


Fig 2: Circuit diagram of low distortion two-tone generator (source *Radio Handbook*).

"The jumpers may be replaced by two sets of three diodes, with anodes to MC14410 pins 3, 4, 12 and 3, 13, 14 respectively, and with the cathodes of both sets commoned and grounded via single pole (normally-open) switches or push-buttons. This is more convenient if frequent adjustment of the balance control is required when using the unit with different transceivers."

"INVISIBLE" AND INDOOR ANTENNAS

A GROWING PROBLEM in many countries is the imposition by local authorities, landlords, estate managers, etc of restrictions on the erection of any type of outside antenna. Where such restrictions do not cover TV antennas, it is possible for amateurs to use these as, in effect, random length HF antennas with the outer-braid of the coaxial feeder cable connected to an ATU. Efficiency of such antennas is likely to be reduced by the proximity of the cable to the building but nevertheless they usually provide plenty of contacts.

A more efficient, and well-tested, technique is to use a fixed outdoor long-wire antenna using very thin enamelled wire (24 or 26 gauge) supported by nylon kite string. Such an antenna will be almost impossible to spot from a distance. Provided that it is between fixed supports that do not sway with the wind, such an antenna can last a reasonably long time, unless broken by an unwary bird for whom such antennas can be a hazard – and vice versa. Another echo from war-time clandestine radio is to use an aluminium-wire 'clothesline' or to conceal a wire in a cord clothesline or indeed in any rope that does not seem clearly out of place.

A more challenging situation arises when there are restrictions against any sort of antenna and no supports for an 'invisible' antenna. Albert Parker, N4AQ, in *QST*, May 1993, p65 tells how when he moved to a retirement community in Florida in 1991 he faced and overcame this difficulty. He writes: "I was eager to get on the air and began looking around for an inconspicuous antenna. It couldn't be just any antenna; I needed one with multiband capability .... but not one that would send the clear message (of traps) when displayed in public – "Ham Antenna Here!"

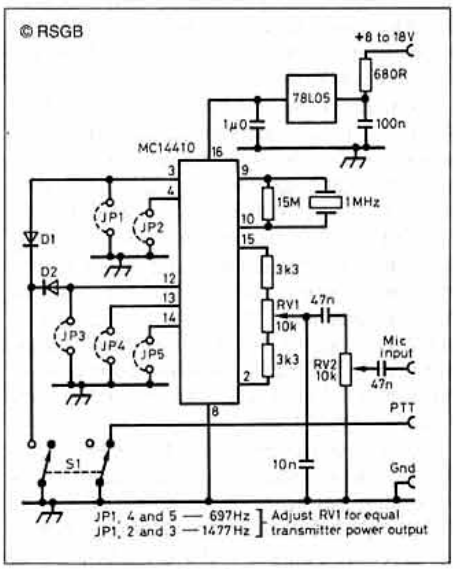


Fig 3: The simple 'quick and dirty' two-tone generator that ZF1HJ found adequate for checking SSB transceivers.

His solution was to purchase a Hustler 4-BTV four-band trap vertical antenna which he felt he could squeeze inside a 2-inch PVC pipe. At his first attempt he found the hose clamps on the traps were too large: "Knowing nothing about plumbing and even less about PVC pipes, I was very discouraged. I journeyed to another hardware store and found another 2-inch section of PVC and again tried to insert the trap. To my delight, it fitted perfectly!

"This was thin-wall PVC whereas the first one I had tried was heavy-duty PVC I

SIMPLE SUBJECTIVE SELECTIVITY FOR CW

ALMOST 20 YEARS AGO in *TT*, October 1973, the late 'Dud' Charman, G6CJ, first disclosed to amateurs his system (British Patent No 916,843, January 1958 taken out by EMI) of providing enhanced weak CW signal reception. This used the principle of slightly delaying the signal provided to one ear thus providing a form of pseudo-stereo. Later, with Richard Harris, G3OTK, he provided full construction details of a suitable 'stereocoder' (*RadCom*, September 1975). It was a fairly complex unit and since it provided a detectable advantage only on weak signals in the presence of QRM the original system never really caught on. However a number of simplified arrangements that can to some extent provide a stereo-like effect have appeared.

One such arrangement appears in 'Reflecties door PA0SE' (*Electron*, April 1993) ascribed to LA8AK, uses two standard AF pot cores tuned about 5Hz apart fed separately to the two earphones, and thus providing a form of pseudo-stereo-like audio filter: **Fig 4.**

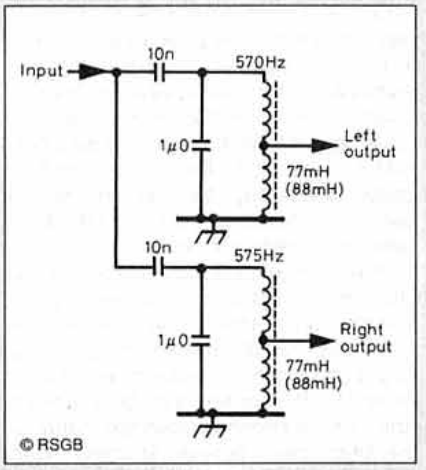


Fig 4. Simple form of CW 'stereo' audio filter described by LA8AK.

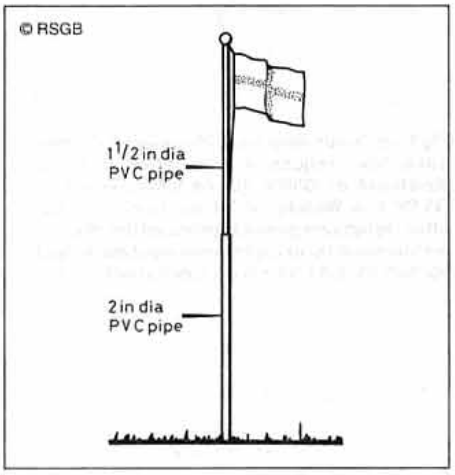


Fig 5: Sketch of N4AQ's disguised flagpole antenna in which a Hustler 4-BTV trap vertical is concealed in 2-inch PVC pipe as described in *QST* (May 1993).

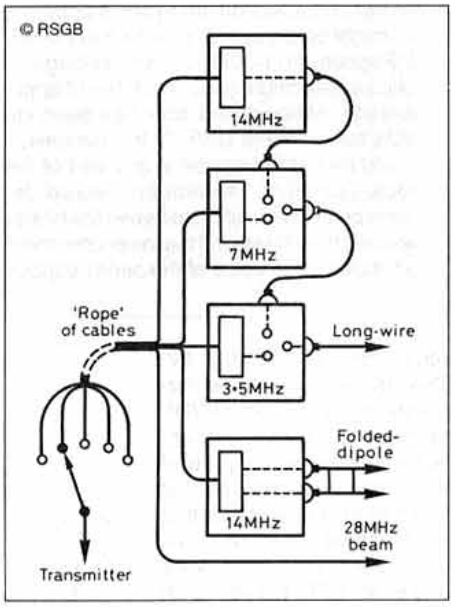


Fig 6: Layout of the feeder cables and switching relays used in 1950 by the late G2EC for his 'quick put up and take down antennas' on the roof of a seven-storey Mayfair building in 1950 after his earlier more visible antennas had been declared architecturally unsightly. Although he declared the antennas "fell far short of the ideal" they enabled him to obtain the leading G score of 130,442 points in the 1949 ARRL DX Contest.

purchased a 14ft section of thin-wall PVC along with a 12ft section of 1.5 inch PVC. I assembled the Hustler and cut the 2 inch PVC to fit over the lower part of the antenna, ending about two inches above the 20-metre trap. At that point I used a reducer to couple to the 1.5 inch PVC that I had slipped over the thinner top section that remained. When I finished, the entire antenna was enclosed in PVC! I had to leave off the 7MHz capacitance hat but later found no trouble operating on that band without it.

N4AQ drove a 1.5in thick wall pipe about 4ft into the ground to serve as base, trimming the length to keep the feed point about 4in above ground. A 5ft section of copper pipe was driven into the soil to serve as a ground connection (burying radial wires might have attracted attention). Buried 50Ω coax cable was used to feed the antenna with about 10 turns of coax cable near the base to act as an RF choke [probably not necessary with a buried cable – *G3VA*] and another 10 turns near the MFJ989C ATU. The antenna, **Fig 5**, loads his Collins KWM-380 transceiver well on the four bands from 7 to 28MHz providing good CW and SSB reports even if not really capable of competing with high-gain antennas.

N4AQ adds: "Finishing touches consisted of adding a used toilet-tank-float ball on top of the pole as an ornament, and a three-inch bolt near the top to mount a pulley. The base is hidden by flowers which I water often to enhance my ground conductivity! My neighbours see the Stars and Stripes flying proudly day after day, unaware that the flagpole is really a multiband antenna."

The use of aluminium flag-poles as vertical 'whip' antennas was a well-known arrangement for Diplomatic HF installations in embassies etc in the days when most countries used HF for diplomatic traffic, but the idea of enclosing a multi-band trap vertical in a plastic pipe is new to me.

How one well-known amateur overcame similar problems while living in a sixth-floor flat in Mayfair was described over forty years ago by G2EC in 'Aerial Systems for the Flat Dweller!' (*RSGB Bulletin*, August 1950, pp55-56). G2EC was, of course, the unique call (the only British two-letter call with an 'E') of the late Major-General Eric Cole, CB, CBE, Director of Telecommunications at the War Office, 1956-61, and President of RSGB in 1961, who died last December at the age of 86 years. For reasons that will become obvious, no name was attached to his article.

In 1950 he wrote: "Some eighteen months ago, after much argument with higher authority, the aerial systems, erected with much painstaking effort on the roof of the building, were declared architecturally unsightly and 'were to be removed forthwith'. Courses open were thus: (a) Give up Amateur Radio; (b) Change location; (c) Use 'invisible' wires; or (d) Use systems which could be erected and dismantled at short notice for use during darkness hours or when censorious eyes were absent.

"The latter, course (d), was chosen and though it has been irritating to have to move out of a warm room and grope around a roof 80ft high in stygian blackness, sometimes in wind and snow, before being able to put the transmitter on the air, it has proved on the whole very well worth while."

The final system he adopted, based on a 'put up and take down quickly' principle included a long-wire (132ft) antenna for use on 3.5, 7 or 14MHz, end-fed by one of the three 72Ω coaxial cables through suitable impedance matches with matching unit remotely selectable from the operating position; a half-wave, three-wire folded dipole for 14MHz to cover the nulls of the long-wire; and a three-element rotary beam for 28MHz (the 21MHz band was not available until 1952). G2EC reported: "These were so arranged that after considerable practice, all three could be erected and put into operation from their normal completely prone positions lying flat on the roof of the building in a total time at night of eleven minutes away from the operating shack. Times were slightly quicker in daylight!"

The roof of the seven-storey building was some 150ft long and 50ft wide at its widest point and with lift and water outhouses on the top. To feed RF from the transmitter, **Fig 6**, a rope of 73Ω and relay switching cables, terminated at the operating position in a five-way coaxial switch, was led out through the shack window juxtaposed to a black, though otherwise friendly drain pipe, and thence to the roof; the resulting cable run was virtually invisible from the street below.

G2EC described in detail the construction of the antennas on 12ft poles and (for the beam) a 12ft steel mast all arranged so that they could be quickly heaved up and fitted into prepared bases. He wrote: "It looks so simple in print, but in complete darkness, single-handed, possibly in a half-gale with a 70ft unfenced drop to the street a few feet away, the writer recommends manipulating 28lb at the end of a 12ft pole to upset even the most well-behaved human circulating organs,

at least until confidence is gained . . . . The aerials fall far short of the ideal, but nevertheless, observing the local strictures, they permitted G2EC to continue to enjoy the 'vice' of Amateur Radio without causing affront. After all 'What the eye never sees, the heart never grieves over'".

Another exploit of G2EC while SU1EC in the 'thirties is recalled in an obituary note in *The Journal of the Royal Signals Institution*: "In 1934, while serving in Egypt, he participated in a three-car expedition through the Western Desert and the Libyan Sand Sea, a round trip of some 1500 miles. Radio contact was maintained with Egypt Signals using a transmitter and receiver constructed by Eric Cole, proving that 'long distance' communications [from a vehicle] were possible, later becoming routine practice for units such as the Long Range Desert Group". The writer also notes that during WW2, while serving with Joint Combined Operations, G2EC designed the Wireless Hand Cart – nicknamed the 'Radio Pram' which was used during the Normandy landings.

Reverting to the topic of invisible antennas, there are unfortunately many flat dwellers who have no access to a large flat roof, or even a balcony, and must perforce make do with either an indoor antenna or a thin wire lowered out of a window or, for example, coupling their RF into a metal drainpipe or metal windows etc.

The effectiveness of an indoor antenna depends on many factors that cannot be readily predicted or measured. For example a wire antenna erected in a roof-space of a conventional building can often prove almost as good as one outside at a similar height; on the other hand an antenna in a room in a steel-framed building is unlikely to perform well. 144MHz VHF single-element quad antennas can be taped to a window and will radiate well in the direction faced by the window. A number of designs for simple indoor antennas were given in *TT*, July 1983 as shown in **Figs 8 to 10**. The three random-length Marconi antennas for HF are taken from the manual for the paramilitary/clandestine Mk 123 transmitter-receiver. Rather better results could be expected from a compact 'magnetic loop' antenna since there would be less absorption by nearby objects. I would not advise the use of any form of room antenna for high-power operation, but with say 20-40 watts CW there should be no difficulty in achieving plenty of contacts. This assumes you can overcome the potential problems of RFI, often due to leakage into the electricity wiring etc.

SWR BRIDGES & HARMONICS

PETER CHADWICK, G3RZP, with the aid of professional instruments, has been testing out the widely held belief that an SWR bridge should always be followed by a low pass filter to cope with harmonics generated by the diodes. The results are revealing and should prove of interest to those with transmitters that would not otherwise require an LPF. He writes:

"For many years, it has been assumed that the diode detectors in an SWR bridge will cause harmonics which will be radiated at a level high enough to cause interference to other services, notably TV. The UK amateur is most fortunate in that he has no VHF services to worry about, unlike amateurs in other parts of the world; nevertheless, it is taken as an article of faith that troublesome harmonics will be caused and most texts show an LPF following an SWR bridge.

"A degree of cynicism about technical shibboleths is no bad thing and it was decided to put this common assumption to the test. A number of SWR bridges in various instruments were tested: Bird 43 Thruline wattmeter with 50W and 1000W plug-ins; Asahi-Sangyo NEII (two meters, forward and reverse, rated for 100W); Labgear E5048; Daiwa CN620A (crossed needle, power and SWR, 20/200/1000W ranges); and a homebrew Bruene-type meter.

"Of these instruments, the Labgear E5048 and the Asahi-Sangyo MEII are based on the principle of pick-up lines, as in the original 'monimatch', and are frequency sensitive, with an in-

EXPERIMENTAL C & R FILTER/ATTENUATOR

THE USUAL ATTENUATOR consists of a network of resistors (R) while the usual high-pass filter is a combination of inductors (L) and capacitors (C). Peter W Haylett, G3IPV, has been experimenting with a combination of C and R, originally as an attenuator to reduce intermodulation in receiver front ends but which appears to have other applications calling for a filter that passes VHF/UHF signals without undue losses but attenuates HF signals particularly those on the lower HF bands such as 3.5MHz. He writes:

"**Fig 7** shows the basic circuit of this filter which is of a high-frequency pass, low-frequency attenuation type. Experiments with this filter have been carried out by placing it in the antenna coaxial feeder cable of a TV receiver, a 3.5MHz receiver and a simple spectrum analyser. Although the filter does attenuate to some extent the incoming TV signal this does not appear to be a problem except in weak-signal areas. When the attenuation of the filter is observed using the 3.5MHz receiver and spectrum analyser, it appears, as might be expected, to be high in the HF/MF spectrum (1-30MHz) – suggesting that such a filter might have a number of applications. Although this filter has been initially tested at the UHF TV frequencies, it could probably be used in any part of the radio spectrum. Performance would depend on the separation between the higher wanted frequency and the lower unwanted frequency, the value of the series capacitance and the relative intensities of wanted and unwanted signals. The capacitance should be adjusted by trial and error to the minimum practical value at the wanted signal frequency. If necessary attenuation can be reduced by omittng the output resistor.

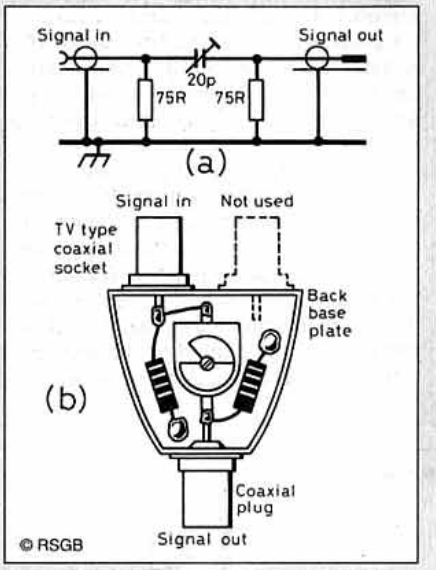


Fig 7: (a) Circuit diagram of the simple R-C high-pass, low frequency attenuation filter as developed by G3IPV. (b) As implemented by G3IPV in a Wolsey 'aerial combiner' unit but other layouts are possible provided that there is a minimum of coupling between input and output sockets except via the low-capacitance trimmer.

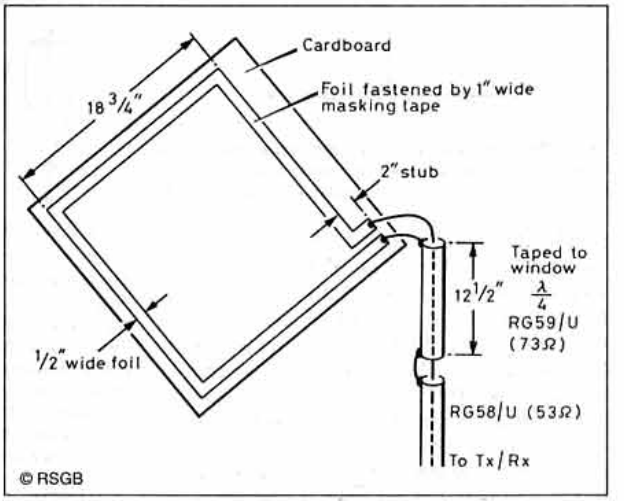


Fig 8: A 144MHz single-element quad antenna suitable for use on windows and made from household aluminium foil mounted on cardboard.

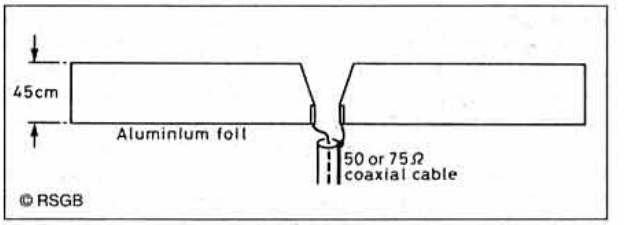


Fig 9: An indoor broadband 'fat dipole' antenna using aluminium ('kitchen') foil for use in lofts or for mounting on indoor walls. Suggested lengths for 3.5MHz are two by 12m; 7MHz two by 6.2m; 10.1MHz two by 4.4m; 14MHz two by 3.4m.

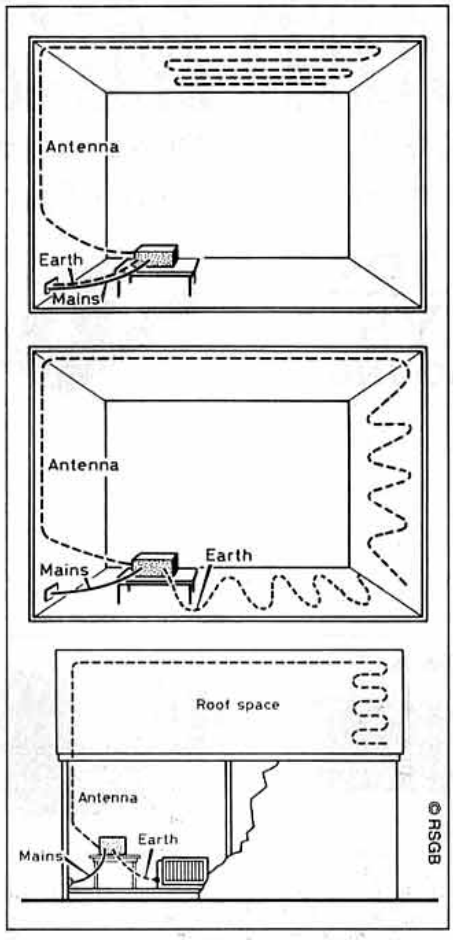


Fig 10: Random-length Marconi HF antennas as suggested in the manual for the Mark 123 paramilitary transmitter-receiver. (a) Preferably in a room high in the building and using a 'mains earth'. (b) Alternative arrangement using a wire counterpoise on the floor. (c) Antenna in roof space with central-heating radiator used as 'earth'. For transceivers intended for fixed 50Ω feed an ATU suitable for end-fed antennas would be required.

crease in coupling to the coaxial line at high frequencies. The Bird Thruline uses a coupling loop with frequency compensation, while the Daiwa CN620 is a Bruene-type with a wide-band current transformer (a typical example of a Bruene-type instrument is shown in the RSGB *Radio Communications Handbook*.)

"Initial measurements were made with an FT102 transceiver on 21.2MHz feeding a low-pass filter, the SWR meter under test, a 100W 30dB wide-band attenuator and a Hewlett-Packard 8562A spectrum analyser. A calibration run was made in each case without the SWR meter, and the meter then placed in line. Power was varied up to the limits of the power meter concerned or 100W, whichever was the lower.

"The results were interesting. With any of the SWR meters, no change in the harmonics could be detected down to –70dB, the limit of measurement.

"The possibility of the phenomenon being power related was considered; the next step therefore was to replace the attenuator with a Hewlett-Packard 778D 20dB wideband directional coupler feeding a dummy load, and to couple the forward signal with harmonics, via the 30dB attenuator to the spectrum analyser. The same answers were obtained at 100W, so the next step was to switch in a power amplifier. At 500W, results remained the same. It was not until the forward power was over 900W that any harmonics caused by the SWR meters could be seen. Even then, only the Labgear E5049 and the Asahi-Sangyo showed any signs of harmonic generation: at 1kW, the harmonic production was about –60dB relative to carrier.

"In a well-matched system, there is no reverse power, and so there should not be any current flowing in the diodes; therefore there should be no harmonics generated. The Asahi-Sangyo meter has two coupling lines – one for forward power and one for reverse power, so the problem in this case is probably produced in the forward detector. However, the instrument is rated for only 100W, and the resistors terminating the pick-up line object violently to 1kW through the device for more than a few seconds. The Labgear E5048 was designed for an 80Ω system, and so was indicating a 1.5:1 SWR. It too is not rated for 1kW and, fitted with Belling-Lee style TV connectors, is quite capable of producing harmonics in the connectors at this power level.

"A works colleague, G8WKS, told me that he once had problems at the –75dB level on a professional VHF transmitter, so the performance of the IC251 was examined. The third harmonic was –68dB relative to carrier, and no change was found when the built-in SWR bridge was disabled.

"The possibility that the effect occurs only when feeding an antenna, which will not offer a good match at the harmonic frequencies was investigated. Again, no harmonic generation observable!

"What conclusions can be drawn? The evidence does not support the original, widely-held premise insofar as the only SWR meters found to produce detectable harmonics were being run a long way outside their power ratings at levels which are illegal in the UK.

"So does an SWR meter need to be followed by a low-pass filter? It does not appear to be so, although the filter itself is probably useful as a precaution against causing interference with low-band private-mobile-radio (PMR) users. Sharp cut-off filters, such as elliptic function or Chebyshev types may well produce an in-band SWR of their own that is high enough to cause confusion when an antenna is being trimmed to resonance, so placing the SWR bridge prior to the filter can be misleading. So much for sacred cows!"

D-I-Y POLYSTYRENE SOLUTION

GRAHAM THORNTON, VK3IY, in *Amateur Radio*, April 1993, p20 shows how to 'Make your own polystyrene solution'. He writes:

"Those of us who can remember the good(?) old days of coil winding will recall the use of polystyrene coil dope. This was used to provide a low-loss sealant and to keep the turns secure. If you want to get a strange look from your component-store salesman, ask for some! However, all is not lost – it's quite easy to home-brew.

"There is an abundance of waste expanded-polystyrene in the environment, ie 'styrofoam'. This dissolves readily in ordinary turpentine. The fizz given off is the release of normal hexane used to expand the polystyrene (beware – inflammable). It takes quite a volume of this material to make a little solution. The polystyrene is not soluble in every component of the turps. The end result is a two-layered solution. The viscous lower solution is the desired result. Simply pour off the supernatant liquid. (No need to waste it – it's still useful turps.)

"It can be applied with a small brush. It seems to take overnight to dry. The same material can be used to make castings for insulators, if desired. Dowelling spreaders, dried in the oven, and painted with this solution, are excellent for transmission lines, eg 'open-wire' tuned feeders."

HERE & THERE

QST (MAY, 1993) REVIEWS a recently published 124-page paperback book 'Heath Nostalgia' by Terry Purdue, K8TP that brings together a number of recollections by former employees of the Heath Company whose decision last year to withdraw from the Amateur Radio kits market was noted nostalgically in 'Goodbye Heathkit – Farewell Leicester Square' (*TT*, November 1992, pp44-45). The review reveals that the original founder, Ed Heath, had no particular interest in electronics but was intensely interested in aviation, founding the 'Aerial Vehicle Company' in Chicago – later renamed the Heath Airplane Company which sold airplane kits, parts and ran a flying school.

Ed Heath was killed in a plane crash in 1931; the new owner moved into the electronics field after WW2 and the first kit was the OT-1 five-inch oscilloscope. Heath's second owner, however, was also killed in a plane crash, and his widow ran the firm until it was acquired by Daystrom Inc in 1955, a year after the entry into the ready-to-build Amateur Radio kit market, becoming for over 30 years the world leader in electronic kits.

Two letters from Holland – from Dick Rollema, PA0SE, and Jaap Dijkshoorn, PA0TO – express surprise that I had never come across transformer-type temperature fuses in practice (*TT* Sep '92). PA0SE recalls similar fuses being used by Van der Heen, an electronics firm in the Hague, for which he used to work until the firm was taken over by Philips in 1967.

PA0TO also recalls that many such transformers were fitted in broadcast receivers made by Philips. He writes: "In the late-1940s and 1950s, the purchase of new power transformers threatened to ruin my schoolboy's pocket-money. So on the days when people put out their rubbish for collection, a schoolfriend and I would ride through that part of The Hague where a refuse collection was due. We looked for thrown-out radios made by Philips at Eindhoven since this firm used temperature-fused power transformers in many of their sets.

"We looked for sets where the temperature-fuse had 'opened' and then set about removing the transformer and any other components that we felt might be useful. For we had discovered that often in the discarded sets it was the thermal fuse that had blown, not the transformer. We simply connected the AC mains to one end of this fuse and another power supply could be built – with much saving of pocket-money! ***G3VA***

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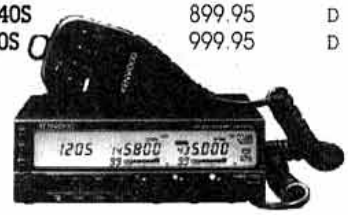

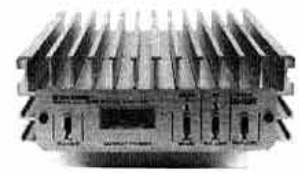

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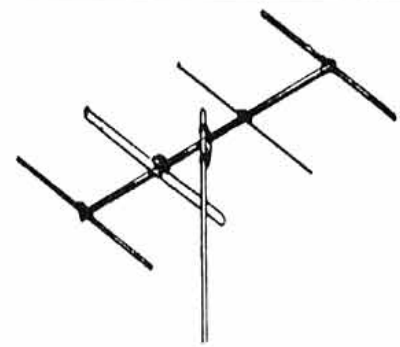
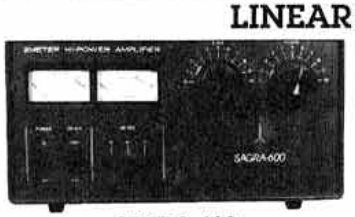
12XY/70	Crossed Yagi 12 element, length 2.6M 12.0dBd	91.77	C



LINEAR AMPLIFIERS



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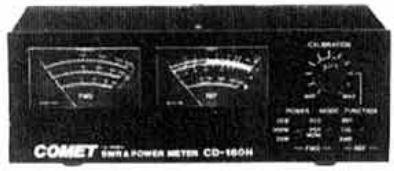

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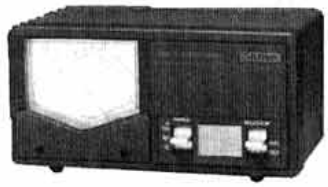
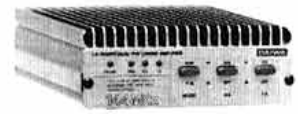


DIAWA PRODUCTS



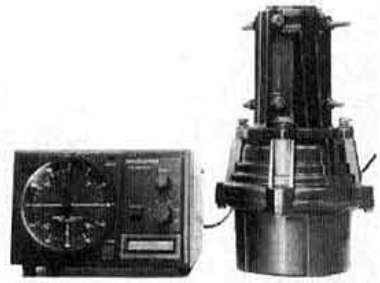
			£	✉
PS120MK2	PSU	3-15V Variable 9A/12A	69.95	D
PS120MIIA	PSU	3-15V Variable 9/12A	79.95	D
PS14011A	PSU	13.8V 12/14A	69.00	D
PS304	PSU	1-15V Variable 24A/30A	129.95	D
RS40X	PSU	1-15V Variable 32A/40A	189.00	D
LA2080H		2m 1.5-5W in 30-80W out	159.95	B
DLA80H		2m/70cm 0.5-25W input auto select 80W 2m 60W 70cm out	385.00	C

ANTENNA ROTATORS

		£inc VAT	✉
G-250	Yaesu Bell type Twist and switch control	109.00	C
G-400RC	Yaesu Bell type Round meter 360 degrees	239.00	D
RC5-1	Create Bell type Round meter 360 deg. vari speed	255.00	C
RC5-3	Create Bell type 360 deg. vari speed + preset	319.00	C
G-600RC	Yaesu Bell type Round meter 360 degrees	329.00	C
RC5A-3	Create Bell type 360 deg. vari speed + preset	625.00	C
RC5B-3	Create Bell type 360 deg. vari speed + preset	939.00	C
G-800SDX	Yaesu Bell type 450 deg variable spd 43-90 sec/rev	395.00	C
G-1000SDX	Yaesu Bell type 450 deg variable spd 43-90 sec/rev	435.00	C
G-2700SDX	Yaesu H/D 450 deg vari speed 50-120 sec	819.00	E
G-400	Yaesu Bell type Meter control +/- 180 degrees	199.00	C
G-500A	Yaesu Elevation Meter calb +/- 90 degrees	245.00	C
G-5400B	Yaesu Azimuth & Elevation Dual Controller	469.00	C
G-5600B	Yaesu Azimuth & Elevation Dual Controller	539.00	D

ROTATOR HARDWARE

GS-050	Rotary Bearing Takes 1⅛" mast	23.95	B
GS-065	Rotary Bearing Takes 2" mast	38.50	B
GC-038	Lower Mast Clamp for G-400, 600, 800, 1000	22.00	B
CK46	Rotary Bearing 1.5" – 2.5" mast	53.95	B
MC1	Lower Mast Clamp for RC5 series	54.50	C



SPECIAL OFFERS

430/726	70cm unit for FT726R	£169.00
144/726	2m unit for FT726R	£139.00
50/726	6m unit for FT726R	£139.00
358 70cm 3 x 5/8 mobile		£15.95
268E 70cm mobile colinear		£16.00
SQ144 2m directional vertical		£49.00
UHF 2 channel xtal TX Boards from Yaesu FTC1044 10W		£49.00

All ✉ C

✉A= £2-00 ✉D= £12-50
✉B= £5-00 ✉E= £16.50
✉C= £7-50

HANDHELDS

			✉
FT26	2m	£289.00	B
FT76	70cm	£315.00	B
FT415	2m	£325.00	B
FT815	70cm	£349.00	B
TH28E	2m	£289.95	B
TH48E	70cm	£329.95	B

DUAL BANDERS

FT530	£529.00	C
TH78E	£469.95	C
ICW2/E	£449.00	C
ICW2/ET	£479.00	C

FT747GX

Yaesu FT-747GX – 100W – 160-10M SSB/CW base or mobile transceiver with 100kHz–30MHz receiver and opt. FM transmit/receive. Dual VFOs, 20 multi-function memory. Scanning with lockout. Main tuning knob or scanning mic up/down frequency entry. RIT, narrow CW filter. AM filter, attenuator blanker, squelch, CAT system bus for PC control. 12V DC@ 20A.
3¼"h x 9⅛"w x 9½d, 7lbs.

£875

FT1000

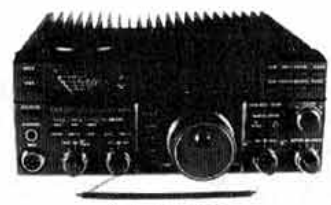
Yaesu FT-1000 – 200W – 9-band, all mode HF transceiver with 100kHz–30MHz receive, 99 memories and built-in antenna tuner with memories. Knob or direct keyboard entry. Simultaneous dual receive with two tuning knobs, balance and dual displays; optional crossband dual receive. Digital Voice Storage option. Antenna selector, electronic keyer. Cascaded filter selections., width control, IF shift, notch, squelch, blanker, CW audio peak filter. Built-in AC ps 6"hx16"wx15"d 58lbs.

£3695

FT990

Yaesu FT-990 – 100W – all mode 160-10M HF transceiver with 100kHz–30MHz receiver, 99 tunable/scannable memories and built-in antenna tuner w/memory. Dual VFOs, digital IF shift/notch filters, speech processor. Special provisions for CW, RTTY, Packet. Digital Voice Contest option. Built-in AC ps.
12⅜"w x 4⅛"h x 11½d, 30lbs.

£2399 DC model £2149



FT890

Yaesu FT-890 – 100W – 160-10M all mode transceiver with 100kHz–30MHz receiver. Two independent A/B VFOs for each band (20 total) hold freq/modes, clarifier offsets and repeater shifts. 32 memories store all data for both VFOs. Blanker, all mode squelch. RF speech processor, built-in iambic keyer. Optional internal auto antenna tuner. 13.5VDC @ 20A.
9⅜"w x 3½"h x 9½d, 12.3lbs.

£1375

0246) 453340
Whittington, Chesterfield

Birmingham 021-327 1497
504 Alum Rock Road, Alum Rock, Birmingham B8 3HX

Axminster (0297) 34918
1 Western Parade, West Street, Axminster, Devon EX13 5NY

PRODUCT NEWS

Note: Product news is compiled from press releases sent in by the manufacturers and distributors concerned. Details are published in good faith but *Radio Communication* cannot be held responsible for false or exaggerated claims made in the source material.

"THE FIRST TRI-BAND handheld FM transceiver ever produced for general sale", has been announced by ICOM (UK). **The IC-delta-1E** covers the 2m and 70cm bands, plus all of the 23cm band. The manufacturers claim many advantages over dual band transceivers, which have now become quite common. For example, simultaneous three band monitoring and reception, independent dial and volume control for each band, incremental tuning on the 23cm band band and 78 memory channels. A very interesting feature of this rig is the facility for crossband double-duplex operation. This enables the operator to transmit on one band and receive on two others simultaneously.

Icom have also announced the **IC-X21ET** dual band handheld for 70cm and 23cm. This one also has receive capability on the 2m band for full-duplex crossband working. The radio has an optional whisper function which provides full crossband operation while reducing the speaker audio to a 'telephone like' level and activating a special microphone in either the BP131 or BP132 battery pack. Thus operation of the transceiver becomes similar to that of a portable telephone.

Further details on these handhelds from Icom (UK) Ltd, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 741741.

McKNIGHT FORDAHL manufacture and market a wide range of high grade **Crystal Oscillator Modules**, for a multitude of applications. The have recently released what they believe is the first voltage controlled crystal oscillator in a true surface mount package. Applications include telecomms, phase locked loop designs etc.

Other VCXOs are available with up to +/- 150ppm pulling range and low power consumption, for frequencies from 2MHz to 45MHz. For regular prototype crystals, McKnight offer either a five-day service, or same-day for orders received before 10am.

Contact McKnight Fordahl Ltd, Hardley Industrial Estate, Hythe, Southampton SO4 6ZY. Tel: 0703 848961.

MOST PACKET RADIO operators will be familiar with the name Siskin Electronics. The company's **Digital Radio Products Catalogue No 8** is now available. They also have the excellent **KaGOLD and PKGOLD** software from Interflex USA, for DOS or Windows 3/3.1. KaGOLD is suitable for all Kantronics units and is claimed to outperform easily Kantronics own Hostmaster program. Features include any HF text mode plus VHF packet on screen at the same time; also conferencing, Yapp transfer protocol (FBB method), built in log book, DX cluster support and online TNC help. PKGOLD is a similar program with versions available for the PK88, PK232, PK900 and DSP1232/2232. Demo versions are available at £2.50 – Please state disk size.

Contact Siskin Electronics at 2 South Street, Hythe, Southampton SO4 6EB. Tel: 0703 207155/207587.

NEVADA STOCK a range of **CQ Communications Video Tapes** dealing with various aspects of amateur radio. The titles are 'Getting Started in Ham Radio', 'Getting Started in Packet Radio', 'Getting Started in Amateur Satellites', and 'Getting Started in DXing'. The series is written and produced by Rich Moseson, N2WL, and although intended primarily for the US market there should be much of interest for clubs, schools or individuals.

Further details from: Nevada, 189 London Road, North End, Portsmouth, Hants PO2 9AE.

A NEW SERIES OF pulse generators has recently been added to the already extensive range of test equipment from Levell Electronics. Two models the **Levell 233 and 240** are available, each with a claimed frequency range of 0.5Hz to 50MHz. In fact the 233 is two pulse generators in one, with independent adjustment of repetition rate and pulse width. The outputs can be run separately, in parallel, in series or summed. Alternatively, one channel can be used as an oscillator to give an internal burst function. Independent adjustment of rise and fall times is a feature of the single channel 240.

Levell Electronics Ltd, Technology House, Mead Lane, Hertford, Hertfordshire SG13 7AW. Tel: 0992 501231.

RADCOM EQUIPMENT REVIEW

Alinco DJ-580SP

2m/70cm FM Handheld

A user review by the *RadCom* team

SINCE ITS INTRODUCTION in the middle of last year the Alinco 580E has deservedly become one of the most popular of the dual band FM handhelds. Now a new version, the Alinco DJ-580SP is available, and the *RadCom* team took the opportunity of putting it through its paces.

FACTS AND FEATURES

A LOT OF ELECTRONICS is packed into the Alinco, and a glance at the circuit diagram reveals that the transceiver is more or less a 2m *and* a 70cm rig in one case. Although relatively light in weight, the radio has a nice solid feel to it.

Rotary squelch and volume controls for each band sit neatly on top of the rig, alongside the rotary tuning knob on the right. The VHF controls on the left were a little fiddly to adjust as they're very close to the antenna BNC socket.

The front panel LCD panel displays both VHF and UHF frequencies, and each band has its own S-meter. It also has information with regard to battery saver, repeater offset, scanning mode, and transmit power (high/medium/low). The display and push-buttons beneath it can be illuminated by a backlight if required.

Most of the front panel buttons are dual function, with the two larger ones at the top selecting the 'transmit' band. It is possible to listen simultaneously on both 2m and 70cm. The front panel keypad can be used for direct entry of the required frequency. However in normal operation this was rarely needed, as all mode and channel information is retained in memory when the set is switched off.

On the side of the rig (just above the PTT switch) is a shift button which is used in conjunction with those on the front panel. This makes it possible to enable or disable functions such as repeater offset, reverse repeat, scan modes and dual band operation.

EASE OF OPERATION

BEFORE USING THE transceiver, it was found worthwhile to program the required modes and channels into the DJ-580SP's 40 memory channels. Once this had been done, the transceiver was very easy to use.

The various scanning functions were found to be very handy, especially the ability to skip selected channels and prioritise others. There are enough memory channels for all UK repeaters in addition to the most common simplex channels, and both bands may be scanned simultaneously.

Continuous operation of the receiver and intermittent operation of the transmitter on the medium power setting, gave a useful period of about two hours before the batteries needed recharging. If the transceiver is scanning a number of unused channels then the battery saver function is useful. It will effectively switch the receiver on for 130mS during each period of 520mS.

Although the receive range extends outside the 2m and 70cm amateur bands, accidental out-of-band transmission is not possible with the Alinco.

Transceivers such as the DJ-580SP with dozens of facilities need a well written and easy-to-understand manual. The one supplied runs to 45 pages and explains the various operations in a clear step-by-step way, although we found the index a little confusing.

A remote speaker/microphone is available or for mobile use there is an optional headset with PTT/VOX.

CTCSS FACILITIES

THERE ARE A NUMBER of repeaters, mostly on 70cm, which operate with a Continuous Tone-Coded Squelch System in addition to the traditional 1750Hz 'beep'. A continuous low level tone is transmitted along with main signal, but as the frequency is below that of the speech it does not intrude at the receive end. CTCSS is particularly useful where it is possible (but not desirable) to receive or access two repeaters on the same channel. Repeaters in different areas of the UK use different CTCSS tones, and full details are given in the current *RSGB Call Book* or see *RadCom*, October 92 p8. Alinco have incorporated the encode/decode CTCSS facility as standard in the DJ-580SP, with the option of programming one of 38 tones for each channel.

CONCLUSIONS

THIS CERTAINLY looks a very attractive transceiver, with a comprehensive range of facilities. Receive sensitivity was particularly good on both bands, and audio quality excellent. A useful array of accessories are included in the package. Amongst these are a Ni-Cad battery pack (EBP-20N), AC charger, beltclip, carry strap and dual band 10.5cm antenna.

Compared to similar dual band rigs, the price is highly competitive and it seems that Alinco have come up with yet another winner!

The Alinco DJ-580SP is available, price £449.95 plus £7 p&p, from Waters and Stanton Electronics, 22 Main Road, Hockley, Essex SS5 4QS. Our thanks to them for the loan of the review model.

MANUFACTURERS SPECIFICATION

The following details apply to the European version.

Size	140 x 58 x 33mm
Weight	410g
Receive	AM 108–143MHz FM 130–174MHz FM 400–470MHz FM 810–950MHz
Transmit	144–146MHz 430–440MHz
Channel spacing	5,10,12.5,20 or 25kHz selectable
Receiver	Double conversion
Sensitivity	–15dBμ for 12dB SINAD
Transmit power	Approx 2W with standard EBP–20N battery Approx 5W with optional EBP–22N battery
Spurious emissions	Less than 60dB below carrier
Memory channels	40 total VHF and UHF plus 1 VHF and 1 UHF call channel
External DC supply	13.8V

BADCOM TECHNICAL FEATURE

Spread Spectrum in Action

The first of a two part article

by James A Vincent, BSc (Hons) CEng MIEE, G1PVZ

SPREAD SPECTRUM techniques are becoming increasingly common in today's radio communication products – they are incorporated in proposals for the latest cellular telephone systems and radio-based computer local area networks. Until quite recently the major Spread Spectrum modulation formats – frequency hopping and direct sequence – were only found in radio systems destined for use by the military and certain government departments. To begin with, I will attempt to demystify the subject and highlight the possibilities for the Amateur Radio Service. [This raises a number of licensing issues. More on this next month – *Ed*].

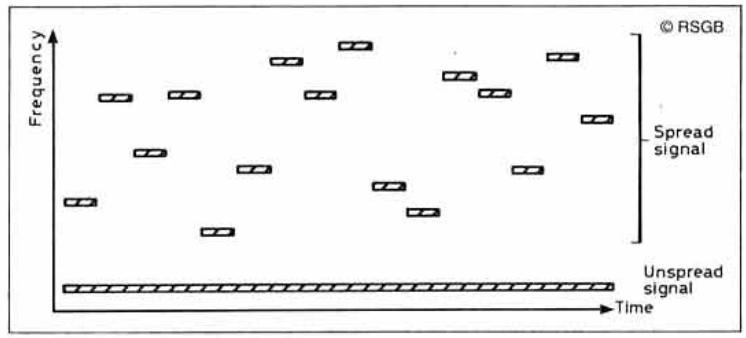


Fig 1: Example of the frequency hopping spectrum.

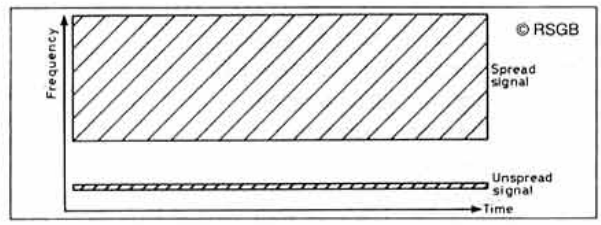


Fig 2: Frequency spectrum of a direct sequence tranmission.

WHAT IS SPREAD SPECTRUM?

MOST RADIO USERS, whether professional or amateur, are accustomed to minimising the radio frequency bandwidth they use in transmitting their signals. As a result there has been a move from double sideband to SSB transmission and an increase in data transmission techniques which utilise very narrow bandwidths. It is easy to visualise the advantages of a narrower bandwidth – more users can be accommodated in the same band and redundant sidebands (as in DSB) can be eliminated, permitting greater efficiency. The resulting narrower bandwidth reduces the noise (natural or man-made) at the receiver, thereby improving the signal to noise ratio. However, bandwidth expansion systems (such as wideband FM), benefit from an improved signal to noise ratio due to the modulation and demodulation process.

Spread spectrum systems use considerably larger bandwidths than conventional narrowband techniques to transmit the same information. Two criteria [1] for a Spread Spectrum system are that:

a) The transmitted bandwidth is much greater than the bandwidth or rate of the information being sent.
b) Something other than the modulation being sent determines the resulting transmitted radio frequency bandwidth.

The two major techniques used in such systems are frequency hopping (fh) and direct sequence (ds). Of the two, frequency hopping is perhaps the easiest to visualise.

CAUGHT ON THE HOP

IN A FREQUENCY HOPPING system the frequency or channel in use is changed rapidly. The transmitter hops from channel to channel in a pre-determined but pseudo-random sequence (see **Fig 1**). The receiver has an identical list of channels to use (the 'hop set') and an identical pseudo-random sequence generator to that of the transmitter. A synchronising circuit in the receiver ensures that the pseudo-random code generator in the receiver synchronises to the one in the transmitter.

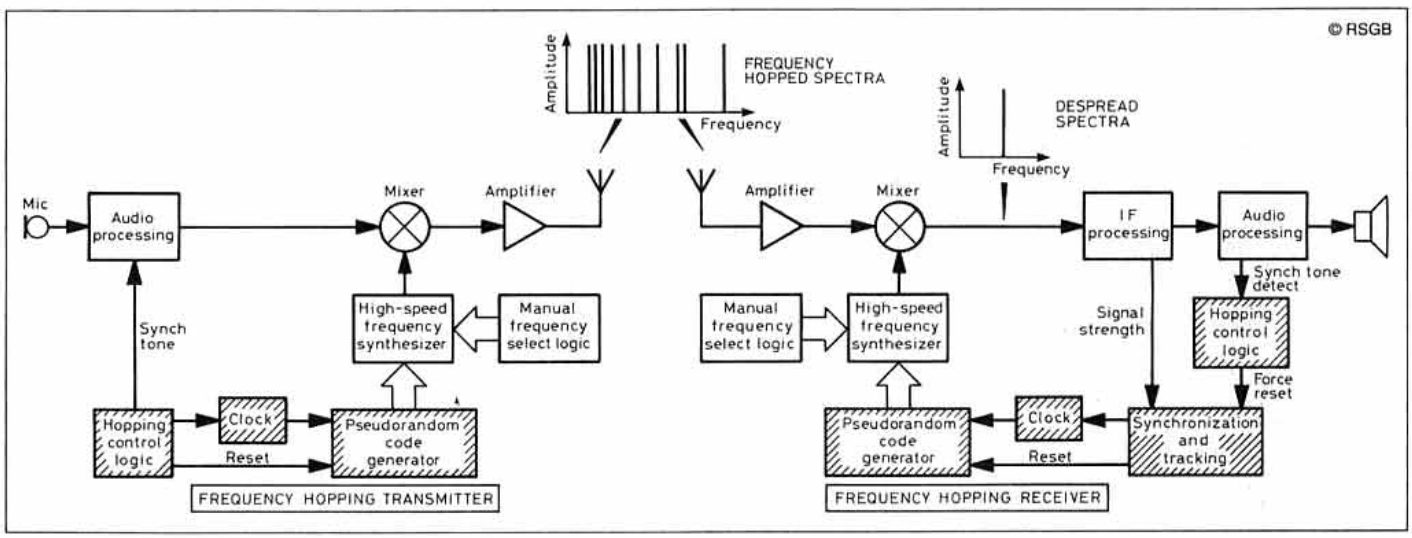


Fig 3: The block diagram shows how the frequency hopping receiver is a near mirror image of its associated transmitter.

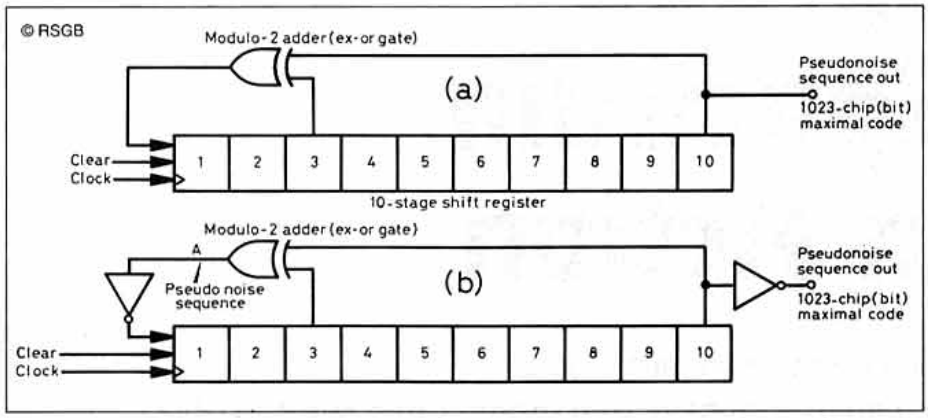


Fig 4: Pseudo-random sequence generator (a). The circuit at (b) avoids all-zero lock-up condition.

When the transmitter and receiver are synchronised the user is unaware that they are rapidly changing frequency. However should the receiver not be synchronised to the transmitter or a conventional receiver is used, nothing will be heard unless the transmitter hops onto the receiver's tuned frequency.

As a frequency hopping transmitter typically hops between tens and thousands of frequencies per second (the hop rate), the time it stays on a particular channel (the dwell time) is very short and as a result the signal would appear as a burst of interference.

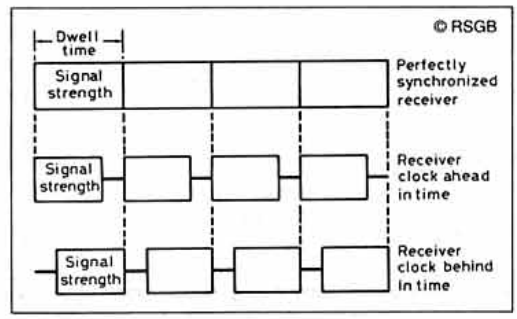


Fig 5: Synchronisation of the receiver results in uniform signal strength during the dwell time.

This can be likened to radio users operating to a rigorous schedule and operating only on particular frequencies at predetermined times. Such a system would use clocks synchronised to (say) GMT. Anyone wishing to join the net must have a list of frequencies to use and the time to use them, as well as a synchronised clock. Loss of any of these items will prevent communications and the same is true of a frequency hopping system.

DIRECT SEQUENCE ALTERNATIVE

THE OTHER MAJOR Spread Spectrum technique is known as direct sequence or pseudo-noise. In this technique a pseudo-random code phase shift keys the carrier, increasing its bandwidth (**Fig 2**). This is known as spectrum spreading. The receiver 'despreads' this wideband signal by using an identical pseudo-random code synchronised to that in the transmitter. As with the frequency hopper, the receiver must utilise a circuit to adjust its clock rate so that the receiver's pseudo-random code is at the same point in the code as the transmitter. A tracking circuit is necessary to maintain synchronism once it has been attained.

This brings us to a summary of the major advantages of the system. There must be major advantages in using Spread Spectrum, otherwise no one would utilise these techniques. It is obvious from the above that Spread Spectrum systems and particularly their receivers are considerably more complex than their narrowband counterparts.

MAJOR ADVANTAGES

THE MAJOR ADVANTAGES of Spread Spectrum can be summarised as follows:

a) Interference rejection.
b) Code division multiple access for multiple use of the same frequency.
c) Low power spectral density.
d) High resolution ranging.
e) Selective addressing.
f) Message privacy.

Spread Spectrum systems provide these attributes by virtue of their 'coded' carriers. The ability of these systems to reject interference, whether unintentional or deliberate jamming, together with their low power spectral density (ie Watts per Hertz) compared with a conventional narrowband transmitter, hastened their development by the military. They provided jam resistant, low probability of intercept (LPI) communication systems. In fact an early system was used during WWII to permit secure communication between Roosevelt and Churchill, [2]. As more information on Spread Spectrum techniques has come into the public domain there has been a rapid increase in civilian applications. The characteristics of Spread Spectrum are best examined after the techniques of spreading and despreading have been discussed.

FREQUENCY HOPPERS

A SPREAD SPECTRUM system can use conventional modulation such as FM, AM or their derivatives to modulate the carrier. Analogue modulation is most frequently found in frequency hoppers as FM voice or FSK data. FM is used rather than amplitude modulation as this ensures a constant power output rather than the varying power envelope produced by AM. A varying envelope signal reduces the covertness of the transmission (ie increases the probability of detection and recognition of the signal) which is naturally of great importance to the military user.

A frequency hopping radio has basically the same design as a normal transceiver (see **Fig 3**). However a few extra circuits (shaded in the diagram) are required. Most transceivers produced today use either phase-locked loop or a direct digital synthesizer [of course many now use both – *Ed*] to permit the users to select many operating frequencies without the complexity of a bank of crystals. The synthesizer of a frequency hopping radio is controlled by a circuit which selects a frequency according to either a pseudo-random sequence generator or a look-up table driven by a pseudo-random generator.

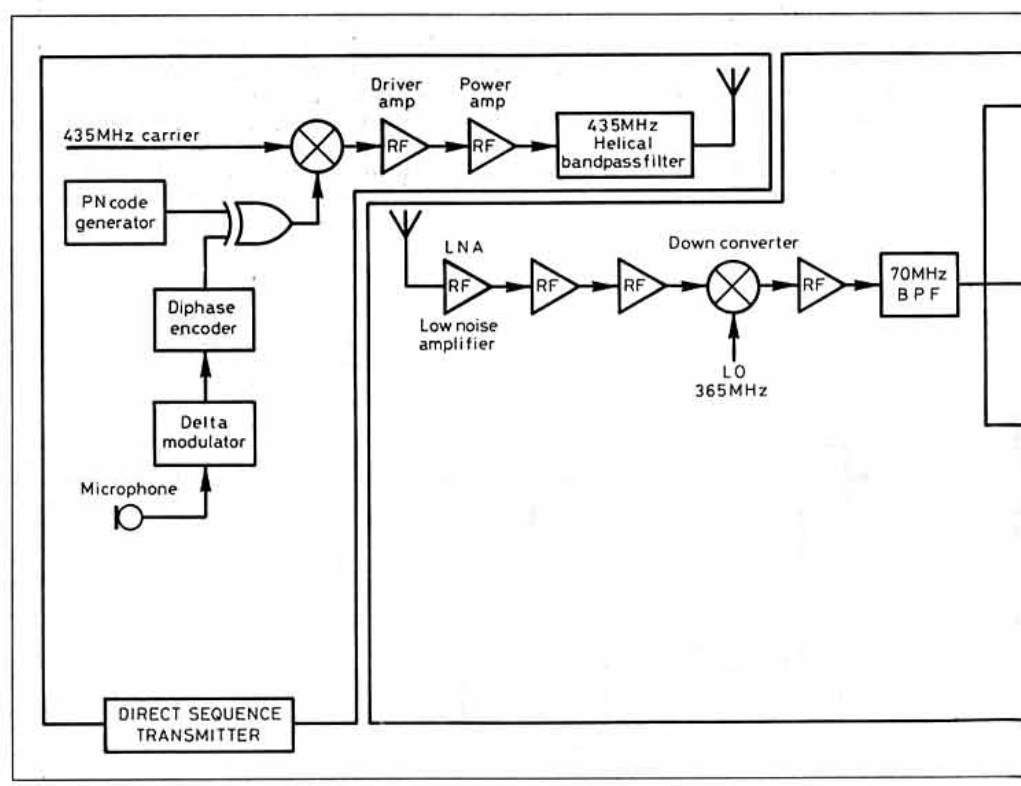


Fig 8: The Rx tracks the incoming transmission by using three IF channels in the despreading path.

In either case frequency selection is arranged such that the radio will hop from frequency to frequency in a pre-determined yet pseudo-random manner. The pseudo-random sequence generator is controlled by a very accurate timebase (usually a hi-stability quartz crystal oscillator) which determines the hop rate and consequently the dwell time.

SYNCHRONISED HOPPING

SO NOW WE HAVE a radio which has a frequency synthesizer capable of very rapidly changing frequency without spurious operation (not a trivial function!) and a pseudo-random code generator which determines the frequency to be used. The receiver needs to follow the transmitter's rapid hopping from one channel to another. The circuitry for the frequency synthesizer and pseudo-random generator are duplicated in the receiver.

We have to ensure that the transmitter and receiver start on the same point in the hop sequence and remain synchronised, such that on each hop the receiver and transmitter are tuned to the same frequency. Once the Tx and Rx are synchronised a 'tracking' circuit in the receiver is brought into operation to ensure synchronism is maintained. This ensures that the receiver clock tracks any frequency change or drift in the transmitter clock frequency.

How is synchronization between transmitter and receiver initially achieved? Firstly, we have the problem of ensuring that the pseudo-random code generators are both starting from the same point in their code sequence (which determines the frequency for communication) and secondly that the receiver and transmitter clock oscillator are of the same frequency and phase. The pseudo-random generator is usually configured from a shift register and a number of exclusive-OR (EXOR) logic gates (see **Fig 4**). The shift register can be reset by a logic level such that all its outputs are forced to a preset logic level. After this reset or clear command the pseudo-random code generator can produce its code sequence from a defined state.

In a commnly used synchronization technique, a synchronization signal (an audio tone or a digital sequence) is sent on a control or 'home' frequency. When this signal is received all hopping radios in the net have their pseudo-random generators and code clocks reset simultaneously. Thus each synthesizer will be tuned to the same frequency determined by the pseudo-random code generators and their clocks will cycle through the pseudo-random hop sequence in unison. The clocks in the transceiver need to be accurate and stable so that they do not rapidly lose synchronization with each other.

For hop rates in the order of tens to hundreds of hops per second, high stability quartz crystal oscillators can be used. The tracking circuit compares the signal strength of the dehopped (despread) signal over the dwell time. If the receiver is exactly synchronized (see **Fig 5**) then the signal strength is constant in amplitude over the whole of the dwell time. If the receiver clock is ahead of the transmitter (ie the receiver retunes to the next frequency in the hop set before the transmitter does) then the signal strength will be high then low over the dwell time. The opposite is true if the Rx clock is slower than that in the TX.

Thus by comparing the signal strength at the receiver over the dwell time a control loop can be made to either advance or retard the receiver's pseudo-random clock. This in turn ensures that the receiver stays in synchronism with the transmitter.

If the signal path is obscured for a short period, it is possible that with high stability code clocks in the transmitter and receiver the system could remain synchronised. If synchronism is lost however, the users must force their system to the home or control channel and re-synchronise using the synchronization tone-sequence.

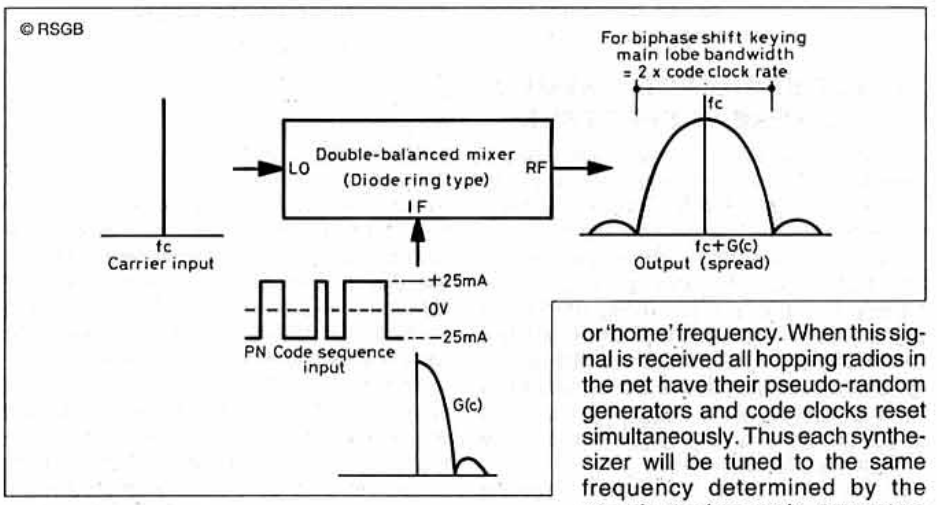


Fig 6: Direct sequence modulation using a double-balanced diode ring mixer.

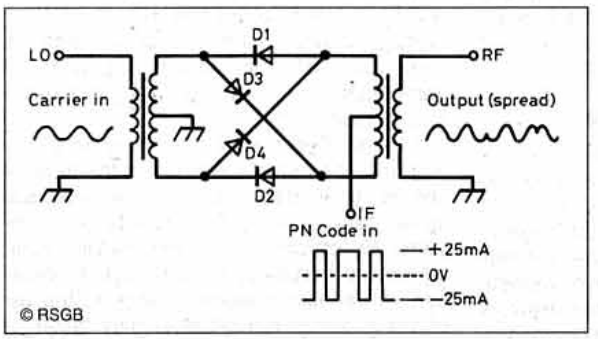
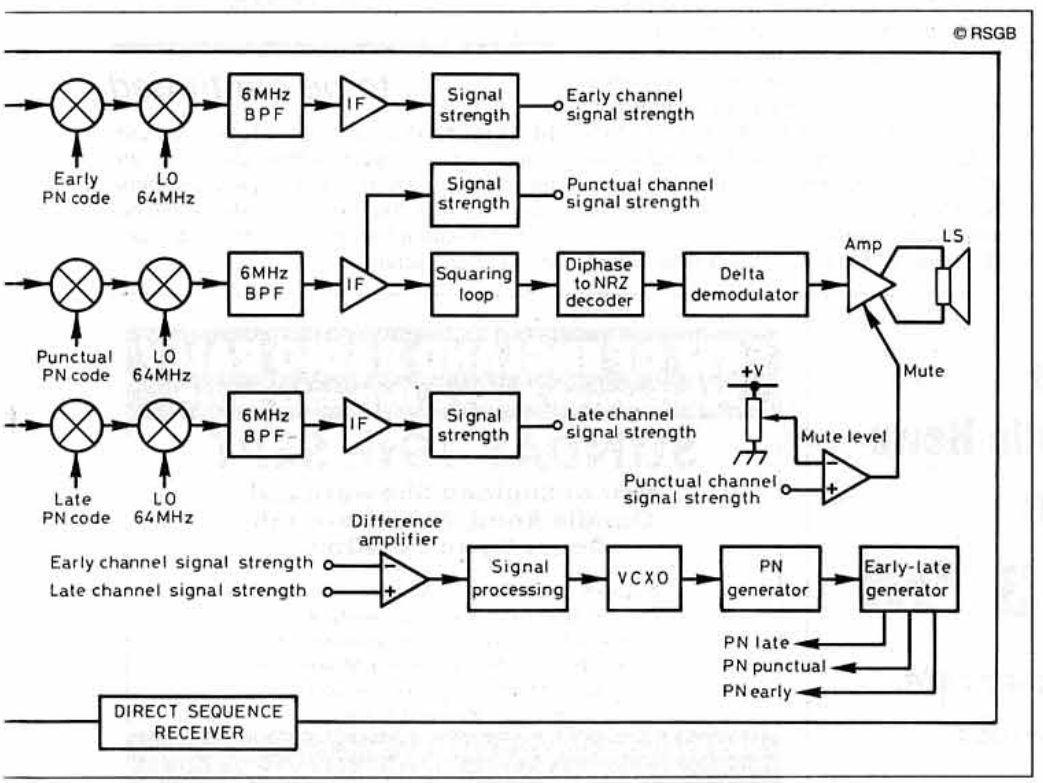


Fig 7: The mixer output is a series of symmetrical sidebands.



CHOOSING YOUR CLOCK

IT IS POSSIBLE to use clock signals obtained from an external source which can be easily disseminated to all users – this avoids the need for individual clock circuits in each frequency hopping transceiver. Such accurate clocks exist in the signals from Navigational Satellites such as the GPS/Navstar system and in the colour-burst synchronization signals in television signals [3].

Of course, the transmissions from a standard frequency and time station such as MSF at Rugby could also be used. With an external clock system the advantage of no longer needing clock and tracking circuitry is coun-

tered by the need for an additional clock signal receiver for both the Rx and Tx.

DIRECT SEQUENCE (PSEUDO-NOISE) SPREAD SPECTRUM

A DIRECT SEQUENCE transmitter uses a pseudo-random sequence generator to phase shift a carrier (see **Fig 6**). Typically, a direct sequence system will use a double-balanced mixer (DBM) to switch a carrier between 0° and 180° (0 and Pi radians). This is also known as biphase-shift keying (BPSK) or sometimes phase reversal keying (PRK). Unlike a frequency hopping transmitter where the pseudo-random sequence commands a synthesizer to change frequency, the direct sequence signal is directly generated by the pseudo-random sequence.

In the generation of a double sideband signal with a double balanced mixer, the audio signal is applied to the IF (intermediate frequency) port. The carrier to be modulated is connected to the LO (local oscillator) input, and the amplitude modulated carrier extracted from the RF (radio frequency) port.

DIGITAL MODULATION

WHEN A DBM IS USED as a biphase modulator the digital modulating mode is applied to the IF port. Rather than the analogue sinusoidal signal in the previous DSB example the digital pseudo-random code switches between a negative and positive voltage. This alternately sources and sinks current as shown in **Fig 7**. The result is that diodes D1, D2, D3, D4 alternatively switch on and off causing a 180° phase reversal in the carrier signal. The output spectra is not like the DSB case with a pair of sidebands (upper and lower). Instead it is a series of symmetrical sidebands which have a $((\text{Sin } x)/x)^2$ distribution due to the many frequency components of the pseudo-random sequence.

As the spreading code has a pseudo-random character the occurrence of a particular frequency component is pseudo-random in time and the direct sequence output appears and sounds like noise when demodulated on a narrowband receiver. As a result direct sequence spread spectrum is also known as pseudo-noise modulation. If we assume that the receiver's pseudo-random code is synchronised to the transmitter's then the despreading process is identical to the spreading process.

CODE MODIFICATION

WITH ANALOGUE MODULATION on a direct sequence carrier anyone can recover the modulation without previous knowledge of the pseudo-random spreading code either by simply tuning to one of the spectral components, if close to the transmitter, or by using a system that squares the direct sequence signal. This produces a pure carrier at twice the centre frequency of the direct sequence signal (the mathematically minded reader is referred to [4]). A technique frequently used to modulate direct sequence signals with data is known as code modification.

With code modification the data or digitised speech is EXORed with the pseudo-random spreading code. This has the effect of inverting the code if the data is '1' or leaving the pseudo-random spread code unaffected if it is 'O'. At the receiver the unmodified code despreads the direct sequence signal to produce a narrowband signal which is still biphase shift modulated but this time with the data or digitised speech. This signal can then be demodulated by a conventional biphase shift demodulator such as a squaring or Costas loop demodulator.

The recovered data can then be either output to the outside world or in the case of speech converted back into an analogue speech signal using a suitable D to A converter. Synchronization is achieved in a similar way to frequency hopping synchronization. A variable frequency clock in the receiver is set to run either slightly faster or slower than that in the transmitter. At a particular instant the faster (or slower) code in the receiver will match (correlate) with the transmitted pseudo-random sequence and the spread transmitted signal will be despread into a narrowband signal (containing the data).

DATA DECODING

THE SYSTEM WILL DETECT this synchronization and engage a tracking circuit to ensure that the receiver code clock tracks any frequency change in the transmitter's clock. One technique (delay-locked loop) uses three receiver intermediate frequency channels in the despreading path. An on-time or punctual pseudo-random code is used for signal recovery, but for tracking an advanced early code (ahead of the punctual code) and a retarded late code are utilised.

The early and late codes are each offset from the punctual code by a fraction of a code bit (chip). For optimum performance this offset is one half a chip. After the signal is despread the energies of the despread signals in the early and late channels are compared. If they are identical the receiver code clock is running at the same frequency as the code clock at the transmitter (neglecting doppler and propagation delay effects).

If more energy is detected in the late channel compared with the early one then the receiver code check is running too slow and must be advanced. This information is part of a control loop which either increases or decreases the frequency of the receiver's code clock – often a high stability voltage controlled crystal oscillator. **Fig 8** shows a typical implementation of a delay-locked loop receiver and a companion direct sequence transmitter.

REFERENCES

[1] *Spread Spectrum Systems Second Edition*, Robert C Dixon, Wiley Interscience, ISBN 0-471-88309-3.

[2] 'Cryptology and the Origins of Spread Spectrum', David Kahn, *IEEE Spectrum Magazine*, September 1984.

[3] 'Practical Spread-Spectrum: A Simple Clock Synchronization Scheme', André Kesteloot, N4ICK, *QEX*, October 1986 (Also in the *ARRL Spread Spectrum Sourcebook* p8.27 to 8.30).

[4] 'Appendix 4 – Multiplication of Direct Sequence Signals (p 390 & 391)', *Spread Spectrum Systems*, 2nd Edition, Robert C Dixon, Wiley Interscience.

A list of other useful publications for those interested in this form of communication will be included next month.

. . . to be continued

NEXT MONTH: In the final part of this feature, James Vincent gives further details of the techniques used in Spread Spectrum transmissions. Also the results of trials carried out on the amateur bands with a practical communication system.

RADCOM TECHNICAL FEATURE

Multi-Band Phasing Transceiver

The final part of an article by John R Hey, G3TDZ

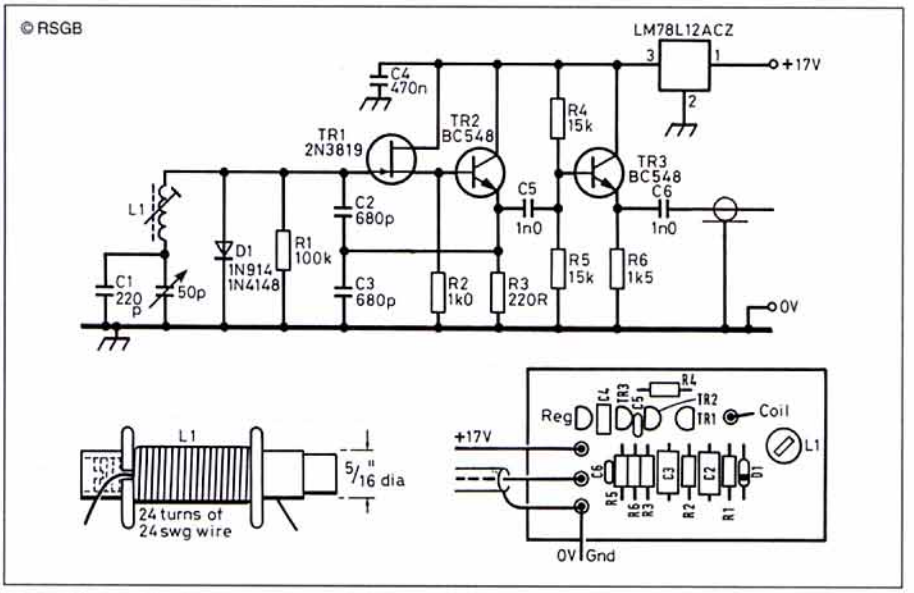
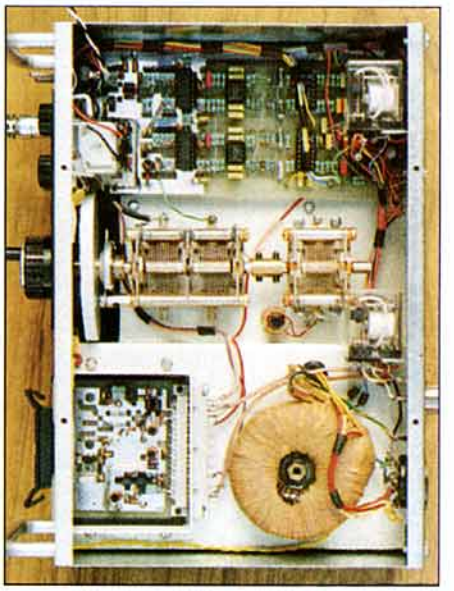


Fig 6: This combined FET and bipolar VFO is electrically and mechanically stable.



Top view of the transceiver.

THE VFO HAS TO BE both electrically and mechanically stable and produce the required signal level for its purpose. A simple compound FET and bipolar oscillator followed by a bipolar buffer is shown in **Fig 6**, together with its board artwork and component plan. The circuit has its own voltage regulator; resistors are metal film and the frequency determining capacitors must be polystyrene types. The coupling capacitors can be cheap ceramic disc.

The coil has 24 turns of 24SWG enamel wire on a $^{5}/_{16}$in former, with iron dust slug. An Aladdin type or one taken from an old CTV convergence board is fine.

Keep the turns tight; the TV types tend to have slots in their end collars which makes finishing off easier. RS varnish is excellent as a finish and seems to have a neutral dielectric effect.

One dodge when mounting the VFO board is to cut a rectangular hole in the chassis deck under the tuning gang to allow the VFO components to poke through whilst using the same bolts to fasten both tuner and VFO board. Mount the coil close to the board and rear tuning gang section. Thin coaxial cable such as RG174 should be used to couple the VFO output to the receiver and transmitter boards. Use two cables: don't simply loop round!

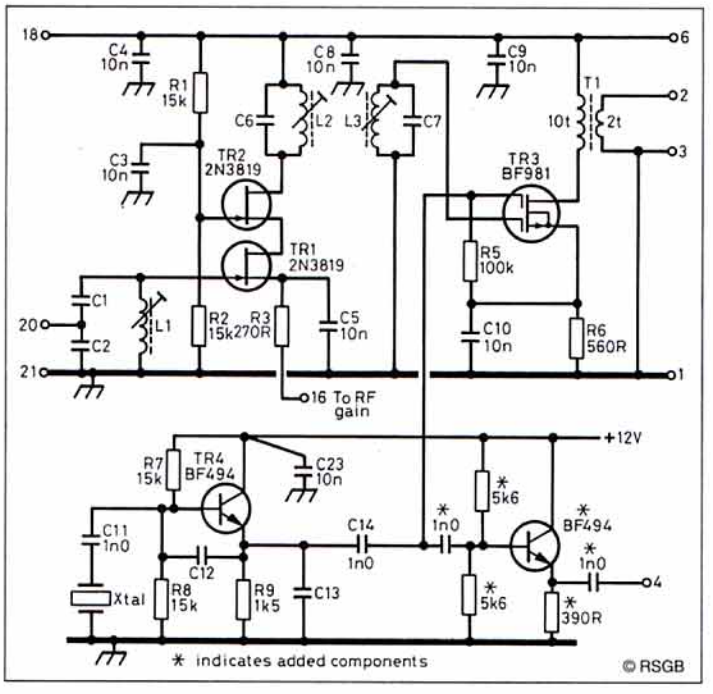


Fig 7: The converter circuit, now showing the extra buffer stage.

PREPARING THE CONVERTERS

UNUSED HOLES AND TRACK will have already been noticed in your converter boards. A buffer transistor such as a BF494 with two 5k6 resistors and one 390R, plus two 1n coupling capacitors should be fitted as shown in **Figs 7** and **8**. Now the transmitter has all its drive requirements. Note that compared with the White Rose receiver [1], the frequency of the conversion oscillators has been changed on 80m and 40m to avoid strong spurious signals. An unfortunate consequence of this change is that the tuning drive operates in reverse on these bands and the sideband switch needs to be set to USB in order to function on LSB. Coil winding data and crystal oscillator values are shown in **Table 1**.

THE POWER AMPLIFIERS

TO AVOID DIFFICULT BAND switching, the receiver converters were made to be plug-in; similarly the transmitter power amplifiers have the same DIN41617 plug and socket ar-

rangement. A single tuned circuit selects the required band and is fed to its hot end via a small capacitor. A two-stage amplifier (**Fig 9**) produces about 5W; this pleases the QRP fraternity, and allows sufficient drive for a linear amplifier. The first stage uses the popular 2N3866, and as this is operated at a fairly high current, a push-on heat radiator is essential. Parallel feedback and resistive damping ensures good linearity.

This stage is transformer coupled to the push-pull PA stage with an iron dust tube. Once through the ring is considered one turn; once round again is two turns. Each secondary winding has but a single U loop; the primary having 4 turns. **Do not exceed these turns 'for luck'!** The output transistors were originally MRF475, but the 2SC1969 from your nearest friendly CB shop proved to be a much better choice, and half the price.

The DC working point bias is set by adjusting VR5; a quiescent current of 14 - 20mA is about right, but will be set more accurately using a two-tone test later. Heat sinks for the power stage are made by bending a 0.75in strip of, say, 14 gauge aluminium into a flat bottomed U. Black VHT paint seems to work well, but a small patch should be left clear so that the temperature sensing transistor TR5 can be super-glued to it once assembled. The DC coupled circuit TR5, TR6 maintain the bias point of the PA pair TR3, TR4 excellently.

The output transformer consists of four iron dust tubes which may be held together with masking tape. Each primary has one loop only of 24SWG enamel; the secondary has four turns. With a 12V supply, the theoretical output is 4.8W, but due to the low-pass filter having a Chebychev characteristic, the output voltage can be higher than that developed across the secondary. On 80m and 40m, powers of 7W have been recorded. As expected, power falls off as the frequency is increased. On the three higher bands, C51 is added which gives a boost in output; this is not fitted in the two lower bands.

The low-pass filter inductors are T50-2 and T50-6 toroids, which are readily available and not too expensive. A characteristic of the filter is that it has two rejection notches at the second and third harmonics. The actual turns have been rounded to full turns and the capacitors recalculated. Luckily in most cases these are off-the-shelf values; low k ceramic plate types are satisfactory. Where the value has to be arrived at by parallel capacitors, provision has been made on the PC board.

Insulation washers are not necessary below the power transistors as a clear patch has been allowed on the board upper surface.

	160	80	40	20	15	10
L1,L2,L3	63t 40SWG	44t 40SWG	31t 36SWG	22t 30SWG	14t 28SWG	12t 26SWG
C1,C6,C7	390p	220p	120p	56p	39p	27p
C2	3n3	1n8	1000p	470p	330p	220p
C12	120p	100p	82p	120p	82p	68p
C13	180p	150p	120p	180p	120p	100p
Xtal	8MHz	10MHz	13.3MHz	8MHz	15MHz	22MHz

Table 1: Component values for the converters.

	160m	80m	40m	20m	15m	10m
L6	63t 40SWG	44t 40SWG	31t 36SWG	22t 30SWG	14t 28SWG	12t 26SWG
C36	390p	220p	120p	56p	39p	27p
C37	1n5	1000p	470p	220p	150p	100p
C45	56p	68p	100p	56p	39p	27p
C46	1000p	470+68p	270+100p	180p	100+15p	47+18p
C47	100+39p	68+10p	27+3.9p	15p	10p	8.2+2.7p
C48	2000p	1000p	680p	330p	180+27p	100p
C49	330+27p	180+33p	39+39p	39p	15+15p	33+22p
C50	1000p	330+120p	330p	120+39p	100p	39p
C51	not fitted	not fitted	not fitted	330p	330p	330p
L7	33t T50-2	23t T50-2	19t T50-2	15t T50-6	12t T50-6	9t T50-6
L8	31t T50-2	21t T50-2	18t T50-2	14t T50-6	11t T50-6	8t T50-6

toroids L7, L8 are wound with 24SWG enamel.

Table 2: Component values for power amplifier modules.

WIRING AND CONSTRUCTION

THE INTER-CONNECTIONS and the PSU are shown in **Fig 10**. To house the transceiver, the Maplin case XJ34M was chosen as this made a very neat job. Metal working details are given in **Figs 11, 12** and **13**. The receiver is mounted above the chassis platform and the transmitter below. With the tuning gang mounted on the centre line, there is just room to fit the receiver board on its left.

Small sized pots should be sought for volume and RF gain to allow the board to fit. Here again Maplin had these in stock. As described earlier, the VFO should be mounted on, or close to the tuning gang. Only the leads to the tuner should leave the board on its right. All signal and switching wires should be dressed to the board's left-hand side, gathered into a cable loom and brought to the front panel; this includes the meter wires and relay but the LS pair should be kept separate. Screened wire is not necessary.

A 12V 2A or 3A voltage regulator is fitted in the centre of the rear panel. Two 4-pole changeover relays are required. One should be mounted on the rear panel over the receiver audio stage (RL1) and the other mounted close to the SO239 aerial socket (RL2). It is responsible for receiver muting, T/R switching, and meter changeover. The bottom end of the RF gain control is taken via the relay before returning to chassis.

In the transmit position, this same contact pair shorts the audio input, either at the AF input or at R91 input. A pair of wires connect from the panel meter to RL1. On receive these connect to the meter terminals next to VR3; on transmit the meter is switched in the 12V supply line to pin 8 of the power amplifier board. A 0.2 or 0.22ohm WW resistor must be soldered across these contacts. the remaining set of relay contacts send the 12V supply to RL2. One side of the energising coil connects to the primary 12V; its return connects via an LED to the Mic socket.

RL2 is triggered by RL1. One set of contacts are aerial changeover whilst a second set earth the receiver input on transmit. The next relay contacts power the transmitter power board, a direct connection going to pin 18, the driver and control circuitry, with the connection to the PA going via RL1 meter switch. Fit a ferrite bead onto each of these wires close to the PA socket. The remaining set of relay contacts connect to any two-pin socket of your choice and are used to switch the linear amplifier if used.

Although more expensive, a toroidal mains transformer is strongly recommended to avoid mains field modulation of the VFO. The transformer will sit on the raised chassis platform, though there may be sufficient room below. A 3A bridge rectifier and 4700µ capacitor complete the power supply.

Fit an IEC mains input socket and a fuse holder into the rear panel below the raised chassis platform. Because there isn't enough room to fit a combined input filter socket, it has been found a good idea to slide a surplus two-hole balun core, found at rallies, onto the brown live and blue neutral mains wires close to the IEC socket, making sure the mains wires pass through exactly the same holes in the core to avoid magnetic saturation. Sleeve all mains connections with either rubber sleeves or heat shrink.

The supply wires to the VFO and receiver are taken directly from the 4700µ reservoir. The exciter and converter supplies, and the PA feed come from after the regulator.

The top of the RF gain pot is connected both to the nearby RF gain contact on the receiver board and across the chassis to pin 16 of the converter socket. This wire may be tied to the coax RF connection from converter to main board. Type RG174 coax is recommended for the interconnections between VFO, receiver and exciter, and exciter to PA.

When assembling, it is recommended the mains and power supply be wired first, right up to the regulator. Fit next the VFO and tuning gang, supplying the VFO board with both positive and negative directly from the reservoir. Power may now be applied and the VFO checked for oscillation.

A suitable dial drive might be a dual speed 6 + 36 epicyclic if these can be found. Alternatively, the ordinary 6:1 slow drive from Maplin should be fitted to the tuner shaft, then in front of this and fastened to the front panel

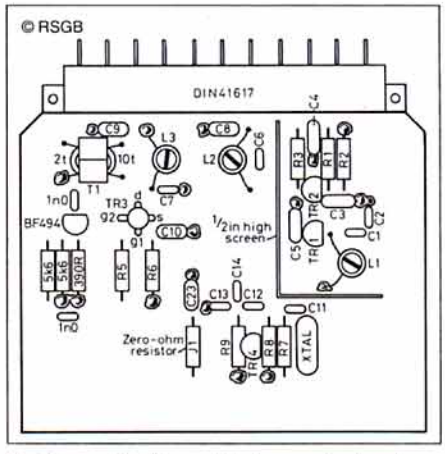


Fig 8: Layout of the modified converter board.

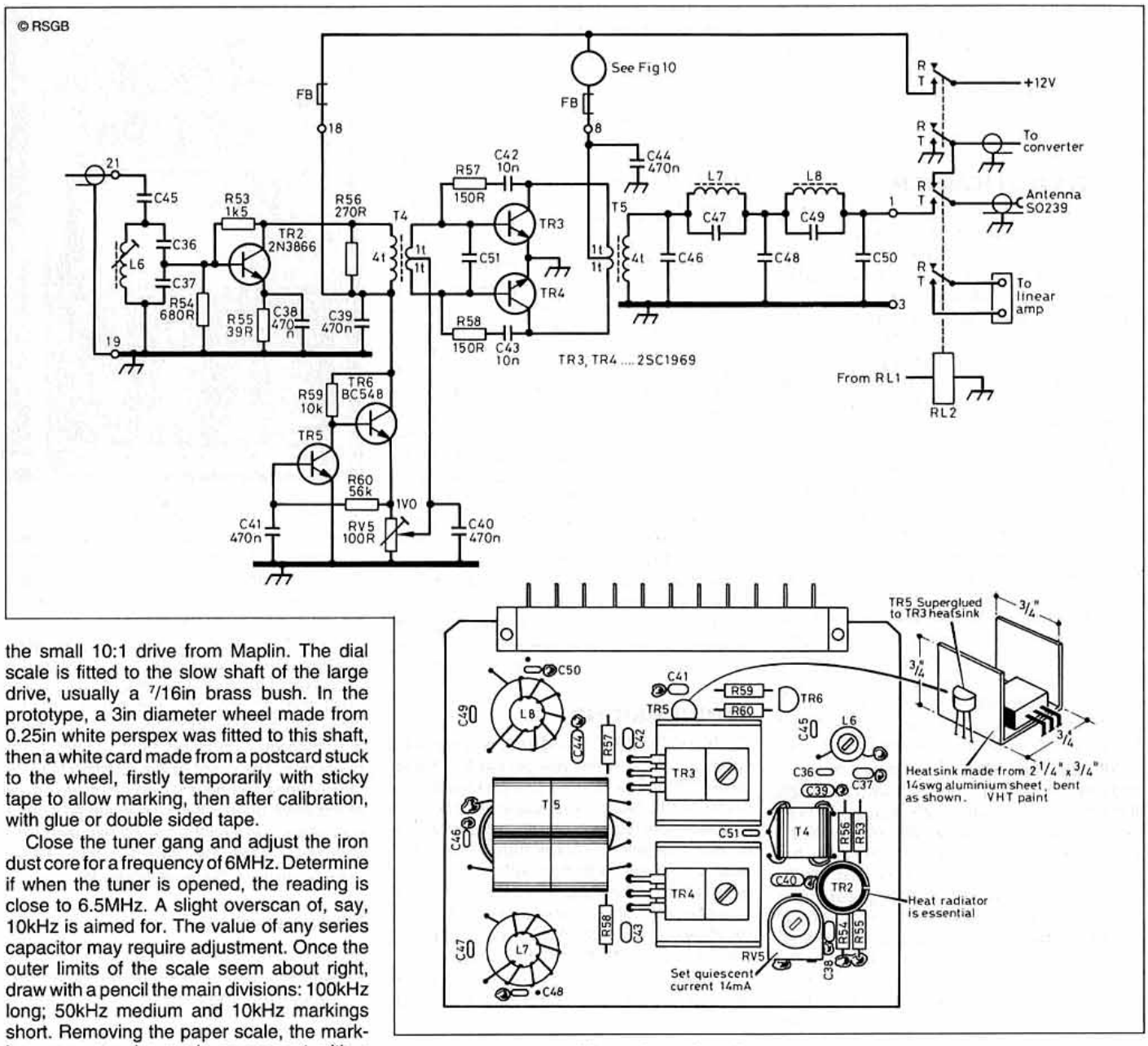


Fig 9: The two-stage amplifier produces about 5 watts.

the small 10:1 drive from Maplin. The dial scale is fitted to the slow shaft of the large drive, usually a 7/16in brass bush. In the prototype, a 3in diameter wheel made from 0.25in white perspex was fitted to this shaft, then a white card made from a postcard stuck to the wheel, firstly temporarily with sticky tape to allow marking, then after calibration, with glue or double sided tape.

Close the tuner gang and adjust the iron dust core for a frequency of 6MHz. Determine if when the tuner is opened, the reading is close to 6.5MHz. A slight overscan of, say, 10kHz is aimed for. The value of any series capacitor may require adjustment. Once the outer limits of the scale seem about right, draw with a pencil the main divisions: 100kHz long; 50kHz medium and 10kHz markings short. Removing the paper scale, the markings may now be made permanent with a drawing pen, and either stencils or Letraset. Refit the scale and continue with main assembly as described earlier.

Below the chassis and underneath the receiver board, fit the exciter centrally, its output to the rear so that the Mic input spigots are close to the four pin Mic socket. The short wires connecting these may be twisted, with a ferrite bead slotted on the hot wire.

Wiring to the sideband switch should be grouped and routed down the outside of the board to the front panel. Chassis holes with grommets allow the interconnecting coax and supply wires to reach their connections by the shortest routes. There will be quite a bundle passing round the rear of the receiver board via the relay and to the regulator. These continue to the reservoir and to the power board connector. Again keep all these closely tied along the rear of the chassis.

Whilst front panel layout is suggested in the chassis drawing, individual tastes might dictate alternative preferences; eg, those making a single band transceiver might omit the two plug-in access holes. Even if a single band set is planned, it might be prudent to make the holes, then at a later date, adding more bands is a simple task.

ALIGNMENT

CAUTIOUS CONSTRUCTORS having felt their way by fitting the VFO first might be happier fitting and wiring the receiver first. The receiver will be aligned at this stage anyway. With power applied and RF gain and volume controls well down, check that the VFO signal is getting to the receiver board. Place an oscilloscope probe on pin 12 of the first mixer U1 and adjust to display the waveform clearly. Adjust VR1 for minimum signal. Transfer the probe to U2 pin 12 and do the same by adjusting VR2. Place a signal generator set to 6.25MHz at A. It may be more convenient to use converter output pins 2 and 3. Adjust tuning to mid travel and with volume raised a little, search for the input signal.

Your signal generator should be unmodulated; a beat note will be tuned and should be adjusted to a pitch and level which is comfortable. Reduce the generator level until the tone becomes fairly weak. Tune the slugs in both L1 and L2 for maximum, reducing the generator level further as these come into alignment. When peaked, switch to the other sideband; the tone will almost disappear. Adjust the main tuning through zero beat and the tone will reappear. Switching back to the first sideband will cause the tone once more to vanish. Remove the generator and turn up the volume to listen to the background noise, noticing the relatively broadband white noise, then switch to CW. The hiss will take on the characteristic of a narrow band nature, which is more of a hollow sound.

Into the receptor, slide a complete converter. Placing an oscilloscope probe on TR4 emitter, say at the top of R9, the crystal oscillator should be seen to be operating. Place the signal generator into the aerial socket and adjust its frequency for the band chosen and sweep till the signal is selected. Tune up the three tuned circuits in the converter for maximum signal, backing off the signal level as you proceed.

Replace the signal generator by an aerial;

switch to USB, and SSB and tune in amateur stations. Try the CW position and the sideband switch; use no more RF gain than necessary for easy reception. Rarely, if ever, will your RF gain be turned to maximum. If all has gone well, your receiver is up and running. Now fit and tune up your other converters.

EXCITER ALIGNMENT

AS WITH THE RECEIVER, check for VFO drive into the exciter board. A high level signal will be seen at TR1 collector. Transfer your 'scope probe to U5 pin 13. If T2 is replaced by the suggested modification, tune L4 for maximum signal level observed. Adjust VR2 for minimum amplitude; adjust VR4 similarly for minimum. Increase oscilloscope sensitivity and readjust both VR2 and VR4 over and over again for minimum trace. Set VR1 and VR3 to mid travel.

At this point a two-tone generator should be fed into the mic input. Primary alignment can be done however at this time with a single tone audio oscillator. Carefully adjusting its input level, a rather impure sine wave should be obtainable with the 'scope set to view 6MHz. Adjust both VR1 and VR3 for maximum purity as observed. From now on, the two-tone oscillator is essential, even if this has to be made up from two separate audio generators fed in through twin resistors of, say, 10k. Setting the levels in this way is a tiresome procedure; the construction of a two-tone generator is a very worthwhile project [4]. *[See this month's Technical Topics – Ed]*

Into the transmitter power board receptor slide the appropriate power board to match the converter. At these early stages, an 80m selection is a good choice. Without switching to transmit, place the 'scope probe on the hot end of the power board's input coil. Again apply some two-tone signal and adjust the scope to show the characteristic wave shape [5]; this might be a bit raggy at this stage. Tune L4 (if fitted) and the input coil L6 for maximum signal level, with the main tuning set to mid scale. Roughness in the top edges of the two tone waveform can now be cleaned up by carefully adjusting VR3 then VR1 till minimum ripple is observed.

In both units operating at G3TDZ, a 50kΩ microphone is used. The gain of the Mic amp is adjusted to suit. For a 600Ω microphone increase the gain – reducing R3 to 5k6 should be about right.

THE POWER AMPLIFIER

VERY LITTLE ALIGNMENT is necessary, yet this is the most critical section of the whole transceiver and care must be taken, and operating conditions observed carefully. Make sure you slot in receiver converters and power amplifiers for the same band! A two-tone generator (or two audio generators as previously described) is now almost essential.

Turn down the quiescent current pot to almost the bottom. Do not at this stage apply signal. Connect a dummy load of 50 to 75Ω to the aerial socket, together with your oscilloscope, its sensitivity set to 1V/div. Switch on TUNE switch: there should be nothing happening on the oscilloscope, neither should there be any great current reading on the PA meter. Slowly adjust the quiescent current pot till a rise in current is observed; adjust to somewhere between 14 and 20mA.

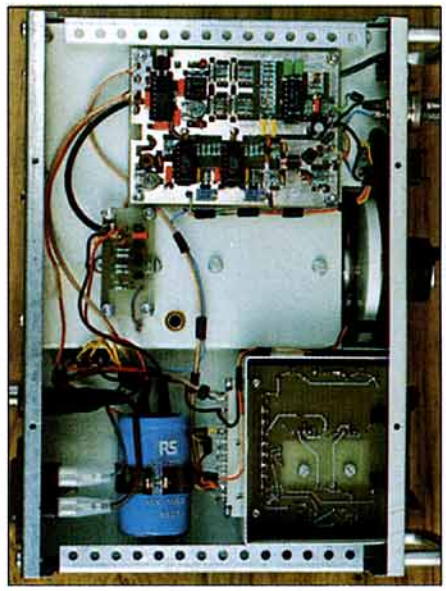
Apply a little signal from the two-tone oscillator. There may be very little current rise yet, though some signs of life should be seen on the 'scope. Adjust L6 to bring into resonance and peak for maximum trace. The familiar two-tone waveform should be resolvable. Keeping the drive level down to give a meter half scale reading, carefully adjust the quiescent current pot for a nice clean and sharp crossover point. Any amateur SSB text book will show right and wrong waveforms [5].

Peak up again L4 in the exciter and L6 in the PA for maximum. Now turn up the drive till clipping just begins to show, then reduce to just the onset of limiting: with your 'scope now reduced to 10V/div, you should be able to get about 40V p-p max. Switch off TUNE: the meter should fall to zero. Allow to cool. Turn on the switch again, apply the same drive, then shut off the drive. Quiescent current should fall quickly to idling level. Next try the microphone. If all seems well, yet the two-tone waveform is still a bit raggy, gently readjust VR3, then VR1 in the exciter. Sometimes a little ripple can be seen on the waveform tops, even after careful adjustments have been made. This is usually because the two tones themselves are beating; slight adjustment of one of the tone oscillators cures this. Speech audio reports are excellent.

CONCLUSIONS

THREE COMMENTS ARE regularly received when on air or when discussing this transceiver: Why was such a design chosen, instead of the more usual superhet and filter method? Everyone else builds the more accepted designs; to repeat these offers little new, and others might do a better job anyway! A Yorkshire upbringing might just play a part in support of stubbornness and thrift (or plain meanness), for cost played as dominant a role as wanting to try something different.

The idea of using plug-in receiver converters instead of expecting constructors to struggle with a large bandswitched system has been widely lauded. Whether plug-in power amplifiers will attract similar support has yet to be discovered. It does however allow room for experimentation without having the whole rig out of service in the process.



As mentioned, audio quality is often commented upon. In some part this might be due to choice of microphone. One unit has a Trio 50k hand mic obtained from a junk sale; the other has a Racal 600Ω hand mic fitted with a transformer obtained from a cheap and nasty mic. The proof of the pudding is in the QSO. Since this rig went on air, more pages of log have been filled than in several previous years. One might just be excused for a little pride when the station is told: "Home brew phasing transceiver here OM".

REFERENCES

[4] *ARRL Handbook*, 70th ed, pp 25.21-25.22.
[5] *Radio Communication Handbook* (RSGB), Chap 6, pp 100 - 103.

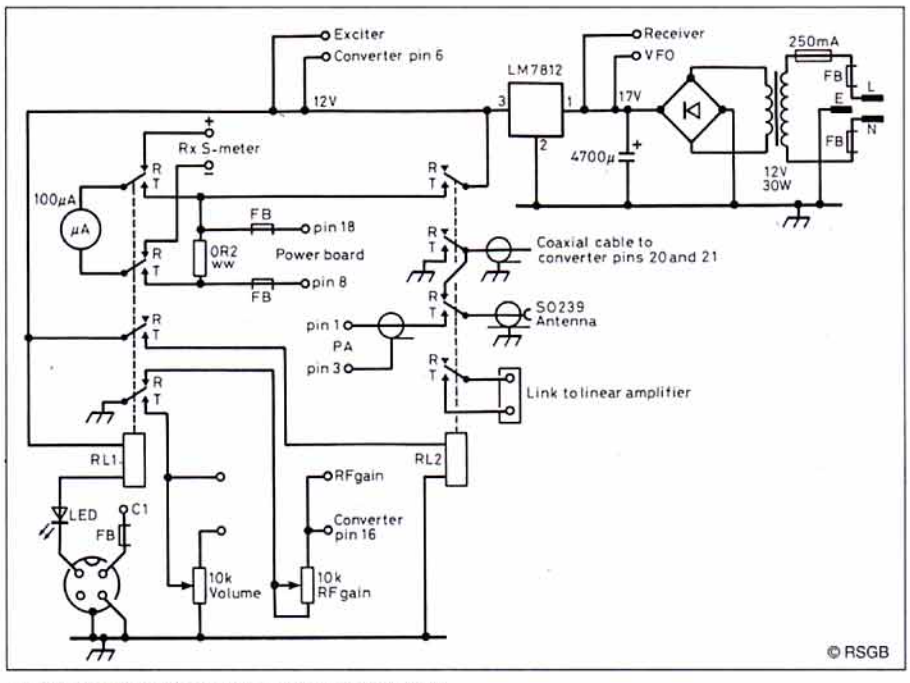


Fig 10: Power supply and inter-connection details.

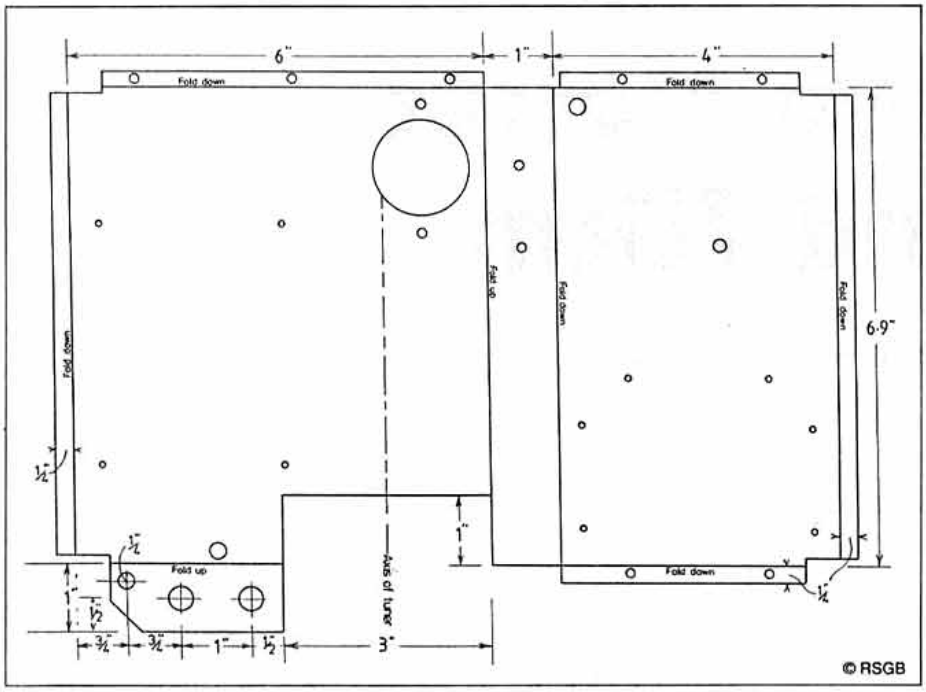


Fig 11: The chassis blank is 11.5in x 8.15in, 18SWG eg Maplin XJ42V.

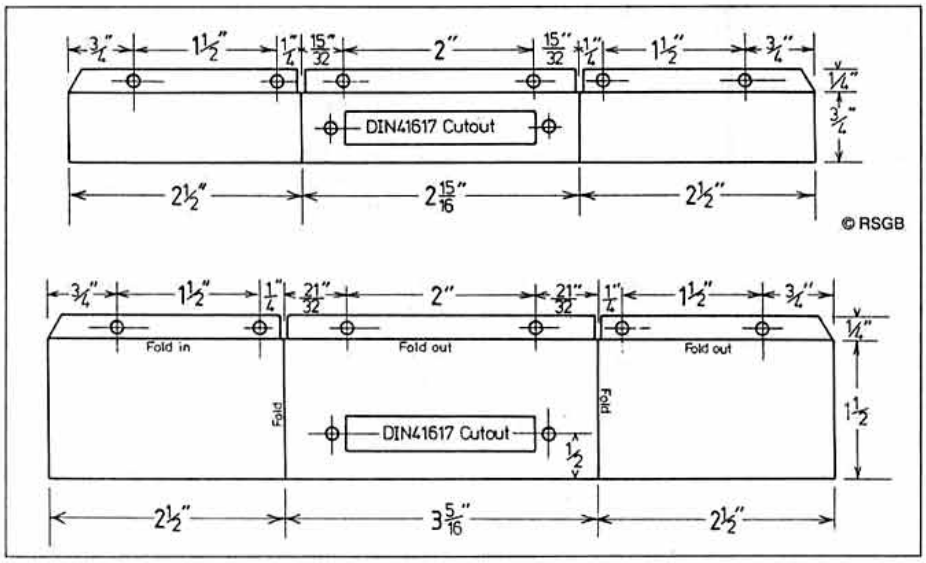


Fig 12: Housings for converter (top) and power amplifier.

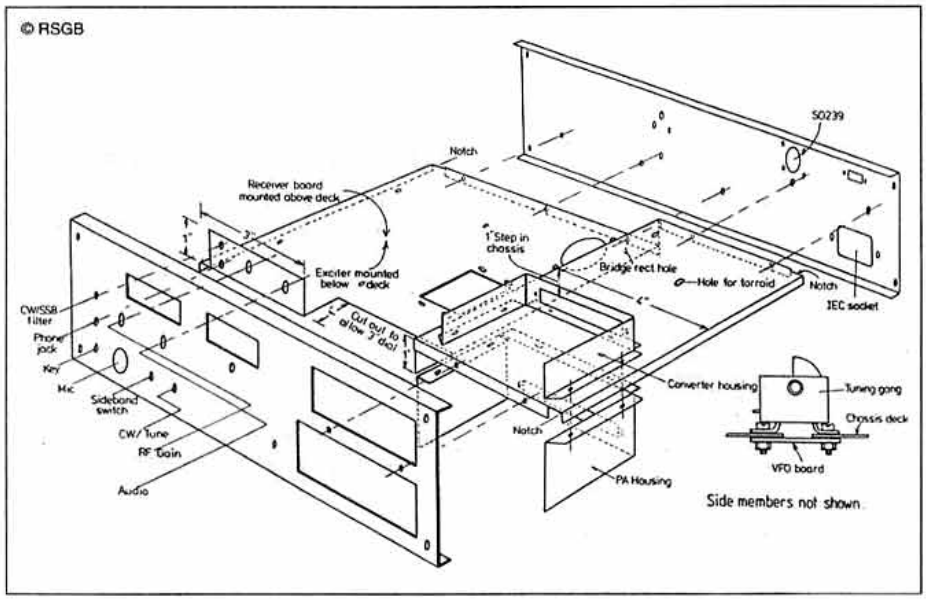


Fig 13: Combining all of the metalwork to fit Maplin box XJ43M.

CONVERTERS PARTS LIST

Resistors:	
R1,R2,R7,R8	15k
R3	270
R5	100k
R6	560
R9	1k5
Added resistors	
	2 x 5k6
	1 x 390
Capacitors:	
C1,C2,C6,C7,C12,C13	See table 1
C4,C5,C8,C9,C10,C23	10n ceramic disc
C11,C14 and two added caps	1n ceramic
Semiconductors:	
TR1,TR2	2N3819
TR3	BF981
TR4,TR5	BF494

POWER AMPLIFIER PARTS LIST

Resistors:	
R53	1k5
R54	680
R55	39
R56	270
R57,R58	150
R59	10k
R60	56k
CR5	100
Capacitors:	
C36,C37,C46,C47,C48,C49,C50,C51	See table 2
C38,C39,C40,C44	0.47µF monolithic
C41,C42,C43	10n ceramic disc
Semiconductors:	
TR2 (Tr2)	2N3866
TR3,TR4 (Tr3,Tr4)	2SC1969
TR5,TR6 (Tr5,Tr6)	BC548

REPRINTS

IF YOU REQUIRE PHOTOCOPIES of the original White Rose Receiver Project which appeared in *RadCom*, February 1990, please send a cheque or postal order for £3 to: RadCom, RSGB, Lambda House, Cranborne Road, Potters bar, herts EN6 3JE.

PCB-MOUNTED PARTS are available from JAB Electronics as follows:

Receiver £27.00

Exciter £24.10

Converters (each) £11.40

Power Amplifiers (each) £18.60

Metalwork and parts not on the PCB should be ordered separately.

JAB Electronic Components, The Industrial Estate, 1180 Aldridge Road, Great Barr, Birmingham B44 8PE.

PCBs are available from the author as follows:

Phasing Receiver Main Board . £4.85

SSB Exciter Board £3.50

Band Converters (each) £1.95

5W Linear Power Amplifiers .. £2.70

John Hey, 8 Armley Grange Crescent, Leeds LS12 3QL.

RADCOM TECHNICAL FEATURE

Wavemeter for Two Metres and 70cm

by Sven Weber, G8ACC

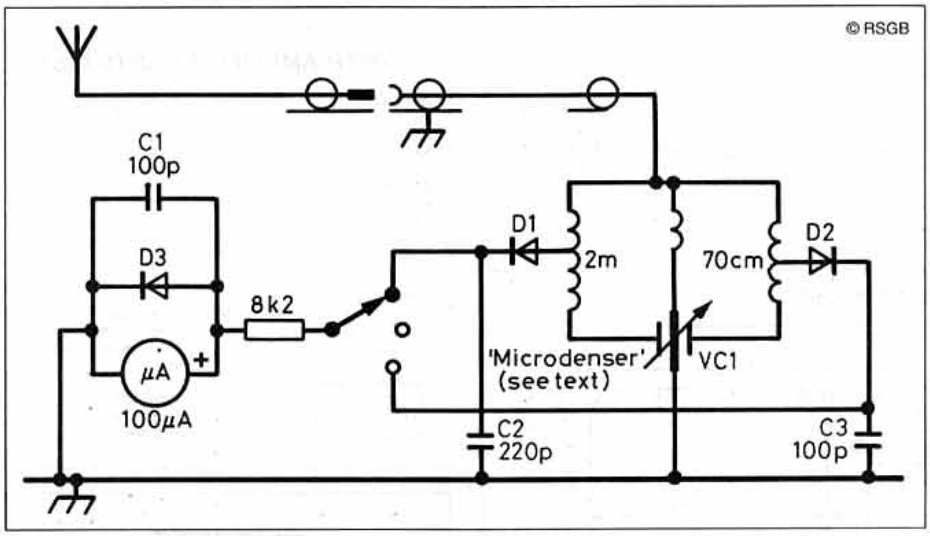


Fig 1: Circuit of the wavemeter, showing how the split-stator capacitor tunes both 2m and 70cm.

THIS LITTLE UNIT is very simple to build and with due care in calibration can be surprisingly accurate. Also it is stable and, above all, very useful. The number of components is minimal and there is at first glance hardly anything inside the box except a tuned circuit and meter. There are a few other things, of course, but most can be found in the junk box. In my particular case, I chose to buy a new meter and box which gives the unit a neat finished appearance.

SPLIT STATOR CAPACITOR

OF COURSE THE HEART of a wavemeter is its tuned circuit (**Fig 1**), and this one was built around an Eddystone 25 + 25pF split-stator 'Microdenser' (that gives my age away!). This is cut down to four static leaves on one side and two on the other, and four rotating leaves (**Fig 2a**). A suitable component is available from Jackson Brothers (London) Ltd (see components list). In fact, any good quality split-stator variable capacitor will do providing it can be cut down to around 10pF and 5pF when enmeshed and will fit inside the box with a little room to spare.

CONSTRUCTION DETAILS

NOW, THE TUNING CAPACITOR has an earthing tag (approx 3 x 12mm) attached to the front of the spindle holder, and this has some inductive reactance at both 2m and 70cm. This inductance is used as part of the tuned circuits on both bands. The variable capacitor did not have an earthing strap from the spindle to the mounting screws, but this was found necessary to ensure a return path for the rectified RF (**Fig 2b**). The main inductor is made from a length of 18SWG silver-plated copper wire, in one piece, even though it forms part of two tuned circuits.

Fig 3 shows the layout of the 2m coil and 70cm loop. The earthing tag, mentioned above, splits this into two with enough inductive reactance of its own to allow the aerial input to be positioned almost next door to it and work effectively on both bands. The diodes used are either 'hot carrier' or low capacity Schottky types, tapped roughly a third of the way up each tuned circuit. They are immediately decoupled (within a millimetre or two) to the wall of the (metal) box. The respective outputs go to a SPDT switch and then to the meter. A 100μA edgewise type is used (RS components or Electromail No 259-561), in series with an 8k2 resistor. The meter is bridged with a forward-biased Ge-Au bonded diode [an OA47 should be suitable – *Ed*] and a 100pF capacitor to cut down on overloads.

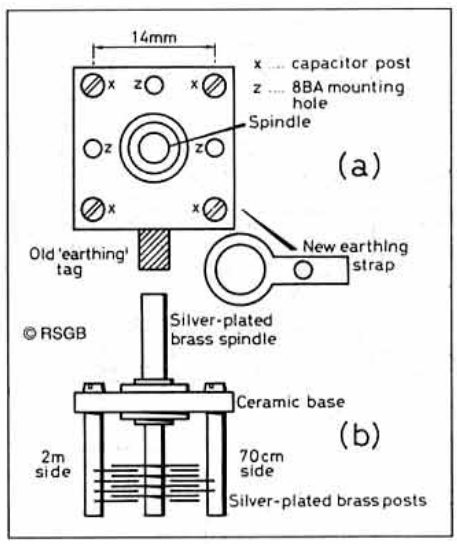


Fig 2: Construction of the tuning capacitor.

SENSITIVITY AND LOADING

AS THE METER RESISTANCE is about 1k75, the total load including the resistor is 10kΩ. The load seen by the tuned circuit is only half that (because half-wave rectification is used), but the effective loading because of the meter circuit at the top of the tuned circuit works out to be approx 45kΩ. In addition the loading produced by the aerial would be very roughly 25kΩ (for a 75Ω aerial tapped approx a quarter of a turn up), so that the total loading would be of the order of 15kΩ. This gives a Q, all other things being equal, of around 80 to 90 with a 10pF capacity at 100MHz on the 2m range, and a Q of approximately 100 at 250MHz (5pF capacity) on the 70cm range.

Sensitivity varies slightly over the range but, for example, 1 volt is needed at the diode outputs for a full-scale meter reading. That translates into roughly 200mV at the aerial socket – about 0.5mW for a full-scale meter reading or 5μW, for a 1/10th reading. These figures are extremely rough and ready and assume that nothing else is likely to affect the tuned circuits, but they do give some idea of how the unit behaves in practice.

PUTTING IT TOGETHER

STARTING WITH THE TUNING capacitor (assuming that a split-stator 'Microdenser', or similar component is available), carefully cut the excess vanes from the fixed and rotary

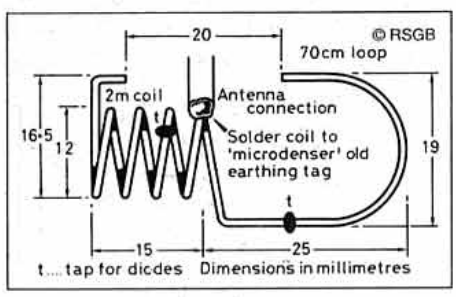


Fig 3: 2-band coil dimensions.

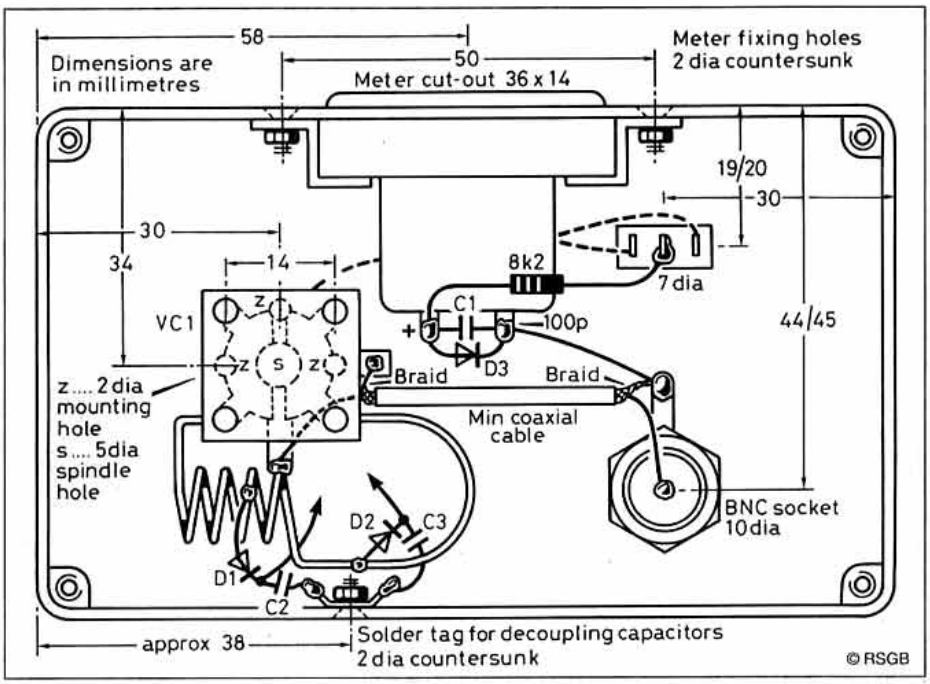


Fig 4: A diecast box makes an excellent case for the wavemeter. Leads on C2 and C3 should be as short as possible.

parts of the capacitor as shown in Fig 2, and then saw the brass stator posts cleanly down to within 2mm of the top leaf. This ensures the capacitor can fit into the box with 2.5mm spacers. Fit the new earthing strap between the spindle and one of the mounting screws. Solder the inductor onto both sides of the capacitor and the old earthing strip.

Next, solder on the aerial lead, which is about 8cm of sub-miniature 75Ω RF coax, so that its braid goes to the new earthing strap. The centre conductor is soldered just above where the old earthing tag holds the inductor on the 2m part of the tuned circuit (see Fig 3). Drill the box for the components and then install them as shown in **Fig 4**, although the layout is by no means critical. The leads from the diodes to the switch fit comfortably under the tuning capacitor and the meter – this should not affect calibration.

Having finished construction, test it with a small aerial near to either a low power transmitter, signal generator or GDO on both bands. Then make a circular scale on a self-stick label (say, 5cm diameter) and attach it centrally to the case. Finally screw the lid on and the unit is then ready for calibration.

CALIBRATION

THIS IS EASIEST USING some kind of oscillator (eg signal generator or GDO) checked with a frequency counter every now and again (**Fig 5**). Use the wavemeter very loosely coupled, perhaps with a short aerial, to give half-scale deflection on the meter. A suitable aerial could be one of the branded makes of telescopic aerials terminated in a BNC plug, or a small loop at the end of some coaxial cable (**see Fig 6**). Calibration is worth taking some care over as the results are well worth the effort.

RADCOM TECHNICAL FEATURE

If no suitable variable frequency oscillator is available, calibration can be done by using some fixed points with a crystal controlled source.

Other frequencies are then interpolated according to a rotational inverse square root law (the split-stator used has a linear capacitance/rotation law on each side for about 175°). **Fig 7** shows the idea. Having carefully marked the frequencies on the scale, using Indian ink or similar, varnish the scale and your wavemeter is ready for use.

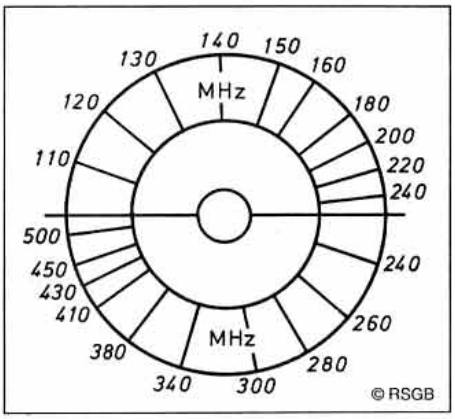


Fig 7: Wavemeter tuning dial.

COMPONENTS LIST

Capacitors

VC1	Split-stator air-spaced variable capacitor approx 25 + 25pF
C1,C3	100pF ceramic
C2	220pF ceramic

Resistor

8k2 0.25W 5%

Semiconductors

D1,D2	BAR28 or similar schottky diode
D3	Ge-Au bonded diode eg OA47

Meter

100µA moving coil type

Additional items

Short length of 16SWG silver plated wire. Tin plated wire should also be suitable and is more easily obtainable – Maplin sell small reels
Diecast box size approx 110mm x 60mm x 40mm
BNC socket
SPST switch
Solder tags,nuts and bolts

Jackson Brothers (London) Ltd have kindly arranged for stocks of a suitable capacitor (25 + 25 split stator, type C704) to be made available to constructors. The price including VAT and postage & packing is £19.12. Ordering address is: Jackson Brothers (London) Ltd, Kingsway, Waddon, Croydon CR9 4DG Tel: 081 681 3727

The remaining components, including the diodes are all obtainable from: Maplin Electronic Components, PO Box 3, Rayleigh, Essex SS6 2BR Tel:0702 554161

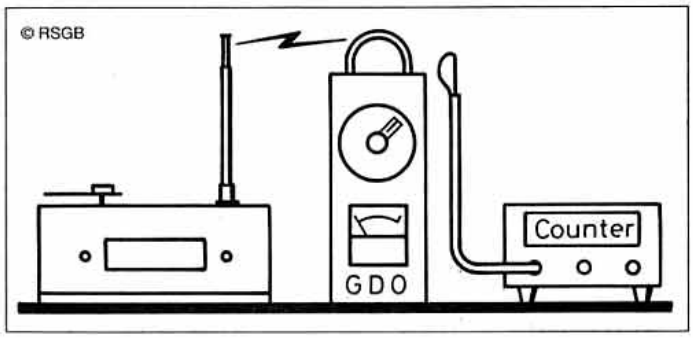


Fig 5: Suitable method of calibrating the wavemeter (left).

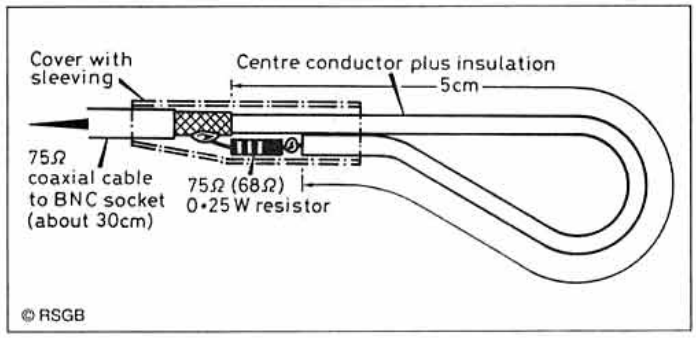


Fig 6: A suitable antenna for calibrating the unit.

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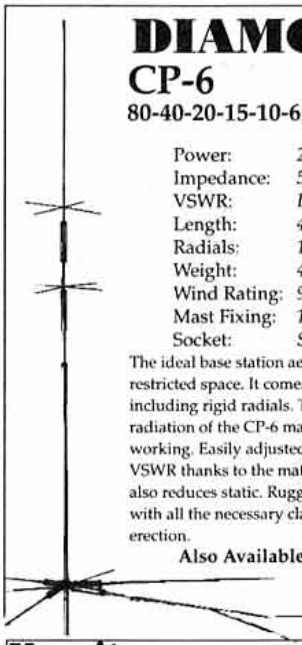

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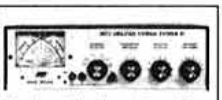

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This new title replaces the eighth edition of the "Short Wave Listeners Confidential Frequency List". We challenge you to find better value! It's crammed with stations that have actually been monitored in Europe, not just listed by somebody else. Our team of monitors have done it the hard way, which means you get the very latest information. When you read this you'll realise what you have been missing! Money back if returned in 10 days. ***£9.95***

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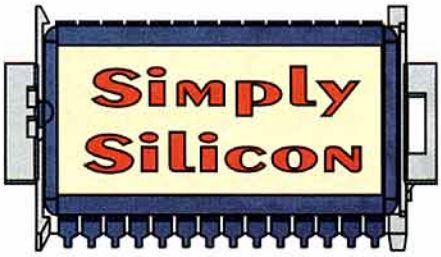


NE5200D DUAL RF AMP

- Two RF amplifiers
- DC – 1200MHz operation
- Low DC power consumption (4.2mA per amplifier at Vcc=5V)
- Power-Down Mode (Icc=95μA typical)
- 3.6dB noise figure at 900MHz
- Unconditionally stable
- Low cost
- Supply voltage 4 to 9V
- Gain (S_{21}) = 7dB at f = 1GHz

THE **PHILIPS NE5200D** dual wideband amplifier should find a number of applications in amateur receivers and transmitters. The frequency range is specified as DC to 1200MHz. With some attention to layout and matching, the device should be usable on 23cm. A simple power-down mode for each of the two amplifiers makes the chip particularly suitable for battery powered portable equipment. The two stages can be cascaded for more gain, or used independently.

Surface mount devices such as this need a small soldering iron, and the layout should use high frequency chip capacitors for coupling and decoupling at UHF.

MANUFACTURERS DATA

APPLICATIONS

NE5200 is a user-friendly, wide-band, unconditionally stable, low power dual gain amplifier circuit. There are several advantages to using the NE5200 as a high frequency gain block instead of a discrete implementation. The first is simplicity of use. The NE5200 does not need any external biasing components. Also the higher level of integration improves the reliability of the amplifier over a discrete implementation with several components.

The power down mode in the NE5200 helps reduce power consumption in applications where the amplifiers can be disabled. And last but not least is the impedance matching at inputs and outputs. Only those who have toiled through discrete transistor implementations for 50Ω input and output impedance matching can truly appreciate the elegance and simplicity of the NE5200 input and output impedance matching to 50Ω.

A simplified equivalent schematic is shown below. Each amplifier is composed of an NPN transistor with an F_t of 13GHz in a classical series-shunt feedback configuration. The two wideband amplifiers are biased from the same bias generator. In normal operation each amplifier consumes about 4mA of quiescent current (at V_{cc}=5V). In the disable mode the device consumes about 90μA, mostly in the TTL enable buffer and the bias generator. The input impedance of the amplifiers is 50Ω. The amplifiers have typical gain of 11dB at 100MHz and 7dB of gain at 1.2GHz.

The graph shows the typical frequency response of the two channels of NE5200. The low frequency gain is about 11dB at 100MHz and slowly drops off to 10dB at 500MHz. It can also be seen that both channels have a very well matched frequency response and matched gain to within 0.1dB at 100MHz and 0.2dB at 900MHz.

NE5200 finds applications in many areas of RF communications. It is an ideal gain block for high performance, low cost, low power RF communications transceivers.

The two amplifiers in the NE5200 can be easily cascaded to make a 13dB gain block at 900MHz. At 100MHz the gain will be 22dB with a noise figure of about 5.5dB. The NE5200 can be operated at a higher voltage up to 9V for much improved 1dB output compression point and higher 3rd order intercept point.

In applications where a single amplifier is required with a 7.5dB gain at 900MHz and current consumption is of paramount importance (battery powered receivers), the amplifier A1 can be used and amplifier A2 can be disabled by leaving GND2 (Pin 3) unconnected. This will reduce the total current consumption for the IC to a meagre 4mA.

The ENABLE pin can also be used to improve the system dynamic range. For input

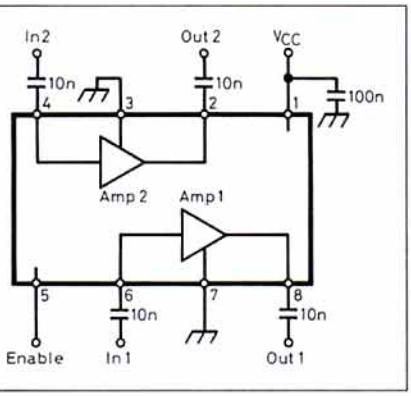


Fig 1: Connections to the NE5200

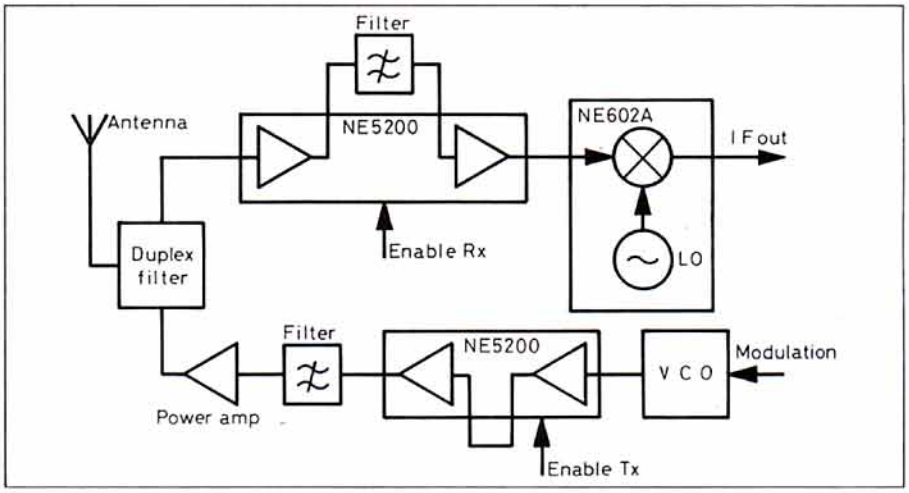


Fig 2: Typical application for the device in conjunction with the NE602A.

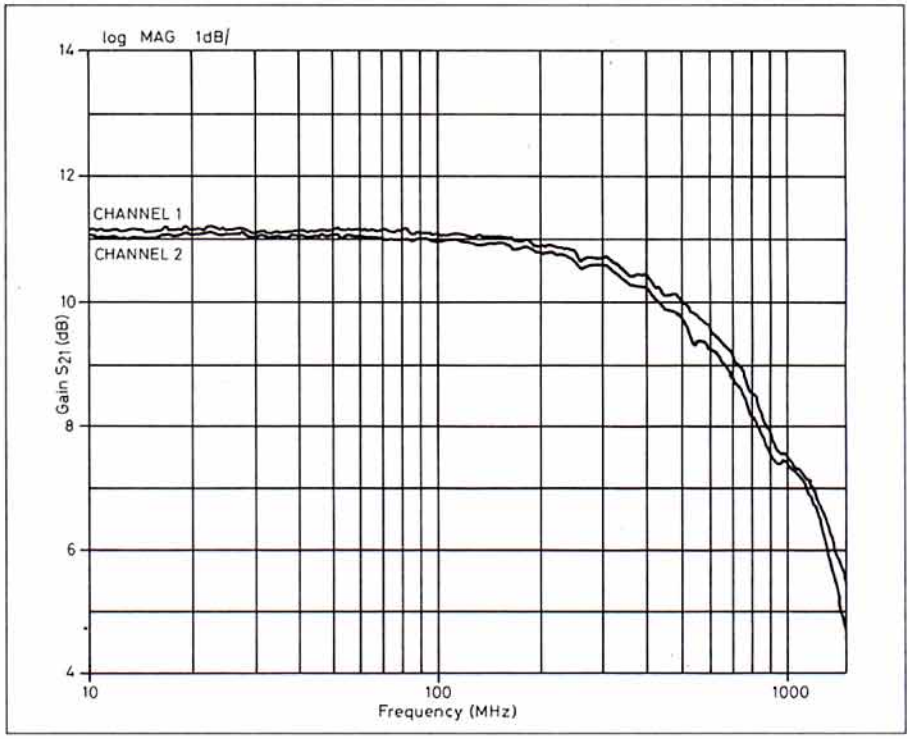


Fig 3: Frequency response of the NE5200. Note the excellent matching between channels.

DC CHARACTERISTICS V_{cc}=+5V T_A=25°C unless otherwise stated

Symbol		Parameter Test Conditions	Limits Min	Typ	Max	Units
Vcc	Supply Voltage		4.0	5.5	9.0	
V_{IH}	Logic 1 level	Power–up mode	2.0		V_{cc}	V
V_{IL}	Logic 0 level	Power–down mode	–0.3		0.8	V
$V_{IDC,ODC}$		Input and output DC levels	0.60	0.83	1.0V	V

AC CHARACTERISTICS[1] V_{cc}=+5V T_A=25°C either amplifier, enable=5V; unless otherwise stated.

Symbol		Parameter Test Conditions	Limits Min	Typ	Max	Units
S_{21}	Insertion gain	f=100MHz	9.2	11	13.2	dB
		f=900MHz	5.2	7.5		dB
S_{12}	Reverse isolation	f=900MHz		–17.9		dB
P–1	Output 1dB compression point	f=900MHz		–4.3		dBm
NF	Noise figure in 50ohms	f=900MHz		3.6		dB
IP_3	Input third–order intercept point	f=900MHz		–1.8		dBm

Note: All above measurements include the effects of the NE5200 Evaluation Board (obtainable from Philips) Measurement system impedance is 50ohms.

levels that are extremely high, the NE5200 can be disabled. In this case the input signal is attenuated by 13dB. This improves the system's overall dynamic range. In the disabled condition the NE5200 IP_3 increases to nearly +20dBm.

AVAILABILITY

ELECTROMAIL (RS Components) stock the Philips NE5200D – surface mount part No 284-501. The price is £3.49 including VAT; postage is £2.95 per order. Contact Electromail, PO Box 33, Corby, Northants NN17 9EL Tel: 0536 204555.

NOTE: Device characteristics and application notes in *Simply Silicon* are compiled from manufacturers' published data. Circuit diagrams are included for experimental purposes only, and have not been proven by *Radio Communication*. Transmitting equipment must be operated in accordance with national regulations. All data is copyright of the device manufacturer.

TECHNICAL UPDATE

2M SSB/CW TRANSCEIVER

Bernie Pallett's, G3VML, recent project has attracted great interest from readers. Geoff Moore, G8BBN, has pointed out that the Tx supply line at the top of the G3TSO exciter (*RadCom*, April, p34) should be earthed on receive, and Rx supply line earthed on transmit. This could be achieved by means of an extra pole on the Tx/Rx changeover relay, and ensures that the switching diodes D101-D104 are biased correctly. Also, the correct type number for Toko coils L1, L2 and L3 of modules 3 and 4 is 35-10403 (code yellow). See page 95 of the latest Cirkit catalogue for details of these.

DF TRANSMITTER FOR 160M

Dave Lauder, G0SNO, has written in with a correction to the circuit diagram for this project (*RadCom*, May '93, p36). The inverting input to the microphone amplifier (IC1a pin 2) should be directly connected to the slider of RV1. Back to back diodes D1 and D2 are then connected between pins 1 and 2 of IC1a. The PCB layout is correct.

COMPLEX NUMBERS EXPLAINED

Despite careful checking, an error crept into Dr Clive Smith's, G4FZH, article in the May '93 issue. Mr A S Watkins, G3EHW, points out that the equation near the top of page 63 (middle column) should read:

Conversely:

$$\text{Tan}\theta = y/x \text{ or } \theta = \tan^{-1}(y/x)$$

$$R^2 = x^2 + y^2$$

Our thanks to the readers concerned for bringing these to our attention.

IDEAS FROM ABROAD

Eurotek

TRANSLATED AND EDITED BY ERWIN DAVID, G4LQI

Quarter-wave 'slopers' have been a cheap way to DX on the lower HF bands for some, but many could not make them work at all. **Karl H Hille, DL1VU,** has tried to take the guesswork out of the design. From **cq-DL** 4/93 by kind permission of DARC.

IT ALL STARTED with amateurs who already had a tower with one or more beams for 14MHz or higher but no space to add a good DX antenna for a lower band. The typical λ/4 or 'half' sloper for 7MHz would then consist of a 10m wire, attached to an insulator 10m up the mast and tied away at an angle of 45° to the vertical. The coax feeder would run up the tower with its core connected to the top of the sloper wire and the braid to the tower, see **Fig 1** [1].

With luck, a manageable SWR would result and the system would show a few dB of directivity in the direction of the slope. This luck was found to depend on many factors, among them the height of the tower and the attachment point, what else was mounted on the tower, the angle of slope, and the ground under the sloper [2]. Those with nothing else on the tower always seemed to be out of luck and those with a wooden mast with only the coax braid as a counterpoise fared even worse, whatever they tried in terms of sloper length and angle. [*Counterpoise* is the key word here, and DL1VU is an expert on that subject – see Eurotek, Feb '91 – *G4LQI*]

THE 7MHZ TEST SET-UP

TO SHED LIGHT ON THIS murky situation I raised in my garden a mast of 40mm OD aluminium tubing, 12.22m high. All cross trees, shrouds and stays were of non-conducting materials so as not to influence the measurements. The mast was erected on and strapped to a near-ideal earth mat consisting of a 50cm square aluminium plate with 48 evenly spaced 21.5m buried radials.

The coaxial cable from my shack [3], 34m of RG8/U, runs up the mast to a connector inside a rain shield (an aluminium box without a bottom) which is bolted to the mast 1.5m below its top. The half-sloper, initially 10.8m long, runs down at a 45° angle from a strain insulator which is attached to the mast between the rain shield and the top. A wire jumper connects the centre of the coax socket to the top of the sloper. An all-aluminium pulley is bolted to the top of the mast and a long bare stranded tinned-copper wire (I would have liked to avoid dissimilar metals but had no aluminium rope) was run over the pulley so that any desired length can be pulled away from the mast top as a counterpoise while the other end is wrapped around the mast and electrically becomes a part of it.

EXPERIMENTS

IN THE FOLLOWING TESTS, SWR was plotted against frequency throughout the 6.5 – 7.5MHz range for different lengths and slope of the counterpoise wire. Restricting the measurements to our narrow 7.0–7.1MHz band might have hidden important trends. [Using a noise bridge and a Smith chart, SWR can be established without transmitting – *G4LQI*.]

The first series of measurements was with the counterpoise also sloping down at 45° and in the direction opposite to the sloper (**Fig 2**). Starting with the counterpoise at zero-length and increasing it in steps, no reasonable SWR was obtained until the length was 8m. From there, the frequency of best SWR dropped by approx. 280kHz for every metre added to the counterpoise length until at approx 9.5m it fell in the 40m band with a 2:1 SWR bandwidth of 150kHz.

After shortening the sloper by 0.5m to 10.3m another series of measurements was done and now the best SWR was in the 7MHz amateur band with a 10m counterpoise, ie with sloper and counterpoise of nearly equal length.

The next question to be answered was that

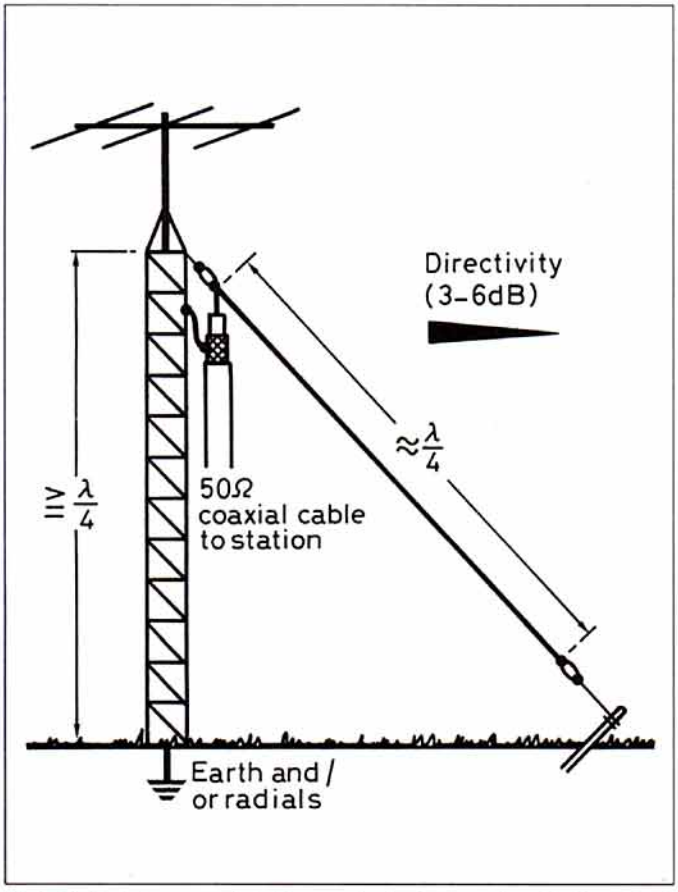


Fig 1: The half sloper as originally conceived – for some it works (from A*RRL Antenna Handbook*).

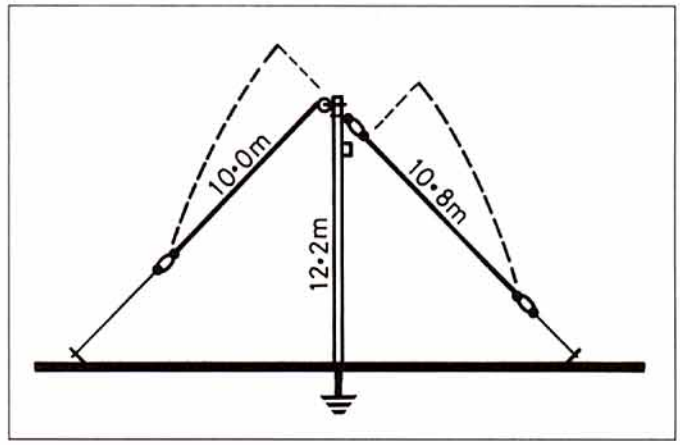


Fig 2: The 7MHz half sloper and sloping counterpoise – it works like an inverted-V. The mast, connected at the top and earthed at the bottom, does not affect the performance.

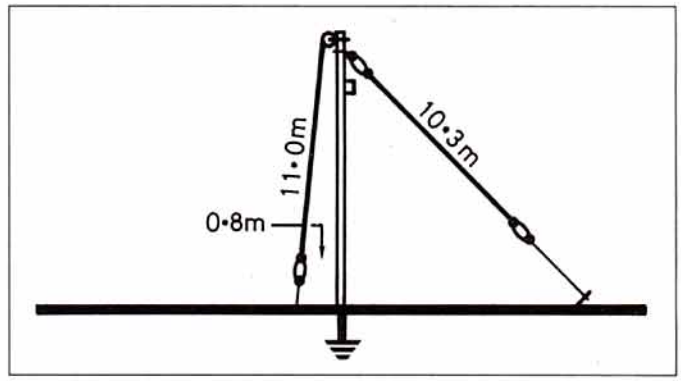


Fig 3: The 7MHz half sloper with non-radiating counterpoise.

of current and voltage distribution. Neon bulbs were connected to the lower ends of both sloper and counterpoise and 100W of 7MHz RF was applied. The two bulbs lit up with equal brightness, indicating roughly equal RF voltages at the voltage maxima, hence equal currents from the top and equal power being radiated by the sloper and the counterpoise. The conclusion: the system behaved like an inverted-V dipole and the mast did not figure in the result at all – a very usable antenna but not what was wanted!

Next, I tried to eliminate the radiation from the counterpoise. That was achieved by dropping the counterpoise down more steeply so that it ran almost parallel to the mast. **Fig 3.** That way, counterpoise and mast become a non-radiating λ/4 stub, open at the bottom and shorted at the top. With the spacing at the mast top fixed at 8cm by the pulley, the resonant frequency and its SWR could be manipulated by adjustment of the counterpoise length and its spacing from the mast at the bottom. I ended up with an 11m counterpoise spaced 80cm from the mast at the bottom with the line flat at 7025kHz. [As expected from what basically remains a dipole with an enclosed angle of only 45 degrees – *G4LQI*], the 2:1 SWR bandwidth had narrowed to 65kHz. **Fig 4.**

If the mast is not tall enough to accommodate the λ/4 counterpoise, the latter can be shortened by any of the methods commonly applied to antenna elements; this also applies to the half sloper itself. Bending, inductive loading and capacitive end loading are shown in **Fig 5.** [This does reduce the bandwidth even further and method 5b, with its easy ground-level adjustment, seems worth trying – *G4LQI*]

WARNING: *The lower ends of the sloper and the counterpoise carry dangerous RF voltages.*

REFERENCES

[1] *The ARRL Antenna Hand Book,* available from RSGB.

[2] J S Belrose, VE2CV: 'The Half Sloper – Successful Deployment is an Enigma'. *QST*, 5/80.

[3] Photograph in *RadCom*, February 1993, page 15.

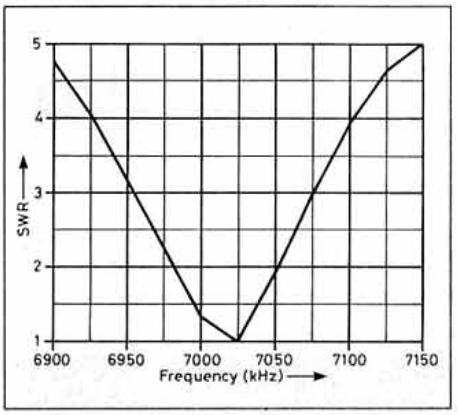


Fig 4: The SWR of the half sloper of Fig 3 was measured at 25kHz intervals. SWR-bandwidth is narrow.

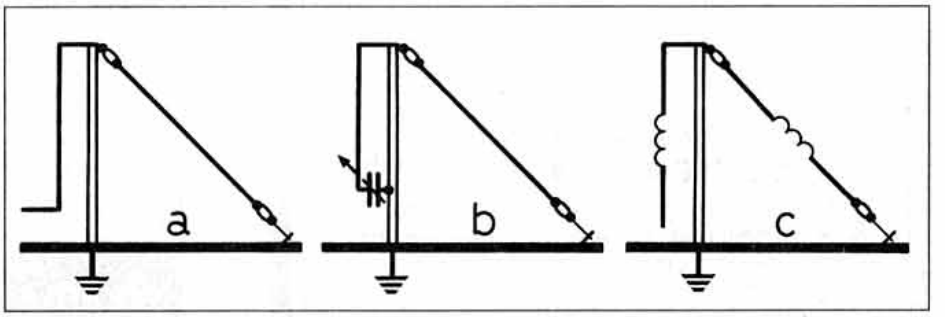
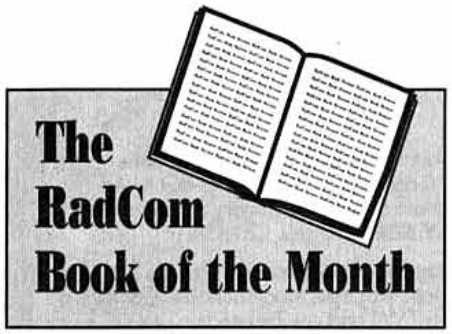


Fig 5: Suggestions for shortening the counterpoise if the mast is not tall enough: a) by bending the open end: b) by adjustable capacitive end loading: c) by inductive centre loading, here also applied to the half sloper itself. All these methods reduce the SWR bandwidth even more.



By Arthur Gee, G2UK

SATELLITE COMMUNICATION SYSTEMS 2nd Edition

SYSTEMS, TECHNIQUES AND TECHNOLOGY 2nd Edition

by G Maral (Ecole Nationale Superieure des Telecommunications, Toulouse) and M Bousquet (Ecole Nationale Superieure de l'Aeronautique et de l'Espace, Toulouse, France).

Translated by J C C Nelson, University of Leeds, UK.

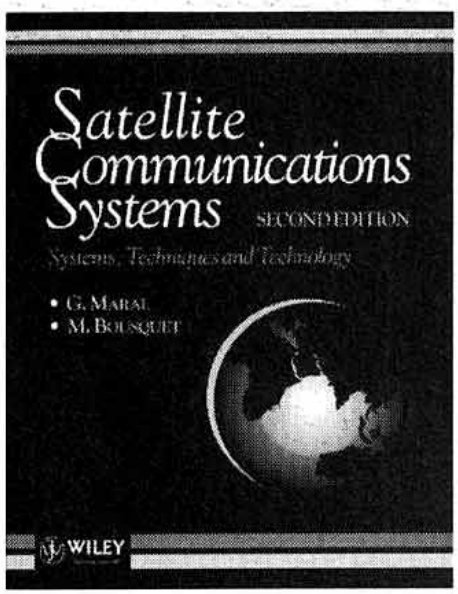
Published by John Wiley & Sons Ltd, Chichester PO19 1UD.

Price:- £29.95 (paperback); £65.00 (cloth cover).

WHILST THIS BOOK is intended for those professionally engaged in satellite communications, there is much in it which the dedicated amateur satellite enthusiast will find of interest. Its price is such that it is unlikely to be purchased by many amateur enthusiasts, but if you can find a copy in a library, an hour or so perusing it will prove interesting and well spent.

An introduction says: "This Chapter consists of a descriptive approach to the characteristics of satellite communication systems. Its aim is to satisfy the curiosity of an impatient reader and facilitate a deeper understanding of satellite communication systems by directing him to the appropriate chapter without imposing the need to read the whole work from start to finish".

The book is one of over 600 pages and is lavishly illustrated with diagrams, etc. A list of the contents will give a good impression of the enormous field covered:- Link Analysis, Transmission Techniques, Multiple Access, Multibeam Satellite Network, Regenerative Satellite Networks, Orbits, Earth Stations, The Communication Payload, Organisation of Telecommunication Platforms, Satellite Installations and Launches, The Space Environment, Reliability of Satellite Communications Systems. I found the sections on the Space Environment, Propulsion Systems, and satellite activities in eight of the most involved countries, particularly interesting and of relevance to our own field. Although aimed at the book-shelf of the professional, it remains interesting reading for the amateur.



Amateur Radio Techniques

by Pat Hawker, G3VA

See page 94

● Georges Vialet, F8OP, in **JN26** is looking for a MS sked with WS square (**IO68**) on 144MHz, SSB or CW. Anyone interested please reply to Georges at Le Cottage, 71290 Cuisery, France.

● Circuit diagrams and/or manuals for **Marconi** radio/telephone equipment **742** Rx and 742 Tx. Information to GM0BPY, 16 Fancove Place, Eyemouth, Borders TD14 5JQ.

● A manual/circuit diagram is required by John House, G7JAI, for a **Heathkit** Digital Multimeter, model **IM2202**. Any help appreciated, all costs will be reimbursed. Please write QTHR or tel: 0926 54556.

● Steve, G3YOL, is looking for a manufacturer's operation or application instruction manual for a **Global Coupler AT-1000**. Contact at QTHR or tel: 0934 843144.

● Alan, G3TIE, needs to locate a source for the **copper foil** as used on the SSB exciter by G3TSO in *RadCom* Oct 1988. Any information to Alan, G3TIE, QTHR or tel: 081 360 3390.

● Information of any source of spare parts for an **Eddystone Receiver EC10**, looking for a BFO coil (L17) and IF Board. All costs reimbursed. Contact G0HMC by Tel: 0429 264735.

● Any information on the existence of a Basic language computer programme which can convert Latitude and Longitude into National Grid reference and vice versa. Please write to GM0TGG, 90 Tay Street, Newport on Tay, File, DD6 8AP.

● John, G0GUF, needs circuit diagrams and/or manuals for Wireless Set No 62 Mk2 (portable transceiver dated 1960 **SN 32761**) The Army type number is **ZA30714** (PC92177) and in the Royal Navy it is type 622. All expenses will be reimbursed. Write to G0GUF, QTHR or tel: 0889 881129.

● Ed Kelly, EI5DR, needs a circuit diagram and/or any other information, copy of manual and a PSU for **ZX Spectrum 128K** +2 Computer. Contact Ed at Cregganavar, Breaffy, Castlebar, Co Mayo, Eire.

● User/service manual or circuit diagram of the **Racal Dana 9911** VHF Frequency meter is required by Frank, G4CJL. Please write to Frank Ashcroft at Rose Cottage, Southmeads Lane, Henstridge, Somerset BA8 0RJ.

● A request now for instruction manuals and circuit diagrams for two instruments: a Hewlett Packard VHF Signal Generator **type 608E** and a Transistor Tester type **TM2** manufactured by Levell Electronics Ltd. All expenses will be refunded. Information to Len, G0DLR, QTHR or tel: 0732 823483.

● Keith, G0OZK, needs operating instructions and a Data Book with thumb-wheel settings for an AVO Valve Characteristic meter **VCM3**. Also Manual and IC info for Advance **TC12** and **TC12A** Freq Counter/timer, plus any spares and mains plugs. Contact at QTHR or tel: 061 477 5303.

● Bill, GW3DGT, is looking for a manual and/or circuit diagram for a Wayne Kerr Component Bridge **B521** (Service Ref: Bridge Universal CT375 WKB/1056 QC no 6625-99-943-2442). Also any calibration Charts for an Oskerblock **SWR 200B** Meter. All expenses refunded. Please write to W Barrett, GW3DGT, Stevina, Ludchurch, Narberth, Dyfedd SA67 8JF.

● G0OZJ, is trying to find an **FT227R** Mobile Mounting bracket and front desk support wire. Any info to G0OZJ, QTHR or tel: 061 485 5036.

● Norman, G4RYS, needs a Handbook and a circuit diagram (or copy) for **Icom IC22** 2m Tcvr. Contact QTHR or tel: 0532 663846.

● Erland Belrup, SM7COS, a devout CW operator needs information on: how many dBs do you gain over SSB, all other things equal, when receiving end operator switches to a narrow filter, say 500 or 250Hz. A figure of 17dB has been quoted. Anyone prepared to give an authoritative answer? All replies to Erland at Kullboarp, S-570 16 Kvillisford, Sweden.

● Circuit diagram for a **Microdot** CW/RTTY Communications terminal, made by Polemark, Royston, Herts who appear to have ceased trading. Also Operating Instructions and/or circuit diagram for a Wayne Kerr Component Bridge model **BS21**. Roger, G4GXM, will reimburse any expenses incurred. He can be contacted QTHR or tel: 0462 453001.

● Stephen Smith, VK2SPS the new writer of WIA's magazine *Pounding Brass* column wants to contact any **CW group** or any CW mags. If able to help contact him care of PO Box 361, Mona Vale, NSW 2103, Australia.

Q R P

REV GEORGE DOBBS G3RJV
St. Aidan's Vicarage, 498 Manchester Road, Rochdale OL11 3HE

THE MICHIGAN QRP CLUB is celebrating its fifteenth anniversary. The club was organised on 19 January 1978 in Michigan's central Lower Peninsula and has grown to include members from many parts of the USA and around the world. Section 2(a) of the club's constitution reflects its purpose: ".... to foster and develop friendship and cooperation among radio amateurs who have a common purpose in the unique pleasure and challenge of operation .... at power levels of 5W output or less". The Michigan QRP Club is affiliated to the American Radio Relay League (ARRL).

Membership is open to all licenced radio amateurs and enquiries are welcome. An application form and club information sheet can be obtained from the Membership Chairperson, Michigan QRP Club, 654 Georgia, Marysville, Michigan 48040, USA. In the USA membership is $5 for each 12-month period with an additional one-time initiation fee of $2. DX (non-USA) stations are charged $10 for each 12-month period with the initiation fee of $2. The M-QRP Club has its own personalised pin-on name badges as well as attractive QSL cards.

The club publish a quarterly journal called *The Five Watter* in March, June, September and December. *The Five Watter* contains the delightful preface, "The products, projects, features and fantasies described are solely for the delight of our readers, no testing has been done and no warranties are intended or implied".

I have a soft spot for the M-QRP Club. I have shared stand space with the club at the Dayton Hamvention and enjoyed the company of their two most active officers, Lowell Corbin, KD8FR, and Buck Switzer, N8CQA. I also have a liking for Michigan having usually flown to the Dayton Hamvention via Detroit. My favourite weekend in the USA was the one I spent with Doug DeMaw, W1FB, the doyen of amateur radio writers, at his farm in the upper part of the Michigan Peninsula.

The latest issue of *The Five Watter* contains a review by Fred Bonavita, W5QJM, on the Kirsta Keyer, a kit produced in Scotland. This keyer is based on a factory programmed GAL16V8 chip and fits on a printed circuit board 1.5" by 2". Further information about the keyer in kit or ready-built form can be obtained from Kirsta Computer Ltd, 35 Main Street, Hillend, By Dunfermline, Fife KY11 5ND.

THE G QRP CLUB VISITS TEXAS (AGAIN)

THE FIRST EVER representation of the G QRP Club in the USA was a visit to the ARRL National Convention in Houston in 1982.

I was also writing this column in 1982 and I well recall reproducing a picture of Dr John Allaway, G3FKM, a rather more distinguished *RadCom* columnist, and myself at the NASA Space Centre. This meeting was rather odd in that I had lunch with John. In those days we lived about five miles apart in Birmingham but we had to visit Texas in order to have lunch together!

Texas, the land of all things big, may seem a strange place for QRP operation but in the 1980s almost all of the officers of the American QRP Club International (QRP ARCI) were Texans. The current list of officers includes three Texans as Secretary, Membership Chairman and Contest Manager. The American representative of the G QRP Club is Luke Dodds, W5HKA, who has been a frequent visitor to the annual QRP Mini-Convention in Rochdale. Ian Keyser, G3ROO, yet another *RadCom* Columnist (*Novice Notebook*) and myself visited Texas again in 1989 to represent the G QRP Club at the HamCom Convention in Arlington.

Not a group of earnest worshippers, or is it? Peter Dodd, G3LDO, presents his antenna lecture in St Aidan's church at the QRP Mini-Convention 1992. [Pity the lecture was not on converters – *Ed*]

W5HKA once again invited the G QRP Club to run a stand and offer a lecture at the 1993 HamCom Convention. I attended the convention in early June with another clergyman QRPer, Les Austin, G0NMD. HamCom is the Texas State amateur radio convention held each year in the spacious convention centre in Arlington. Arlington is sandwiched between Dallas and Fort Worth in the north of the state. The convention centre is in a large complex which includes two theme parks and the huge Texas Rangers baseball stadium.

As usual the Texans showed a keen interest in the home constructed QRP equipment we displayed, although I suspect that few of them actually do much building of equipment. But they did seem to enjoy picking up items of equipment and pronouncing them as being 'arrrwesome!' The lecture session was very well attended on the first day and the club stand was well supported. I was impressed by the large flea market with a good array of attractively price items but somewhat defeated by the outdoor section held in a temperature of 110 degrees. Look out for the W5 QRP operators, there are plenty of them about.

THE G QRP CLUB MINI-CONVENTION 1993

SOMETIMES SIMPLE IDEAS bear more fruit than intended. In 1990 a small group of G QRP Club members decided to hold a small convention at my church complex with the object of gathering together northern members of the club. The intention was to run a true convention, with lectures, space for socialising and practical advice and suppliers for constructors, rather than a traders event. The first event was so successful it was decided to hold the convention each year. In subsequent years it has drawn QRP operators from the USA, Canada, Germany, Poland, The Netherlands and Sweden.

Forget about the usual type of amateur radio rally, this event is not like that. If you wish to buy a nice new commercial transceiver, pick over half-working walkmans, find a new hard drive for your computer or buy a plastic toy to appease the situation at home, don't go to the QRP Mini-Convention. A large area is retained for people to meet each other; they are encouraged to bring their own home construction projects to show off and discuss with other constructors. A programme of lectures runs in conjunction with the events in the hall. These are held in the church, the ideal venue because it can provide plenty of seating. There is even organ music during the lunch break. A limited number of traders attend but these are restricted to component, kit and surplus stalls. There is also a Bring and Buy and Junk Stall. Drinks and snacks are provided throughout the day with the famous Mr Salaway pies at lunch time.

The 1993 QRP Mini-Convention is on Saturday 16 October from 10am to 5pm at St Aidan's Church Hall, Sudden, Rochdale. This is on the A664 Manchester Road, a short distance left off the A627M feeder road from Junction 20 of the M62. A talk-in station operates on S22 from 9am. You may enjoy this event. It reminds me of a cross between a mammoth club meeting and the old mobile rallies of the 1950s and 60s.

EMC

MEGAN SMITH, G0MEG
EMC Committee Secretary

I HOPE THAT YOU are all enjoying some good weather and that those of you who took the RAE in May have got your pass slips. Congratulations and welcome to a rewarding hobby. If you have just passed, you shouldn't need to ask what EMC is, but if you have forgotten already see if you can get hold of the August 1991 edition of *RadCom* from your local club as there is a simple definition there.

This month I have a report from the RSGB'93 Exhibition held at the NEC in May, some information on the latest mobile telephone technology from G0SNO and an index of all the EMC columns since June 1989. I hope that it will prove to be a useful source of information. Certainly it would have been useful for the Committee at Birmingham.

ALL CHANGE

THE FIRST CHANGE is that Robin Page-Jones, G3JWI, author of the popular *Radio Amateur's Guide to EMC*, is the new Chairman of the EMC Committee.

The second is that this will be my last column for *Radcom* as my 'proper job' is getting a bit busy and I don't have as much spare time as I'd like to spend on radio. However, I know that I can leave the column safely in the hands of the rest of the EMC Committee. I have enjoyed writing it and I know from your letters that at least some people have enjoyed reading it. [The new columnist is Hilary Claytonsmith, G4JKS – *Ed*]

RSGB '93

THIS YEAR THE EMC Committee stand at 'the show' was busy almost continuously, offering advice and selling filters. Several members of the Committee manned the stand including Robin Page-Jones, G3JWI, who was kept busy signing copies of *The Radio Amateur's Guide to EMC*.

Telephones seem to top the list of problems these days, but videos and TVs are not far behind. It was nice to note that more people seem to be asking for advice about where to put antennas and so on *before* they have an EMC problem. This is by far the best approach, and we endeavoured to encourage 'good housekeeping' in the shack by having a little competition at the Show. Participants were asked to put ten items in order of importance, and the one who came nearest to the EMC Committee's list won a copy of Robin's book.

The order of the Committee's list was as follows:

1. Keep antennas as high as possible and as far from houses as possible.
2. Get on well with your neighbours.
3. Use balanced antennas.
4. Provide a good, low impedance, RF earth.
5. Read "The Radio Amateur's Guide to EMC".
6. Use horizontally polarised antennas.
7. Make sure antenna feeder drops vertically to ground.
8. Use an inductively coupled ATU (Z-match).
9. Use Morse code.
10. Fit a ferrite choke to transceiver mains lead.

The winner was Mr R T Richards, G4IRD. When G3JWI telephoned him to say that he had won, he said he already had a copy of the book. No wonder he got the most right!

NEW PHONES COULD BE PAINFUL

THE NEW PAN-EUROPEAN GSM standard for cellular telephones uses a transmission technique called TDMA (Time Division Multiple Access) at around 900MHz while PCNs (Personal Communication Networks) and DECT cordless telephones will use TDMA at around 1800 and 1900MHz respectively. With TDMA, a number of transmitters share the same frequency, each having 'time slot'. In the case of GSM, a mobile or portable unit transmits a burst of digitally encoded speech for one eighth of the period of the 4.62 ms TDMA frame and turns the carrier off for the remaining seven eighths of the frame period.

From an EMC point of view, TDMA might mean 'Telephone Disturbs My Amplifier'! With GSM, a carrier with a power of up to 8W is pulsed on and off at a rate of 216Hz and this provides much greater potential for breakthrough than existing analogue cellular phones which use narrow band FM. In *Microwave Engineering Europe*, March/April 1993 it was reported that tests using a simulated GSM cellular phone transmitter showed that it could cause a buzz in some hearing aids up to 30 metres away while at a distance of 1.5m the sound level of the buzz could be as high as +130dBA which exceeds the threshold of pain!

The hearing aid EMC problem is a difficult one because the units are so small that it is unlikely to be possible to modify those already in use. When GSM, PCN and DECT phones come into widespread use, they will probably show up many other EMC problems with equipment such as stereo systems, alarm systems and ordinary wired telephones. If manufacturers of such equipment with poor immunity receive a barrage of complaints about breakthrough from TDMA phones, let's hope that they will show more interest in solving these problems than some companies currently do when we tell them about lack of immunity of their products to amateur radio transmissions!

Retiring columnist Megan Smith, G0MEG, and new chairman Robin Page-Jones, G3JWI, at RSGB'93.

BUZZING ALL OVER THE BAND

WE RECEIVE SOME enquiries from members suffering interference to amateur radio reception and in some cases the source can be quite difficult to trace. Broad band noise from 1.8 to 440MHz or interference every 23kHz from 3.5 to 29MHz are two recent examples. Characteristics of the interference such as the frequency spacing, drift and modulation and the times when it occurs can give some useful clues about what to look for although it is often necessary to go out and do some direction finding.

SPARKS AND PEAKS

Something arcing continuously, for example a faulty insulator on an overhead electricity line, produces a steady broad band noise amplitude modulated at 100Hz while arcing at the commutator of an electric motor may produce a characteristic whine.

Interference which has definite peaks at regularly spaced frequencies could come from sources such as a computer, a microprocessor, a switch-mode power supply or a TV line timebase. Microprocessor controlled domestic equipment such central heating controllers, control boxes of burglar alarm or fire alarm systems, satellite TV decoders or fax machines are often connected to long wires which radiate HF efficiently. They may also use a ceramic resonator rather than a crystal in the clock oscillator in which case the harmonics may drift a few kilohertz from one day to the next.

Harmonics from switch-mode power supplies and TV line timebases usually only affect the HF bands, particularly the lower ones. TV line timebase harmonics are spaced at intervals of exactly 15.625kHz while switch-mode power supply harmonics are normally at intervals of about 20 – 50kHz and are likely to drift. Any QRM which is amplitude modulated at 100Hz is probably getting out onto the mains supply via a full wave rectifier (each time the mains cycle passes through zero, no diodes are conducting and the RF path is momentarily switched off).

If the QRM does not drift, this suggests a crystal controlled source such as a computer or microprocessor and if it is amplitude modulated at 50 – 70Hz but not synchronised to the mains, this could be harmonics of a video waveform such as the video drive to a computer monitor. Most PC-type computers also have switch-mode power supplies which are generally free-running and not synchronised to the video line rate except in the case of Amstrad PC 1512/1640 with the power supply in the monitor.

OVERHEAD WIRES

Anything with a mains power supply and a connection to a telephone line, such as a cordless phone, answering machine, fax machine or modem may put HF QRM onto telephone lines. This can either be directly from the equipment itself or indirectly from a completely different source via the mains supply. Inter-winding capacitance in the mains transformer of any mains powered telephone equipment creates an RF path from the mains to the telephone line allowing mains-borne QRM to radiate from the phone wires, especially at HF.

DIRECTION FINDING

The problem with tracking down QRM on the lower HF bands is that it can travel hundreds of metres along wiring making the actual source difficult to pinpoint. At the higher HF frequencies, and especially at VHF or UHF, you are more likely to be able to detect signals radiated directly from the source rather than from wiring.

It is usually best to find the highest frequency on which the QRM is detectable then go around looking for the strongest signal. When you find where it is stronger, try moving further up in frequency. By searching for fairly weak QRM on the highest possible frequency, it is easier to hear changes in level on a portable receiver without an S-meter. If you can still hear the QRM at 30MHz, then if possible, check whether there is any detectable signal on 50, 70 or especially 144 and 432MHz where a portable directional aerial can be used.

MESECAM VIDEO

WE HAVE COME ACROSS video recorders which produce HF QRM and were originally sold in the Middle East or Asia where they would not need to meet UK RFI standard BS800 or the equivalent European Norm EN 55014. They have been imported into the UK and converted for UK operation by changing the sound IF filters but have switch-mode power supplies without adequate mains filtering.

This results in QRM up to about 4MHz which gets out via the mains and via the braid of the aerial coax. The tell-tale sign is a video recorder labelled "Multi-standard PAL/MESECAM" where MESECAM presumably means the type of SECAM colour system used in the Middle East. Whoever is converting these, will they please fit mains filters!

E IS FOR EMC

TABLE 1 IS AN INDEX to all the *EMC* columns produced by the Committee since June 1989. You may also find that there are references to EMC matters in other parts of *RadCom*, for example *Technical Topics* or *News and Reports*, but I have not included those in the list. I hope that it proves to be useful, and together with the *Radio Amateur's Guide to EMC* will help you plan your shack and sort out any EMC problems. Enjoy your radio!

INDEX OF EMC FEATURES JAN 1989 – JUNE 1993

Table 1.

Emergency!

RONALD M COWAN, GM4SRL
85 Eastwoodmains Road, Clarkston,
Glasgow G76 7HG

AT 1715 ON THURSDAY 10 June a massive thunderstorm struck the Llandudno and Conwy areas of North Wales. It has been estimated that five-and-a-quarter inches of rain fell in only two-and-a-half hours, described by some experts as a once in five hundred years event. Torrents of water inundated the area and five hundred houses were seriously flooded including that of Mike, GW1BBH, the deputy controller of the East Gwynedd RAYNET group, and to a lesser extent that of the group controller, John, GW8WFS.

A four foot high wall of water crashed through the casualty department of the local hospital with practically all the basements and ground floors in Llandudno being flooded, and electricity supplies and telephone lines were cut off. Roads, including the new Conwy Tunnel, were flooded to a depth of over four feet, effectively isolating the area for about two hours. When the rain eased off the extent of the damage became apparent. Large areas of Llandudno had become lakes, causing flooding to homes, hotels and business premises. The railway line had been washed away. A similar situation existed in Llandudno Junction and in Conwy the storm had flooded old people's bungalows, a council estate and the hospital.

At 2100 hours the County Controller, GW8UZL, offered RAYNET's services to the local authority, Aberconway Borough Council, and a call-out was initiated for RAYNET members from West, North and Central Gwynedd along with Clwyd County. RAYNET was requested to establish links and man evacuation centres, a police station, schools, and social services departments. The operators from outside the flooded area had great difficulty in getting into the affected area because of the flooded roads. By 2200h the requested links were in position but at that time there was little traffic to pass. The operators were stood down at 0315h, after a flotilla of small boats and RNLI inshore rescue craft rescued families, elderly people and animals, evacuating them to unaffected schools and civic centres.

The RAYNET teams were again called into action later that morning, being asked to provide communications between the Civic Centre and various evacuation centres and with British Telecom, The Electricity Board, The National Rivers Authority and Welsh Water as there had been a loss of normal communications. Rescue work continued throughout the day with the Army and RAF being drafted in to help. RAYNET operators accompanied these teams and helped to coordinate the search for people reported missing by relatives.

By the Friday evening many people who had stayed upstairs in their flooded homes realised that the floods were not receding and that they would have to evacuate, as they were without electricity. Accordingly, the rescue services were called into renewed action, for which RAYNET provided crucial radio links. These were maintained until 2130h on the Saturday.

On Sunday 13th the RAYNET stations were manned from 0800h until 1800h when assistance was given to the Red Cross which was distributing food supplies to the affected areas. RAYNET standby was requested on Monday 14th, but as it turned out, no help was required as the County Emergencies Planning Officer's Department had by then set up their own PMR system for communications. By this time the floods had only marginally receded and massive pumps had been brought in by Welsh Water, while the Fire Service had been continuously pumping out basements since the Friday.

By Wednesday 16th the floods were diminishing and HRH The Duke of Edinburgh paid a visit to the area. He met representatives of the Emergency Services and also RAYNET's County Controller.

During the call-out, thirty two RAYNET operators were involved, with five hundred and twenty hours of operating time. Two thousand five hundred people were made homeless and many of those will not be able to return to their structurally damaged homes for many months. Fortunately no lives were lost, but this was the worst disaster Wales has experienced in recent years, overshadowing the Towyn floods of 1990.

PETERBOROUGH DISTRICT HOSPITAL INCIDENT

FOLLOWING A MAINS SUPPLY problem, the battery backup on Peterborough Hospital's telephone system failed and communications ceased. This left the hospital with an inoperative switchboard, no internal phones, no paging system, no cardiac arrest alert system and very minimal external communications with the outside world. All this was on a site covering several acres, with a main building six storeys high and an annexe several hundred yards away.

The Raynet stand at RSGB'93.

The hospital had several handheld radios which were issued to key staff but these were limited in number and as soon as their internal batteries failed were of no further use for twelve hours while being recharged. Within the hospital staff there were also a small number of radio amateurs who brought their radios into play, and suggested calling in RAYNET.

The first call at 1400h went to Four Counties RAYNET Group who have several members living in the Peterborough area. The controller, Roger, G6CKR, soon had his members on site and working, and in conjunction with the hospital administration placed his members in key locations. RAYNET control was established in the switchboard room.

At 1700h it became apparent that the operation would require additional support and Leicester and Cambridge RAYNET groups were alerted and three off-site coordination points, under the control of G1SPA, G4FSS and G6XYX were set up. The purpose of this move was to make and receive the many telephone and radio calls which were necessary to maintain a supply of operators at the site.

Communications with these off site centres was difficult and at 1800h it was decided to move RAYNET control to the top floor of the hospital in order to reduce the noise problem originating from the switch room. At this time a RAYNET administration room was established in order to ascertain the exact requirements of the hospital and the details of all operators, including duty hours etc

By 2100h RAYNET operators arriving at the hospital from one of the off site centres, were met on arrival and booked in at a holding area set up in the hospital reception. Then, to a defined plan, the new operators began to replace those who had by then been on duty for a long period. By 2200h the first shift change had been completed.

After working through the night, at 0600h the telephone engineers declared the switchboard and its associated systems repaired and operational, and RAYNET were stood down.

At 1545h the switch failed for a second time and RAYNET were again called out. The fault was not so extensive this time and control was established in the telephone room itself. Work continued until 0030h when the fault was again rectified.

Two days later another fault occurred and RAYNET was again called out for a further period of twelve hours. On repair of this fault, RAYNET volunteered to stay overnight in case there was a recurrence of the problem, and the next day RAYNET stood by while all the standby batteries were replaced.

NOVEMBER EMERGENCY COLUMN

CONTRIBUTIONS FOR THE **November** Emergency Column should be sent by the **1 September** to me at the address above. My fax number is 041-638 0732. Please send in any photographs you may like included in this column.

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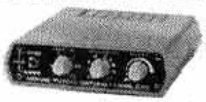

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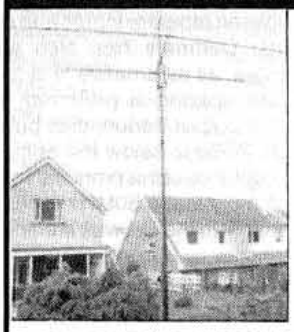

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RSGB MEMBERSHIP CONSULTATION

30MHz and Up at IARU 1993

Prepared by John Morris, GM4ANB, RSGB VHF Committee

THE NEXT IARU Region 1 conference takes place in Belgium between 19 and 24 September. Committee C5 will discuss matters affecting amateur operation above 30MHz. As always there are many proposals from many national societies. The following is a review of those which come under the remit of the VHF Committee and VHF Contest Committees. The conference document numbers are given in brackets.

Note that these are only proposals, which means that each one has been suggested by a national society. Some will be accepted and some rejected by the conference, and some will lead to further discussion. Some are uncontentious so far as the UK is concerned while others will provoke some debate. They are presented here with a minimum of comment. It is your opinions which matter.

Defence

CONSIDERABLE ATTENTION will be paid at the Conference to the subject of paramount importance to us all: defence of our bands. Many of our VHF/UHF bands are in 'prime territory' for commercial exploitation. If we lose a band all questions of bandplans, technical standards and the rest become academic.

The IARU has an excellent record of defending and extending our allocations and the meeting will be looking at ways to maintain this record.

Two items in particular will be discussed: representation of amateurs at World Administrative Radio Conferences (WARCs), and the ways in which we can deal with intruders in our bands. Committee C5 will be looking at 144MHz especially, our only exclusive VHF allocation.

Keep an eye on the new *IARU* column in *RadCom* for news of this vital subject [see page 21 - *Ed*].

50MHz

Usage Below 50.5MHz

The current IARU bandplan reserves 50.1 to 50.5MHz for 'narrow band' modes. The Netherlands (C5.4) has proposed that this be clarified as being for transmissions occupying a bandwidth of not more than 6kHz. The idea is that NBFM and digital modes using AFSK should be used only above 50.5MHz, with the lower 500kHz kept for DX modes.

Repeaters

Denmark (C5.18) has proposed a repeater plan for 50MHz: ten channels with inputs at 20kHz intervals from 51.210MHz to 51.390MHz, and outputs 600kHz higher. The corresponding channel designations would be R21 to R39. Simplex channels would fit between repeater inputs and outputs. Denmark has also suggested an alternative if a narrower spacing is preferred: the same output frequencies but inputs 200kHz below the outputs. Acceptance of this proposal would *not* imply that a 50MHz repeater network in the UK was imminent.

Facsimile Working

There is no designated facsimile working frequency on 50MHz, although there are frequencies for other modes; such as SSTV on 50.510MHz. The RSGB (C5.30) has proposed that 50.550MHz be nominated as the facsimile working frequency.

144MHz bandplan

Satellite Frequencies

145.800 to 146.000MHz is allocated for satellite working. Finland (C5.39) has suggested that 200kHz is not enough to accommodate current and future satellites, especially with the growing use of packet transponders. They have proposed that a second slice of the band be allocated to satellites. As a "starting point for study" they suggest the sector 144.400 to 144.600MHz.

12.5kHz Channel Spacing

Switzerland (C5.41) has proposed that we move to 12.5kHz channel spacing for repeater and simplex FM operation. [This has been discussed many times in the UK, but the problem of "how do we get from here to there" has yet to be resolved - *GM4ANB*]

The Swiss paper says "The 12.5kHz channel spacing for 144MHz repeaters has been put into use in several countries. It provides additional space with no adverse effects if geographical siting factors are carefully considered." The experience described was almost certainly with the 'X' channels, which use normal deviation and bandwidth, but are offset by 12.5kHz from the normal channels. They go on to express the opinion that "This move will push manufacturers to market equipment with 12.5kHz frequency steps and with suitable IF filters."

Amateurs in Space

With real live amateurs in space, on Mir and the Space Shuttle, Finland (C5.37) has proposed that a suitable frequency pair with 600kHz offset should be nominated for them to use. Amateur operations from space have been arranged on an ad-hoc basis so far, which the Finnish paper notes has resulted in operation on some unusual - within Region 1 - frequencies: even within our beacon band. This would need co-ordination with IARU Regions 2 and 3, and Finland has proposed that the existing IARU and Region 1 Satellite Co-ordinators should get involved with this.

EME Frequencies

At the VHF Manager's meeting last year 144.140 to 144.160MHz was proposed as a secondary EME working segment to alleviate problems from computer harmonics in the EME sub-band at 144.000 to 144.025MHz. In practice it has not been used so the RSGB (C5.29) has proposed that it be abandoned and that instead the EME sub-band be extended up to 144.035MHz.

Channel R8/S8

In the IARU bandplan 145.200MHz has been unallocated since the deletion of repeater channel R8. In the UK bandplan it is simplex channel S8. Germany (C5.8) and the Netherlands (C5.5) wish the IARU plan to follow suit. The Netherlands paper goes on to suggest that this channel be used to accommodate local RTTY and CW mailboxes.

French Repeater System

France has long had a unique repeater system, with inputs below 145MHz and outputs above, in contravention of the IARU bandplan. The inputs run from 144.725 to 144.825MHz, with outputs 600kHz higher, amongst the FM simplex channels. The French Society (C5.44) has submitted a paper asking that IARU recognise and authorise this unique usage by adding a footnote to the bandplan. The channels would be designated R8bis, R9bis, R10, R11, R12.

All-Modes Section

The 144MHz band carries a greater variety of traffic than any other: SSB and CW DXing, satellite working, packet, local FM working - and many more. The 'all modes' section in particular (144.500 to 144.845MHz) is home to many different modes of working, and some frequencies can be very congested, with silence on others.

This needs to be sorted out. But before that can be done we must know how the all modes section is actually used, throughout Region 1. The RSGB (C5.34) has proposed that all Societies be asked to make a study of the usage of this part of the band, with the aim of tidying up the bandplan in the future. For example, it would be interesting to know just how much usage there really

is of some of the specialist mode calling frequencies. There also seems to be a general feeling that the beacon band - currently 144.845 to 144.990MHz - could be reduced somewhat.

432MHz

Digital Repeater Frequencies

Germany (C5.9) has proposed that the four wide offset repeater channels R66 to R69 (Outputs on 438.550 to 438.625MHz with inputs 7.6MHz lower) be nominated 'multi mode', to be used for new transmission technologies. The paper mentions their use for activities such as RTTY, digital transmission and weather fax.

UK Low Power Speech Repeaters

The RSGB (C5.31) has requested a footnote allowing use of R61 to R67 for short range, low power speech repeaters. These have outputs from 438.425 to 438.575 with inputs 7.6MHz lower. Some of these are currently allocated to digital links in the IARU bandplan. These would complement the existing repeater network using the RB system.

Syledis

France (C5.46), has no explicit proposal to change the band plan, but has raised the problem of other services, such as Syledis, encroaching on the band. This can make it difficult to set up 432MHz repeaters using any of the existing standards. They suggest that a solution might be to use a wide offset, such as 9.4MHz (presumably only in France).

Packet Radio

THERE ARE SEVERAL proposals relating to the use of packet radio on 144MHz and 432MHz. The most radical comes from Israel (C3.20), proposing that new bandplans be devised "which will ensure a minimum of 20% of each band as a realistic segment, adequate for future growth, to be allocated to NBDP [this seems to refer to packet - *GM4ANB*] and Data Transmission modes."

144MHz Channels

Spain (C5.24) has proposed that an additional two metre frequency, either 145.275 (S11) or 145.300MHz (S12), be nominated for simplex local packet working. An express aim of this is to allow full duplex working with the other packet frequencies at 144.625 to 144.725MHz. France (C5.43), has made a similar proposal but only suggesting 145.275MHz. Again, full duplex working is mentioned as a reason.

Access from 144MHz

Many amateurs, in the UK and elsewhere, access the packet network via nodes and bulletin boards on 144.650MHz. This contravenes the current IARU bandplan, which includes the footnote "No packet-radio networks will be set up in the 144-146MHz band and no access from the 144-146MHz band to networks on other bands will be allowed."

The original idea of this footnote (which was opposed by the RSGB) was to encourage the use of higher bands. The RSGB (C5.25) has proposed that the footnote be changed to "When a packet radio node or bulletin board is established on the 144MHz band it should also have access ports on other VHF/UHF or Microwave bands and should not use the 144MHz band to forward traffic to other nodes or bulletin boards." In other words, get the inter-node traffic off two metres and encourage the use of higher bands all round, but meanwhile don't try to restrict the current user access on 144MHz. Germany (C5.10) has proposed that the footnote be dropped altogether, with no replacement.

FSK Packet Frequencies

Currently there is no allocation for narrow band packet radio (FSK instead of AFSK). France (C5.42), has suggested that 144.600 to 144.610MHz be used for this while Germany (C5.10) has proposed 5kHz spaced channels from 144.610 to 144.630MHz.

432MHz Frequencies

On 432MHz Finland (C5.40) would like to see a 200kHz wide packet radio allocation somewhere within the section 437 to 438MHz. This is part of the satellite sub-band (435 to 438MHz) and the paper notes that close co-ordination with the AMSAT groups via the IARU Satellite Co-ordinator would be essential.

Call for Comments

It is likely that the subject of packet radio frequencies - especially on 144MHz - will provoke a lively discussion, and packet operators will already have seen many bulletins circulating the UK network on this subject. What is your opinion? Should there be a general push to higher bands? To 12.5kHz channel spacing? Additional 144MHz frequencies? Some ideas for 144MHz band were given in *RadCom* June 1993, page 6.

Contests

VHF/UHF/Microwave Field Day

Several countries organise VHF/UHF field days in early June. Belgium (C5.22) has proposed these be joined into one IARU Region 1 VHF/UHF/Microwaves event, over the first weekend in June at the same time as HF NFD.

50MHz Contest

Denmark (C5.17) would like to see the introduction of an IARU contest on 50MHz, either as a separate event or by changing the September contest to cover 50 and 144. Previous 50MHz contests have been ruled out as countries have not had comparable power levels.

Co-ordinating Contests

Also from Denmark (C5.19) is a proposal for "at least some degree of synchronization between cumulative/activity contests in Europe, in order to make it more interesting to participate in these events and thereby increase general activity on the VHF/UHF/SHF bands."

Contest Scoring

The use of locator squares as multipliers in contests has been discussed in the UK recently. Denmark (C5.20) has made an alternative proposal of bonus points for each square worked. This would not be a multiplier, but extra points added to the normal points per kilometre for a contact in each new square. They say this scheme has been used with some success in Nordic contests.

Date Change

The IARU UHF and Microwaves contest takes place each October. A paper from France (C5.45) suggests a move to July or August to increase participation.

Computer Logging

Many contest entrants now use computers for scoring. Denmark (C5.16) has suggested a common format for disk based log entries to ease automatic adjudication, especially in international contests. The proposal is that all entrants who make more than, say, 100 contest contacts should submit entries on disk, in a specified file format. This would allow adjudication to be largely automated, to give fast results. Two matters here: whether a fixed log format should be adopted, and if so, what it should be.

ATV Contest

Belgium (C5.23) has proposed some changes to the IARU ATV contest. RSGB delegates will consult BATC about this – they will have an observer at the Conference.

Operating

SSB Random

Attempts to spread out random SSB meteor scatter operating have not worked. Stations still cluster on 144.200MHz, giving QRM. Finland (C5.38) has proposed that 144.195 to 144.205MHz be used for random SSB MS operation, to encourage operators to spread out a little, but with no formal frequency selection. Note that the Finnish proposal is only SSB. CW MS would not be changed.

Finland has also proposed an ad-hoc committee to discuss the future of the random SSB MS segment at 144.400 to 144.426MHz.

Extended Locator System

Several amateurs have pointed out that the locator system is not always precise enough for aiming microwave antennas. The RSGB (C5.33) has proposed an extension to the system, dividing each sub-square into a ten by ten grid, for greater precision. It is not intended that the extension be used in normal contest or other operating, but only when greater accuracy is needed.

Packet Terminology

New technologies develop new vocabularies. The RSGB (C5.26) has proposed a small dictionary of common packet radio terms ('Network', 'Digipeater', etc) so we all talk the same language.

Spread Spectrum

Israel (C3.21) has proposed that countries should approach their administrations for permission to experiment with spread spectrum techniques, and that standards be prepared to allow stations to work. [See p 53-56 - *Ed.*]

Over to You

COMMENTS ON ANY or all of the above proposals should be sent to the RSGB VHF Committee c/o G3UBX (QTHR) or via packet radio to G3UBX @ GB7MAX, or via Internet email to jphb@scitsc.wlv.ac.uk.

Comments on *purely contest matters* should be sent to the RSGB VHF Contests Committee c/o G4DEZ (QTHR).

CONTEST CLASSIFIED

All rules should be read in conjunction with the General Rules published in *Contest News* January 1993

HF RULES

RSGB CLUB CALLS CONTEST ("CCC") 1993

1. General: Aims - to encourage contacts between Affiliated Societies, to give Club Callsigns an airing and to encourage Class B licencees to operate under appropriate supervision. Note the changes in duration and frequency band from the 1992 event. The General Rules for RSGB HF Contests will apply (January 1993 *RadCom*).

2. Eligible Entrants: All licensed Amateurs and SWLs in UK. Multi-operator entries accepted in the Transmitting Contest. Entrants may represent only one club during the event.

3. Date and Time: 2000GMT to 2300GMT Sat 13 November 1993.

4. Frequencies/Mode: 1870kHz - 1990kHz, any licensed mode. CW operation to centre about 1955kHz to encourage QSOs with Novices. Entrants may encounter stations working DX (particularly JAs, whose entire frequency allocation lies within this segment), and should take care to avoid causing unnecessary QRM to non-contest users of the band.

5. Exchange: RS(T) + serial number commencing at 001 + (Other Data) [name of Club + 'Club Station'], or [name of Club + 'Member'], or 'No Club', as appropriate.

NB: The name of the club may only be reduced to initials for CW QSOs . . . . . otherwise it must be given in full, ie: Addiscombe Club = OK any time, AARC = OK only on CW. A 'Club Station' MUST use a callsign which is specifically issued to a Club or Society which is currently affiliated to RSGB.

6. Scoring: Only ONE contact with any station, regardless of mode. 3 pts per QSO, with these bonuses: 5 pts for the 1st ordinary member from each club; 25 pts for each Club Station; 50 pts for the RSGB HQ Station.

7. Address and Date for Entries: as per General Rules.

8. Awards: The Ariel Trophy to the leading Society/Club station. Certificates to the leading individual club member and the individual non-club-member giving away the most points.

RECEIVING CONTEST

Rules as above except: SWLs log only stations active in the transmitting section. Log column 'Other Data' to show name of Club + 'Member', or 'No Club', or name of Club + 'Club Station' as appropriate. Any station may appear only once in the 'station heard' column, regardless of mode.

A certificate will be awarded to the leading entrant. Additional awards may be made, subject to the level of support.

WINTER 1.8MHZ CONTESTS 1993/4

There are expected to be other European 1.8MHz contests running at the same time as these events, which should increase activity and interest. This applies particularly to the November contest. Entrants should not pester overseas stations for serial numbers, but merely log whatever contest exchange details are offered. The normal contest exchange and county code must be sent in full. Such QSOs may be claimed for points for both parties.

1. The most recent General Rules for RSGB HF Contests will apply (as published in *RadCom*).

2. When: 2nd 1.8MHz CW Contest 1993 - 2100GMT Saturday 20 November to 0100GMT Sunday 21 November 1993.

1st 1.8MHz CW Contest 1994 - 2100GMT Saturday 12 February to 0100GMT Sunday 13 February 1994

3. Sections: Single-operator entries only.

(a) British Isles.

(b) Overseas including EI.

4. Frequency and Mode: 1820 - 1870kHz, CW only.

5. Exchange: RST plus Serial Number starting at 001. British Isles stations must also send their County Code.

6. Scoring: Overseas stations work only British Isles stations for points. **Section (a)** Three points per QSO plus a bonus of five points for (i) the first QSO with each British Isles County worked and (ii) the first QSO with each Country (outside the British Isles) worked.

Section (b) Three points per QSO plus a bonus of five points for the first QSO with each British Isles County worked.

7. Address and closing date for logs: RSGB HF Contests Committee, c/o S V Knowles G3UFY, 77 Bensham Manor Road, Thornton Heath, Surrey CR7 7AF, England. Send within 15 days from end of contest.

8. Awards: (a) 2nd 1.8MHz CW Contest 1993 - The Victor Desmond Trophy to the leading station in the British Isles. **(b)** 1st 1.8MHz CW Contest 1994 - The Somerset Trophy to the leading station in the British Isles. **(c)** Certificates of merit to the second- and third-placed UK entrants in each event. **(d)** The Maitland Trophy to the Scottish entrant with the highest aggregate number of points in both events combined. **(e)** Certificates of Merit to the leading three entrants in the Overseas section in each event.

RECEIVING CONTESTS

The General Rules for RSGB Receiving Contests will apply, as will the special rules for the Transmitting Section except as modified below.

Eligible entrants:

(a) British Isles - RSGB members only

(b) Overseas - all SWLs

Holders of transmitting licences for frequencies ONLY ABOVE 30MHz may enter the receiving section. Holders of UK Class B licences are particularly encouraged to enter.

Logs: Columns to be headed: time GMT; callsign of station heard; report/serial number/County Code sent by that station; callsign of station being worked; bonus; points claimed. **NOTE** - In the column headed 'station being worked' the same callsign may only appear once in every three contacts unless the station heard is a new bonus.

Awards: Certificates of merit will be awarded to the leading entrants in each section. Additional certificates may be awarded at the discretion of the HF Contests Committee dependant upon the number of entries.

HF CONTESTS CALENDAR

1993	
1 Aug	RoPoCo-2 (Feb93) (note date changed)
7/8 Aug	*YO DX (CW/SSB)*
14/15 Aug	*WAE (CW) (Aug 93, p14)*
4/5 Sep	SSB FIELD DAY (Jul93)
4/5 Sep	*JARL All Asia SSB (Aug 93, p14)*
5 Sep	*LZ DX CW (Aug 93, p14)*
Sep/Oct	QRS Cumulatives (Jul 93)
11/12 Sep	*WAE SSB*
18/19 Sep	*SAC CW*
25/26 Sep	*SAC SSB*
25/26 Sep	*CQ WW RTTY*
2/3 Oct	*VK-ZL SSB*
3 Oct	21/28MHz Telephony(Apr93)(note date changed)
9/10 Oct	*VK-ZL CW*
17 Oct	21/28MHz CW (May93)
30/31 Oct	*COWW DX SSB*
1/7 Nov	*HA-QRP*
13 Nov	Club Calls (CCC)
12/14 Nov	*JARL Int'l DX SSB*
13/14 Nov	*WAE RTTY*
14 Nov	*OK DX (Mixed)*
20/21 Nov	2nd 1.8MHz CW
20/21 Nov	*All Austria CW*
27/28 Nov	*COWW DX (CW)*
4/5 Dec	*ARRL 160m*
12 Dec	*ARRL 10m*

HF RESULTS

LOW POWER 1992

My first task as adjudicator of this event is to offer sincere apologies on behalf of the HF Contests Committee for the fact that it was overlooked that the frequency band allocated for this event effectively excluded Novices. John Wresdell, 2E0ADL, did manage some QSOs and included a very justified brickbat with his checklog . . . . all will be rectified before the next event.

Conditions for the contest were very poor, with noise on 3.5MHz and no real propagation within the UK on 7MHz. The leader's score was 20% down on that of 1992 but despite this there were only four fewer entries. If checklogs are included in the reckoning the number is exactly the same! The callsigns of 44 other UK QRP stations (some of them very well-known contesters) appear regularly in the logs and a number of these would have done very well had they submitted an entry.

Congratulations to the leading stations, and a special mention for Harold Owen, G2HLU, who takes the certificate for the leading all-homebrew station, and for Philip Bagshaw, G3NEO, who not only claims the award for the leading 'one-watter' but whose entry was the highest-scoring error-free log. Also deserving a special mention are Stanley Ingram, EA6ZY (ex-G6ZY), who managed to winkle out a dozen QRP Gs on 40m, and Angie Sitton, G0HGA, whose excellent checklog and accompanying report amounted to an A4 page of closely typed text. *G3UFY*

Posn		Call	- QSOs - 80m	40m	Pwr	Points	Equipment
1	+	G3JKS/P	61	14	5W	1015	TS120V, Separate Dipoles
2	*	G0IVZ	54	17	5W	985	TS120, 3.5MHz Dipole, 7MHz 2-ele Yagi
3	*	G4ARI	66	3	5W	925	Sugiyama F850, Separate Dipoles
4		G4OGB	62	1	5W	838	TS430 + IRF510s PA, Separate Dipoles
5		G0OGN	56	-	5W	805	TS120, 3.5MHz Dipole @ 20'
6		G4ZFE	58	1	5W	800	Racal 'Syncal-30', Separate Dipoles
7		G3HEJ	45	11	5W	740	FT-one (BD135 PA), 3.5MHz 2-ele + 7MHz 4-ele driven wire arrays
8		G3YAJ	47	6	5W	690	Ten-Tec Corsair II, Separate Inverted Vees
9		G4KGG	41	10	5W	685	TS130V, Low Doublet
10		G3CQR	48	-	5W	665	HW9, Dipole
11	=*	G2HLU	42	4	5W	655	G3TSO tscvr (2SC1945s PA), Doublet
11	=*	G3NEO	45	2	1W	655	FT101B (2N4427 PA), 280' Horizontal Loop @ 40'
13		G4TLS	45	5	5W	643	TS940S (2N3632 PA), 100' Doublet @ 20'
14		G0KZO	39	-	5W	495	FT747 (ALC Mod), Dipole @ 33'
15		G3IGU	33	-	0W5	475	FT707 (BD135 PA), 66' L/Wire @ 25'
16	=	G0CRW	33	-	5W	435	IC735 (BLX13 PA), G5RV
16	=	G0LKX	34	4	5W	435	FT747 (ALC Mod), G5RV
18		G3KDP	22	11	3W	405	H/B (2N5321s PA), Dipole
19		G3GMS	23	5	4-3W	400	IC735 (ALC Mod), 27' Vertical
20		GW3GWX	24	-	1W	335	FT102 (2N3053 PA), Inverted-L
21		G3KZR	20	1	1W	295	FT107 (BD135 PA), 250' Doublet @ 20'
22		G0NID	15	1	4-1W	215	JR599 + Jupiter TX + OXO TX, G5RV + Dipole
23		EA6ZY	-	13	5W	190	TS450S, 2-ele yagi @ 55'
24		G3ILO	8	-	1W	115	TS680S (BFY50 PA), Dipole
25		PA3FSC	-	5	0W5	60	HomeBrew, Inverted-Vee @ 45'

Checklogs gratefully acknowledged from: 2E0ADL, G0HGA, G0JNZ, G3EAO, G4KGK and GW0KZW.

\+ 1930 Committee Cup
* Certificate of Merit

ROPOCO 1 1993

Congratulations to the trophy and certificate winners in this challenging contest. The scores and positions of many entrants (including the leaders) changed because of errors made in reading callsigns and postcodes, or in copying them into logs. G0IVZ lost only 3 points this way and so pushed his rivals out of first place. There were three error-free logs, the highest-scoring being from G4KGG who takes the Verulam Trophy.

Some comments from entrants: "Overslept and started four minutes late" - G4BJM. "Enjoyable" - G3KAF. "Doesn't disrupt the day too much . . . . encourage more operators" - G3KHZ. "Antenna bent in all directions" - G3KNU. "Nice contest . . . . my wife's favourite" - G3HKO. "Space should be a valid character . . . . few entrants seem to space properly" - G4IFB [What do others think ?]. "Do I need to show postcode sent since it is the same as postcode just received?" - G3RSD [No!]. "Tried using computer log and got into a right mess" - G4WYG. "Great fun . . . . logged my own (altered) postcode on the last QSO" - G3KKQ. "Usual collection of interesting postcodes" - G4CZB. "Hope to be in the next leg" - G4RCG. "Good for the first hour" - G3JSR. "Oh for a linear!" - G0OPB. "My First RoPoCo" - G4UXG. "Poor propagation" - GM4SID. "Sorry my entry was slightly late" - G4FUI [You're forgiven]. "Postcode recovered from DOS wetware memory!" - G3NKS. "Band was noisy here" - GM3UM. "My favourite contest at 73 years old" - GW4KVJ.

One well-known GW station (who seems to have been too embarrassed to send in an entry) decided to make a rare appearance on CW. However, he sent his own postcode to everyone! This added enormously to the fun and meant that if the contest had lasted another hour, his would have been the only postcode circulating! Hope to see you all in the next contest.

G3SQX/G2HLU.

Posn		Callsign	Eqpt	Score
1	*	G0IVZ	4C5	737
2	*	G4BJM	4C7	734
3	*	G5LP	3C1	718
4		G4BWP	3C4	694
5		G3TBK	4C6	682
6		G3KAF	3C4	658
7		G3KHZ	3C8	652
8	+#	G4KGG	3C2	630
9		G3KNU	3C	609
10		G3JJZ	3W3	607
11		GW3WWN	3C	601
12		G4BLI	3C	588
13		G3HKO	3C	587
14		G4BLX	4C5	585
15		G4IFB	3G1	584
16		G4FNL	3C3	578
17		G4OGB	3C3	574
18		G3RSD	3C3	567
19		G3VMO	4C3	559
20	=	G4WYG	3C	554
20	=	G2HLU	3C2	554
20	=	G3SQX	3C3	554
23		G3JSK	3W4	551
24		G3KKQ	3Q	548
25	=	G4EBK	4C3	547
25	=	G0JQN	3W1	547
27		G4XPE	3C1	537
28		G4CZB	4C2	524
29		G3MA	3C6	509
30		G3IZD	4C2	505
31		G3BPM	3G6	499
32		G3JSR	3W	495
33		G4RCG	3C	481
34		G3AWR	3C	477
35		G5MY	3G	466
36		G3IGU	3W	462
37		G4XRV	4C2	457
38		G0OPB	3C	456
39		G0RSA	3C	434
40	+	G3GMS	3G2	430
41		GW3SB	3W1	402
42		GM4SID	4C	391
43		G4UXG	3C2	385
44	+	G4FUI	3W	380
45		G4PTE	3G	378
46	=	G0IBN	3C	374
46	=	G3MCK	3C	374
48		G3CQR	2C	369
49		G3VNG	2C	337
50	@	GW3JI	3C	327
51		G3NKS	3W	290
52		GM3UM	W4	288
53		GW0KZW	3C	269
54	@	G0LKX	3W	189
55		GW4KVJ	3C	131

\# Verulam Silver Jubilee Trophy
* Certificate of Merit
\+ Error-free log
@ Unmarked duplicate contact found

HF CHAMPIONSHIP 1993 – CORRECTION

The first event contributing to the HF Championship was shown incorrectly in the rules (Contest Classified, May 1993) as 'LF Phone'. This event has been replaced by 'IOTA SSB'.

VHF RULES

CHRISTMAS FUN CONTEST

Following a number of requests, this year's 4m/2m/70cm Christmas Contest will feature normalized scoring to determine the overall band-scores. This means that the leading station on each band each day will be awarded 1,000 points, and the other stations will receive a pro-rata amount. The final score will be the sum of the normalized band scores for each day - ie a maximum possible score of 12,000 points (4 days, 3 bands, 1,000 points each).

70MHZ TROPHY 1992

The comments regarding G4SEU's entry in this contest were in no way intended to indicate that G4SEU were being accused of cheating, simply that there was excessive carelessness in the submission of their entry.

THE TYPEFACE in Contest News has been reduced at the request of the HF Contests Committee in order to do justice to the large amount of contest information requiring publication, whilst retaining the same page allocation.

VHF RESULTS

70MHZ CUMULATIVES

A reasonable number of entries this year - conditions not that good, but activity appeared to be reasonable. Congratulations to Geoff Grayer, G3NAQ, who wins the single operator section, followed very closely by M Vincent G3UKV. Congratulations also to the winners of the 'other' section GD7HEJ, The Three Legs DX group and to the runners up only a few litres behind, Flight Refuelling, G4RFR! Certificate also to G0FCT for best station using 25 watts or less and single antenna. *G4DEZ*

FIXED STATION SINGLE OPERATOR

		Normalised scores					Total			
Psn	Call	J24	J31	F21	F28	M14	3 best	Pwr	Ant	Loc
1	G3NAQ	752	1000	952	1000	1000	3000	90	8	IO91
2	G3UKV	1000	-	1000	937	840	2937	100	5	1082
3	G3WHK	519	696	694	718	734	2148	100	4	IO91
4	G3ZJY	341	448	574	631	477	1682	40	4	IO90
5	G0FCT	301	466	449	368	416	1331	8	6	IO91
6	G0EHV	-	294	431	-	371	1106	50	HB9CV	IO94
7	G4EYD	-	253	323	337	118	913	25	4	IO92
8	G3TWG	69	248	-	225	408	881	50	4	IO91
9	G4OUT	272	248	293	-	297	862	10	3	IO92
10	G4SJH	207	190	221	-	-	618	50	3	IO91

OTHER SECTION

1	GD7HEJ/P	1000	1000	1000	1000	1000	3000	140	5	IO74
2	G4RFR	961	774	853	896	969	2826	140	2X12	IO90
3	G4ZTR/P	591	334	670	737	727	2134	70	2X5	JO01
4	G4ZAP/P	758	369	—	—	854	2081	160	2X5	IO92
5	G7FDC	—	538	289	512	861	1911	25	9	IO80
6	G4DSP	369	453	262	303	546	1368	140	5	IO92

Sorry that we cannot print actual scores this time, but space is limited.

MARCH 144/432MHZ

Lots of entrants commented on the clash with the VHF convention. The contest has been on this weekend for many years, and VHFCC is not involved in organising the convention. For once we're really not guilty!

Those who put the contest first enjoyed reasonable conditions and plenty of activity from contests in France and Germany. Portable stations were blessed with unseasonably warm weather. The convention clash reduced local activity on 70cm, although DX was clearly available with OK heard. On 2m, the main effect was a welcome reduction in background noise levels. G6CTU was very honest in not claiming an incomplete contact with OE having logged all the incoming information.

It was a bad weekend for aerials. G8LNC suffered a tower luffing failure which entailed six hours of begging and borrowing replacements. G4DSP dropped some elements which got run over by following cars while G8DWD concentrated on modern sculpture. The dangerous sports award goes to G1OGQ for raising their tower in its extended state after a cable breakage!

Logging standards were highly variable. Most logs had error rates of 1 - 2%, but there were some noticeable exceptions. G4WKN had only one logging error and one unmarked duplicate in nearly 400 (non computerised) contacts. On the other hand, two of the larger logs contained over 5% errors. In one case these included six unmarked duplicates, with a 25% loss of claimed score. On 2m, the only error-free log came from G7LSH. The results show the number of contacts after adjudication.

A few entries have moved section. In particular, please note that in multi-band contests, a single op station has one op for all bands, not one op per band. Thanks go to G3UOL and G3MEH for their checklogs.

Congratulations and certificates go to all section winners and runners-up, too numerous to list individually. A special mention goes to GM4VVX, who persevered despite periods of many hours when nothing at all could be heard. *GW8GSQ*

144MHZ FIXED STATION

	Call	Points	QSO	Loc	Power	Aerials	Best dx	km
1	G4WKN	2346	311	92OG	350	17+9	FF6KFH	734
2	G4DEZ	1140	132	01IN	400	17	DF0CB	646
3	G1GCT	1126	135	01KU	100	14	DF0RI	565
4	G8ZRE	663	126	83NE	100	8	ON4ASL/A	510

FIXED STATION LOW POWER

1	G5UM	98	14	92MP	12	8	ON7RY	440
2	G8IFU	53	13	90BT	2	2	G4DSP/P	293
3	G7LSH	13	5	90HV	25	5/8	G7FDC	164

SINGLE OP PORTABLE

1	GM8ORG	683	66	74TQ	80	17	PA0GHB	
2	GM4VVX	299	19	78WA	150	9	G8LNC/P	846

SINGLE OP PORTABLE LOW POWER

1	G8FBG	1575	190	91TF	25	16	GM4VVX/P	786

MULTI OP

1	G8LNC/P	7851	665	90JO	400	4x19	GM4VVX/P	846
2	G4DSP/P	6188	561	03AD	400	80el	DB8NU	777
3	G4CRA/P	3755	379	01IT	180	2x14	DL0UL/P	732
4	G0CDA/P	2608	258	93AD	120	15	DK0BN/P	759
5	G6CTU/P	2306	361	91XG	350	2x17	GM4VVX/P	794
6	G8DWD/P	2272	173	02QV	350	2x13	DG0CAL	706
7	G3KMI	2237	251	90HW	150	4x17	DK0XX/P	749
8	G1MDG/P	1703	248	91RO	400	13	DL4ZBC/P	692
9	G7FDC	1487	170	80FI	275	2x7	DL3EBM	697
10	G6GLR	310	42	94FU	400	17	F1CBC	594
11	G3ZTT	246	42	83QE	10	12	ON4ASL/A	500
12	G7GTL/P	137	19	70XN	25	12	FC1NQP	468

OVERSEAS

1	PE1EWR	531	63	11SL	10	10	F5DE/P	589

432MHZ FIXED STATION

	Call	Points	QSO	Loc	Power	Aerials	Best dx	km
1	G1GEY	718	56	94FW	400	2x21	F9NB	940
2	G4WKN	423	71	92OG	100	2x21	F6APE	546
3	G1GHA	377	45	92CM	100	21	DL9LBH	562
4	G4DEZ	138	20	01IN	50	18	DL0KK/P	404

FIXED STATION LOW POWER

1	G5UM	56	14	92MP	10	18	G1GEY	251

SINGLE OP PORTABLE LOW POWER

1	G8FBG	489	69	91TF	25	28	G8UZM	427
2	GW8AWM	455	49	81LS	25	21	PE1LMX	642

MULTI OP

1	G3CKR/P	3266	260	93AD	400	4x21	DF9FD	812
2	G4SIV/P	1514	156	03AD	400	4x21	F6DBB	754
3	G1OGY/P	1122	122	01IT	100	4x17	DJ9RX	578
4	G3NAT/P	953	122	91XG	400	27	FC1DBE	
5	G8KMI	312	42	90HW	100	2x21	PI4GN	629
6	G4SSD	100	15	80FI	50	12	FC1BJD/P	346
7	G4EUZ	88	14	94FU	100	21	F6APE	835
8	G8ZTT	43	7	83QE	25	16	G3NAT/P	276
9	G0JLF/P	22	6	70XN	10	8/8	GJ7AOG/P	198
10	G0ERS/P	8	8	90JO	5	1/4	G8OQN	40

OVERSEAS

1	PE1EWR	416	50	11SL	10	21	GW8AWM/P	455

NORMALISED POSITIONS FIXED STATION

	Call	144	432	Total
1	G4WKN	1000	589	1589
2	G1GEY	1000		1000
3	G4DEZ	486	192	678
4	G1GHA	525		525
5	G1GCT	480		480
6	G8ZRE	283		283

FIXED STATION LOW POWER

1	G5UM	1000	1000	2000
2	G8IFU	541		541
3	G7LSH	153		153

SINGLE OP PORTABLE

1	GM8ORG	1000		1000
2	GM4VVX	438		438

SINGLE OP PORTABLE LOW POWER

1	G8FBG	1000	1000	2000
2	GW8AWM	930		930

OVERSEAS

1	PE1EWR	1000	1000	2000

MULTI OP

	Group	144	432	Total
1	Warrington CG	332	1000	1332
2	Spalding & D ARS	788	464	1252
3	Victory CG	1000	2	1002
4	Colchester R A	478	344	822
5	11th Hour CG	294	292	586
6	Southampton Univ	285	96	381
7	East London Exiles	289		289
8	South Devon RC	189	31	220
9	Chesham & D ARS	217		217
10	Great Lumley ARES	39	27	66
11	Mid Cheshire CG	31	13	44
12	Univ Plymouth	17	7	24

DIRECTION FINDING

GT PECK MEMORIAL TROPHY

This year's event started at Cowleaze Wood near Stokenchurch, with 14 competitors.

Station A, G3TRY, was approximately six miles east and situated in a wood infested by holly bushes. The aerial was a continuous loop.

Station B, G4MDF, was a weak signal being some twenty two miles north east of the start of Berkhamsted Common and hidden behind a fallen tree.

Afterwards tea was held at Naphill Village Hall with the winner John Hall from Ripon being presented with the GT Peck trophy.

RESULTS

Pos	Name	Club	Time of Arrival at Transmitters A	B
1	J Hall	Ripon	1445	1540
2	P Tyler	Mid Thames	1445	1554
3	G Foster	Mid Thames	1556	1444
4	C Wells	Mid Thames	1557	1442
5	C Boyce	Mid Thames	1557	1442.30
6	T Gage	Mid Thames	1558	1444
7	G Brightman	Mid Thames	1558.30	1444
8	A Collett	Chelmsford	1509	1601
9	B Bristow	Mid Thames	1604	1443
10	R Gray	Mid Thames	1443	1605
11	G Whenham	Coventry	16.25	1530
12	B Pechey	Mid Thames	-	1528
13	S Stone	Mid Thames	-	1537
14	R Goodearl	Mid Thames	-	1555

JOHN PILAGS, G0RAW/G8HHI

As you will have read in a previous *RadCom*, John Pilags, G8HHI passed away at the end of March. All of us on the VHFCC will sadly miss John's experienced contributions to VHF contesting. John was due to adjudicate the September 144MHz Trophy contest and the November 144MHz CW Contests. Logs for these events should go to: September 144 MHz Trophy - Ian Pawson, G0FCT, 3 Orion, Roman Hill, Bracknell, Berks RG12 7YX. November 144MHz CW - David Johnson, G4DHF, 65 West Street, Bourne, Lincs PE10 9PA.

VHFCC VACANCY

The loss of John Pilags gives rise to a vacancy on the VHF Contests Committee. Anyone interested in applying should write to the Chairman, Bryn Llewellyn, G4DEZ, stating why they wish to join and giving a brief summary of their relevant experience. Applications should be received by 14 August 1993.

RSGB 1993 VHF/UHF CONTESTS CALENDAR

322 Aug	2nd432 MHz Fixed (Feb 93)
31 Aug	144MHz CW Cumulative (Feb 93)
4/5 Sep	144MHz Trophy (Feb 93)
15 Sep	144MHz CW Cumulative
19 Sep	70MHz Trophy (Apr 93)
30 Sep	144MHz CW Cumulative
2 Oct	1296MHz Trophy
2 Oct	2320MHz Trophy
2/3 Oct	432MHz-24GHz & IARU Contest (Apr 93)
5 Oct	1.3/2.3GHz Cumulative (Apr 93)
13 Oct	432MHz Cumulative (Apr 93)
15 Oct	144MHz CW Cumulative
20 Oct	1.3/2.3GHz Cumulative
28 Oct	432 MHz Cumulative
31 Oct	2nd 1296/2320MHz Fixed
1 Nov	144MHz CW Cumulative
4 Nov	1.3/2.3GHz Cumulative
6/7 Nov	144MHz CW, Marconi/6/24 hr
12 Nov	432MHz Cumulative
18 Nov	1.3/2.3GHz Cumulative
29 Nov	432MHz Cumulative
5 Dec	144 AFS / Fixed
6 Dec	1.3/2.3GHz Cumulative
14 Dec	432MHz Cumulative
26,27,28	
29 Dec	70/144/432MHz Fixed

For details of rules for European contests, contact G4PIQ, QTHR.

Please remember to include full details of your antenna, particularly the height above ground, with your entry.

RIPON QUALIFYING EVENT

Date: 15 August 1993

Map: 105 (York and Surrounding Area)

Assembly: 1300 for start at 1320

Location: Skip Bridge off A59, NGR 484560

Competitors requiring tea should notify John Hall, tel: 0423 567390, no later than 8 August.

COLCHESTER/ CHELMSFORD QUALIFYING EVENT

Date: 5 September 1993

Map: 155 (Bury St Edmonds)

Assembly: 1300 for start at 1320

Location: Great Green, 1.5 miles NE Cockfield, NGR 916560

Competitors requiring tea should notify Mike Hawkins, Tel: 0787 880887, no later than 29 August.

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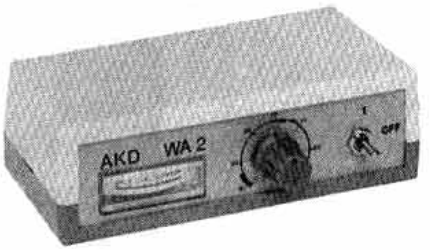
CHECK YOUR FREQUENCY — KEEP IT LEGAL!



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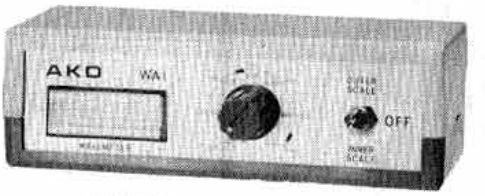

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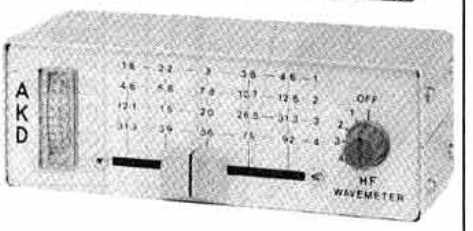

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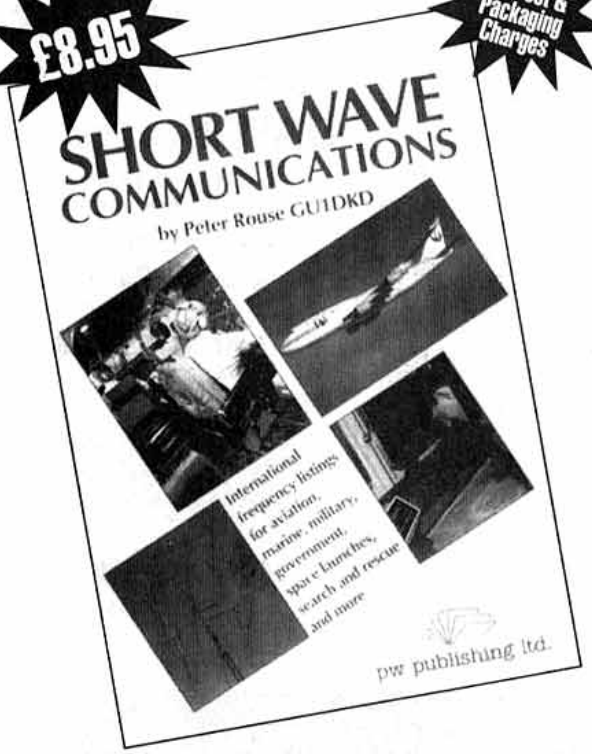

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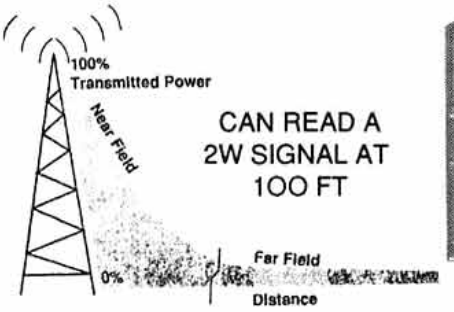

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YAESU FRG8800 Gen Cov all mode HF Receiver fitted with FRV8800 VHF Converter, mint: £400. FRT7700 Tuner: £40. G0PGF, QTHR. (London) 081 505 0568.

YAESU FT101B 100w HF Tx/Rx(Non WARC) CW filter fitted, with Base Mic and Fist Mic, owners manual and spare valves: £300 ovno. FTV107R Transverter with 2m fitted and manual: £125 ovno. FC700 Antenna Tuner: £120 ovno. Datong ASP Processor: £75 ovno. Please use answer phone. (Willington, Co Durham) 0388 745787.

YAESU FT726R VHF/UHF Tribander fitted with 6/2/70cm Modules, Mic and handbooks, immaculate condition: £600. G0OPL. Please Fax 0584 876675 or Phone (Ludlow, Salop) 0584 872522.

YAESU FTONE, All band, all mode, solidstate HF Tcvr, fitted all options, Shure 444D Mic, complete with operating and technical manuals, one owner. Going QRT, health reason: £500 for quick sale. Yaesu Antenna tuner fitted FAS14R if sold with FT ONE: £100, separate £150. Yaesu SP102 Speaker: £45, buyer collects so able to test equipment. G4OWN, QTHR. (Sutton) 081 395 6890.

6200 RECORDS - Wide range of Music, including 12inch singles, EP's, and 7inch Singles. Coloured Vinyls picture disks, picture covers in good condition. Many collectors items from fifties through to eighties. A good collection, well worth having, will not split: £2000 for quick sale. Wide range of LP's also available. Can be selected if required. Price as arranged. G6MMG, QTHR. (Merseyside) 051 430 9167.

AERIAL MAST comprising three 20ft Tubes to make 35ft 'A' Frame. Also optional 7ft Extension (42ft): £35. Offers. G3OWB. (Cambridge) 0223 358601.

ALINCO DR410E 70cm Mobile 5/45W: £175. Yaesu G-500 Elevation Rotator, used for only two weeks: £100. Kantronics KTU Home Weather station c/w Annoimometer and external Temp sensor, boxed with manual: £150. Kenwood TH78E 2m/70cm H/held, boxed as new: £325. Telereader Codemaster decodes RTTY/CW: £55. ICS FAX-1 gc: £190. All prices ono. GM0BRJ. Telephone after 6pm. (Kilsyth) 0236 824167.

ALTRON 55ft Compact Tilt Over Tower, complete with KR400RC Rotator, AQ6 4 ele Beam, auto braking winch: £495. Buyer collects. G0KUD. (Grimsby) 0472 341156.

AMSTRAD 1640 PC double 5.25 floppy drives, mouse, CGA Colour Monitor, VGC, original boxes, MSDOS, GEM, Gemdesktop, Gempaint: £250. G4MUT. (Reading) 0734 693766.

AMSTRAD 6128 with CTM644 Colour Monitor, Multiface 2, RS232, Amsword WP, Tasprint Mini-office 2, Rambase 3, other utilities CPM etc and 40 games: £230 ono. G4DYM. (Weston Super Mare) 0934 833478.

ANTENNA HI-GAIN TH3JR 10, 15 and 20 Metres: £225. Rotator KR600RC with Controller: £75. Scarab RTTY Modem with S/ware - Amstrad 464, 664, 6128 Computers: £40. (Weobley) 0544 318875.

ANTENNA PKW Model 'K', 80-40m Vertical with radial Kit. New and unused: £100. Martin, G4TOO, QTHR. (Chelmsford) 0245 266728.

ARCHIMEDES A310M Computer. 4M Ram, 20M Hard Drive, Beebuc External Drive Interface, Taxan770 Multisync Monitor, Cumana Twin 5.25, 80/40 Disk Drive Unit, manuals, S/ware, mint condition: £675. (Orpington) 0689 839548.

ARMY RADIOS A13 Manpack, A41 No 2, A43, WS38 AFV, Canadian 52 Receiver, New Zealand ZC1, PRC6, B2 Tx & Rx. Phone (Kingston-upon -Thames) 081 949 2317.

ATARI STE Morse, RTTY, transceive automatic to max speed, noise filter and adjustable Mark/Space ratio, also a word processor, makes good log book: £20. Also 6 ele Quad 2m 13dB gain plus feeder: £20. V. McClure, 43 Roman Way, Seaton, Devon. (Seaton) 0297 23421.

BBC B COMPUTER, Colour and Green Monitors, Twin 40/80T Disk Drives, ROM expansion Board. Lots of S/Ware, including Games, Business, Education, Comms and Morse: £200, Buyer Collects. G6FPF, QTHR. (Halifax) 0422 350580.

BBC COMPUTER 32k with user guide, 40-80 disc Drive, 2x 100 disk box with disks, 5x 10 disk box, some disks spare. Spare Mother board and Power unit, second processor? The Lot: £150. NO OFFERS. (Denaby Main) 0709 868302.

BBC COMPUTER, 80t Floppy RAM/Drive, books, progs, monitor: £100. Avo Signal Gen 95KHz to 80MHz offers. Solartron CD1012 Scope, big, heavy, working: £35. Marconi Sig Gen TF913 21-168MHz AM/FM, rough, working: £15. Manual for Kenwood TS930S: £10. G3RVD, QTHR. (Weston S Mare) 0934 812348.

BLACK STAR 'Meteor' 1500 Frequency Counter (up to 1.5GHz): £165. Orion Pal Composite RGB (and Sound) Video Pattern Generator: £110. Jupiter Function Generator (up to 500kHz): £110. Weltz CT300 Dummy Load (1kW peak): £60 new. Tel: Paul, G4XHF (evenings only). (Crawley) 0293 515201.

BUTTERNUT HF2V 40/80m Vertical Antenna, half price: £90. Postage extra. G3VOF. (Hornchurch) 0708 373366.

COLLECTORS Items. Collins TCS13 Receiver: £40. PCR3 Receiver: £30. Murphy B40D Receiver: £70. All good condition. GM8GUX, QTHR. (Hawick) 0450 75089.

COMPLETE MOBILE Amateur/SWL Station; Yaesu FT757GX Tcvr with matching Auto ATU and Mains PSU. Clegg 2m Tcvr 144-148MHz FM 10/25w. Philips DC77 Radio/Cass LW, MW, VHF/FM and 3.17-21.91MHz AM/SW. Technics CD Player with CD Travel Kit. G-Whip Flexi Ten and G-Whip Multi (9 bands). 2m 7/8 and 70cm 7/8 Ants. Gutter Mounts, Mag Mount, Bumper Mount all fitted into 1990 H-reg Lada Riva 1500 Estate (with FSH) including fitted mounting brackets for all above. Sparkrite AT125 Alarm, all handbooks for only: £4600 the lot. (Company car forces sale). Telephone Robin. (evenings or weekends preferred). (Northampton) 0604 644341.

COMPUTER BBC B Dual Disk Drives, ROM Exp Satpic - ROM + SATPIC Decoder Interface with books, disks etc. Any demo. (Only requires Audio input for WeFax Meteosat HF-VHF). All for: £200. Phone first, equipment at 203 Tankerton Road, Whitstable, Kent. 0227 262491 work, (Whitstable) 0227 276118.

COMPUTER FAX Card SR1 in orig box with Software: £75 ono. Plus two PK80 Packet Modems for 1200 and 2400 Bauds, needs cases and TAPR chip: £45 each ono. (Hayling Island) 0705 465121.

CUSHCRAFT R7 Three months old, as new. Too many Verticals in Garden. All instrs, boxed: £280 or Swap for Tri-Bander. (Southampton) 0703 898887.

DAIWA Automatic Antenna Tuner 500w PEP, 3.5-28MHz, Dummy Load, 2 Aerial Crossneedles, superb mint condtion: £80. Ken, G3WXB. (Eastbourne) 0323 720059.

DANCOM RT101 Radiotelephone, 1.6-4.2MHz, GC Rx, plus 30 channel Tx & Rx. 200W pep, 12 or 24v, manual, 19 X 14 inches, HEAVY. Rx working, offers. Collect. Wanted FR101 with VHF. (Dartmouth) 0803 833621.

ERA MICROREADER Mk2, unwanted present, hardly used, all instructions, plugs and PSU: £100 ono. Richard, G0TBX. (London) 071 431 2484 evenings.

FDK-750X 2Mtr Multimode 10W Tcvr: £150. Nevada 50MHz 15W Linear Amp: £10. Computer Monitor VGA mono: £60. RX-4 Multimode receive program for the CB64 computer; RTTY, CW, AMTOR, SSTV by Technical S/ware with TTI interface: £15. (Tewkesbury) 0684 299420.

FL290R2 FL2025 Clip-on Linear 25W, Nicads charger, boxed: £400 ono. Collinear CA2X4Max 2m/70cm with Diplexer: £70. Microwave Modules Rx converters 2m/70cm: £15 each. (Kilmelford, Nr Oban) 08522 237.

FL7000, full working order all bands, complete with leads and manual: £1200. (Wing, Nr Aylesbury) 0296 681109.

FRE8800 Rx, Twelve memories, original condx: £395. HyGain CD4511 Rotator with control and cable: £80. KW 3 way Ant Switch: £15. (Plymouth) 0752 775375.

FRG7700 with memories, virtualy new, General coverage 50Khz to 30Mhz, AM/FM/SSB etc: £275 plus P+P. 8 Track Stereo, speakers, cartridges. Phone Mike, GM4KLO, QTHR. (Glasgow) 041 639 2729.

FT101Z, CW filter and 10MHz installed. Tx just gone DEAD! Best offer accepted. G4AYP, QTHR. (Harrogate) 0423 563196.

FT101ZD WARC bands, CW filter, DC converter, fan, mic, manual, spare tubes: £425. FV101Z Ext VFO: £85. SP901 Speaker: £25. All Ex condx: £485 the Lot. 2m FM Trio TR7800: £95, fair condx. (Coventry) 0203 450476.

FT726R HF Module 15, 12, 10 metres. Good working order: £200 plus P&P. (Cardigan) 0239 811157.

FT767, mint with boxes, matching speaker, 2m, 6m & 70cm Modules, manual and technical reference, cat interface and S/ware: £1300. Multicom S/ware, manual for MFJ1278: £35. AEA ET1 ATU, mint, boxed: £100. Farnell 12v 20A PSU: £60. Paul, GW4AMZ. (Abergele) 0745 833847.

FT890 Exc Condx little used, never on transmit(no mic), manual, leads, plus special imported Keypad for direct entry of freq, boxed: £1050. Two way Coax switch: £15. Both boxed and little used. Nick, G7IYG. (Uxbridge) 0895 236397.

HEAVY DUTY Triangular Mast 2x 20ft Sections, 4ft Top Section with Rotator Plate and bearing: £200. Buyer Collects. (Cambridge) 0223 247930.

HF LINEAR 2kW Dentron, recent overhaul. A solid Beast! Broadcast quality Eimac 8877 tube. Bargain at: £525. (Teignmouth) 0626 773301.

HQ1 MINIBEAM : £75. FT290R: £245. Daiwa LA206 2m linear: £75. Mutex SLNA 2m Preamp: £25. 144/9 Yagi + AR30 Rotator: £75. IC02E 2m H/held: £125. BBC-D issue 7, DFS8271 +interword +GX2 FAX/SSTV, high resolution Monitor +Software: £385. Wordwise-Plus: £40. TX3 FAX/SSTV TX/Rx, incl Interface. Spectrum+ Alphacom Printer +FAX3/SSTV +Interface: £95. G4KTX, QTHR. (Chelmsford) 0245 33233.

HYGAIN 10-3 28MHz Mono-Band Beam: £30. Wanted Altron AQ620, SB200 Linear, working or not, to complete Heathkit SB101 lineup. G0KSB. (Telford) 0952 612709 6-8pm only.

HYGAIN BEAM TriBander Antenna model TH3JR-S for 10, 15 & 20 metres. Recently erected and working but not suitable because of Planning difficulties: £225. Original box available. Tel: Lionel, G0NOB. (Torquay) 0803 293325 any time.

IC3220E :£390. FT470: £275. AOR1000: £179. Diamond SX200: £50.Weltz SP420: £35. Weltz SP10X: £18. Diawa PS120: £45. Adonis AM303G: £25. Kent Key: £20. Duplexer 2m/70cm: £10. Quality Coax Switch: £10. Yaesu YH-55 Headphones: £10. Yaesu YH-2 Headset: £10. Nevada TC50DX: £45. Tokyo HL-35V: £50. Capco SPC-100: £70. FT736R 6m Unit(Faulty): £90. Heatherlite Headset: £15. DualBand (144/70) Mobile Ant: £10. Mutek TVVF144a: £150. Welz SP-350: £45. TS1440S: £800. Samson Paddle: £20. After 6pm. Dave. (Hoddlesden) 0254 771621.

ICOM 728 Transceiver as new. First offer: £800 secures. Buyer pays carriage or collects. Mike, GM4KLO, QTHR. (Glasgow) 041 639 2729.

ICOM 735 HF Tcvr, very little use, AT150 AATU, PS-55 PSU, Spkr IC-SP3, exc cndt: £1175. (Bristol) 0272 772804.

ICOM IC-R100 wide band scanning Rx 0.5-1800MHz AM NFM/WFM SSB, AD-15E PSU, boxed with accessories: £350. Trio JR599 HF Amateur Bands only Receiver, silver front Model matches Tx 599, with S-599 Spkr: £120. Icom IC402 70cm SSB/CW Portable Tx/Rx, boxed with Accessories: £150. Richard, G8ITB. (Bromley, Kent) 0689 852177.

ICOM IC740 with FM board and 250Hz CW filter, ex condx, used only for EME, all HF, twin VFO, memories, excellent Rx perf: £450 ono. Wanted: Valve Audio Gear, Telefunken V74/80, MK26, Compressor EMT valve Reverb, AKGC28 Mic. Conrad, G0RUZ. (Barnsley) 0226 757624.

JIM MIZUHO MX7S 40mtr Pocket QRP Tcvr inc additional Crystal MS1, Spkr, Mic, AN7 Portable Aerial, boxed, mint: £160. (Cardiff) 0222 892425.

KENT IAMBIC Keyer and twin paddle: £55. HF5 Vertical 10-80m including radial kit: £55. Racal Digital Meter 9070, good condx: £35. Toshiba MSX 64K Computer, games, joystick, books etc: £30. Ferguson portable tape recorder: £10. Ray, G0GXJ, QTHR. (Sheffield) 0742 465713.

KENT Single Paddle Key: £30. Kent Keyer: £35. Or £60 both. BNOS 12A PSU: £50. Phone (Pontypool) 0495 757221.

KENWOOD SM220 Monitor Scope with BS-8 Band Scope: £325 ono. Philips CMT FM Xcvr modified 4m: £40. Hy-Gain 204BA: £100. (Henly on Thames) 0734 724192.

KENWOOD TM231E 2m FM 50watt Mobile Tcvr, vgc: £200 ono. HF5 5 Band Vertical: £60 ono. Wanted 70cm H/held. Phone Peter. (Chesterfield) 0246 415784.

KENWOOD TS140S HF Tcvr, CW and SSB filters fitted, boxed, as new, complete with Mic and leads: £590 ono. (Kegworth) 0509 672042.

KENWOOD TS140S, MFJ949D ATU, LF30A LPF as new. Excellent Receiver. Tx used once: £690 ovno. (Watford) 081 428 7019.

KENWOOD TS440S CW filters, PS50 PSU, AT230 ATU, SP430 Ext Spkr, LPF, MC60 Desk Mic, Phones, Dummy Load(Toyo), Kent Key, Mint collection. Station: £995 bargain. Separately; Eight 4.75ft Sections Alum Mast, 2 inch Dia: £55. (incl Reels Polythene). Unused AKD TVI Filters: £4 each. Buyer pays postage. (Largs) 0475 675967.

KENWOOD TS530S, WARC bands, CW filter, good condition, boxed, manual and Mic. Reluctant sale due to hearing disability: £475. GW4PTY, QTHR. (Abergavenny) 0873 831922.

KENWOOD TS530S: £420. SEM Transmatch: £55. VR3 TriBand Vertical: £35. The Lot: £480. Prefer Buyer collects. All good condition. G0CZB. (Hitchin) 0462 434552.

KENWOOD TS690 Power Supply Unit, purchased Nov'92. Offers. G4WIE, QTHR. (London) 071 987 2296 anytime.

KW2000B HF Tcvr with AC/PSU/Spkr, KW match SWR, Mic, original operating manual and circuit diag. Lots of KW info, inc HRT series on uprating the KW2000 rig: £130. G0RDT, QTHR. Phone evenings/weekends. (Northampton) 0604 757368.

LOWE HF150 General coverage Rcvr, 30Khz to 30Mhz, mint: £290. Avo BM201 Battery Megger, brand new: £80 ono. G4DBX, QTHR. (Crewe) 0270 71369.

OLIVETTI PC XT, 640kRam, 10Mb HDD, 5.25 FDD, Mono Monitor, some Software: £150 or WHY. Ideal for Packet. Joe, G0NNZ, QTHR. (Scarborough) 0723 862958.

OSCILLOSCOPE, HITACHI 20Mhz Dual trace, gwo and good condition: £110 ono. G4PSJ, QTHR. (Portsmouth) 0705 750526.

OSCILLOSCOPES Advance OS-2000 20MHz: £50. Telequipment D52 5MHz. Both Double Beam, vgc. G4BNB, QTHR. (London) 081 504 3260.

PAKRATT 232 TNC complete with mailbox, manuals, leads also Pakratt & Lan-Link software: £275. FT790R Multi Mode, complete with Charger and Mic: £225. Mother Board 386 with 2m of Ram: £89. (London) 081 953 6921.

PROFESSIONAL SWEEPERS, Directional couplers and Bridges (ex wrkg condx) plus Bearcat Scanner 50XL (mint). (Little Rissington, Glos) 0451 821896.

PYE RADIO Valve type model R33 MW and LW, 195-220v, 221-250v AC: £13. Mains-Portable Radio AM, FM, PB, Air, WB: £11. Radiomobile stereo cassette Player model 302CS: £9. Cylinder Fan 60mm 115v, 230v AC 50Hz as new: £6. Car Radio 12v type 1522AM AUD4749 for Marina Ital: £15. Valve TT15: £4. G3OEG. (Staines) 0784 454757.

QRO? PTFE BAR 1inch Dia, 6 feet available: £25. Or cut at 50p/inch. Ten 600uF 300V: £10. Rollercoasters, Airspaced Caps, etc. (Bridgend) 0656 665225.

RA17L Rx 0.5-30MHz: £100. G3WPO 5W 80m DSB Tcvr, needs new Vcap: £15. G3WPO GDO kit: £10. All ono. (Nr Stockport) 0625 586069.

RACAL RA1772 Digital Receiver, manual, good condition. Offers Please. G4WFL, QTHR. (Epsom, Surrey) 0372 729475.

RACAL RA17L Receiver: £140. Racal MA79 Tx: £145. Racal TA99 1Kw Linear, less PSU and final Tubes, plus matching Racal VSWR Unit and Racal distortion Unit: £170 or £390 for Complete package. Jaybeam TB3 TriBander, only used once for event, as new: £320. Eddystone Single Paddle Key: £25. All above inspect/collect and ono. Contact Dave, G0MJK, QTHR. (Northampton) 0604 711647.

SILENT KEY SALE G3CHN. Many items, new and vintage, including Hallicrafters Receivers. Hundreds of Magazines dating back to 1950s. Send SAE for lists. G3RJK, QTHR. (Freshwater, IOW) 0983 753122.

SILENT KEY Sale, G4XOK. Kenwood TS930S, Mic, AATU: £750. Yaesu FT230R 2m Mobile: £125. Cushcraft R3 Vert: £50. Buyer Collects. G4TUK, QTHR. (Norwich) 0603 810392.

SILENT KEY Sale. FT736R 2m/70cm Tx/Rx, mint: £1100. TS830S HF Tx/Rx, excl condition: £575. PK232MBX Dig Proc, mint: £250. BNOS CLP432 ZS 100M 430MHz 100w P/A SSB/FM, mint: £200. Revex WS540 SWR/PWR Meter 140-525MHz 200w, mint: £55. Manson EP525 Mains PSU 0-30A DC, mint. Offers. MMA 140V 2m Pre-amp, offers. FT101ZD HF Tx/Rx(P/A Fault): £350. Ring S B Lord, GW3PHN. (Colwyn Bay) 0492 546875.

STANDARD C500 boxed, gd condx: £200. PK232: £175. Tono 150W 144MHz Amp: £110. Spectrum Pre-Amp MH: £35. 19ele 70cm Tonna: £25. 9ele 2m Tonna: £25. 5ele 6m Met: £50. FT101 AM board: £10. FT101 DC-DC Converter: £15. (Worthing) 0903 877254.

SUPA Tuta Plus(boxed): £35. Kent Key, boxed: £25. Mutek 2m Pre-Amp for Shack use: £20. 9 ele Tonna 2m, boxed, unused, with coax: £25. UHF, VHF Multi standard TV 4inch B/W with PSU: £40. Icom World Clock: £15. Coax Switch 259 Two Way: £15. FT890 with Keypad, boxed, little used, never on transmit: £1050. Books, send SAE. Nick, G7IYG, QTHR. (Uxbridge) 0895 236397.

SWR METER: £15. HF Mobile Aerial 10/80m: £30. New Car battery: £15. Quantity of RadComs, Free, Callers only. G2KF, QTHR. (Cornwall) 0637 878741.

TOWER Altron CM35, wall mounted, can be post mounted. Complete with winch cage, G400RC Rotator control unit, cables plus J Beam Mini Max Tribander 10, 15, 20. Inspection invited, under no obligation. Can supply photo's: £550 ono. G0FRM. (Welwyn Gdn City) 0707 322682.

TOWER Altron Telescopic Tiltover AT32PM c/w Ground post, good condx: £225 ono. Cushcraft R5, 5 band Vertical in excl condx: £175. 1950 Coventry Victor 5/7 HP Diesel engine c/w 12v Alt in rally condition. This engine has only run 50 hours since new: £500 ono. (Plymouth) 0752 707550.

TRIO 830S amendment June ad, with AEA Econo Tuner. 100watt Load, Headphones, handbooks & working manual, Filter, Ants: £600. + Odds. G4KFW. (Birmingham) 021 357 2009.

TRIO 9130 2m Multi Mode, boxed, manual, mobile mounting bracket, ex condx: £350. Dave, G4MCL, NOT QTHR. (Wellingborough) 0933 276197.

TRIO TR9000 2m M/mode 1-10w o/p: £150. G7GQQ, QTHR. (Basingstoke) 0256 29874.

TRIO TS520, CW filter fitted, gwo: £320. TR2300 2m Tcvr, VB2300 10w Amp, Nicads, charger, carrying case, manual: £120. Coaxial Relay CD-540-D new, 12v, BNC sockets: £25. John, G4VPU, QTHR. (Whitley Bay) 091 252 2304.

TRIO TS530SP Mic, manual, Tokyo HC400L ATU, manual. Both vgc, boxed: £645. Delivery by arrangement or at cost. G0HFB, QTHR. (East Looe) 0503 262823.

TS140S Tcvr, matching PS430 PSU, all cables, Mic, plugs, fuses, boxed, as new, complete with Diamond SX-200 and 4 Band Vertical with coax and plugs. Complete package: £750, free delivery and set up 100 miles. Joe, G3MRC. (Rubery) 0562 710025.

TS520 Tx/Rx 80-10m: £220. TR2200 2m 6 channel: £50. JR310 Rx 10-160m: £30. (Epsom, Surrey) 081393 6367.

TS530S, KW227 Tuner, Mizho Tuner, Himound Key, MC30S Mic, MC50 Mic, SEM Ant bridge, YW3 SWR bridge, lot: £550. CR150 1-60MHz: £50. Plessey PR130: £50. G3BTM, QTHR. (Duxford) 0763 208618.

TS780 Dual Band M/Mode: £650 (mint). IC551 6m Base Station: £350 (mint). Tono 400W Linear Amp, with 12v 35A PSU: £200. MM 70cm 50W Linear with Pre-Amp: £80. Rare TS900 HF Tx/Rx, excellent rig: £300. Wanted TS940, TS930. (Salisbury) 0722 743270.

WANTED COLLINS 516F-2, 302C-3, 180U-2, any condition. Any scrap Collins gear. G4KDV. Phone after 8pm (Otley) 0943 463083.

YAESU 767GX HF Rig, MD1 Desk Mic, boxed, good as new: £1200. Commodore 64, 1541 Disk Drive, MPS801 Printer, Joystick: £125 ono. (Manchester) 061 682 6003.

YAESU FL2100B 1200W 10-80m Linear Amp, little used, mint, boxed for years, tested recently, manual: £290. G4CVL. QTHR. (Twickenham) 081 894 3961.

YAESU FP700 PSU-Speaker, gwo: £80. Carrage paid. G1FTU Spectrum 48k RTTY Tx/Rx prog, plus TU instructions, SSTV Rx Programme: £15 P & P. (Basingstoke) 0256 465126.

YAESU FR101 Receiver vgc, works perfectly: £200 ono. Phone Paul, G7EWS. (London) 081 659 1050.

YAESU FRG7 Receiver, gwo: £110. Realistic DX160 Receiver, gwo: £70. Spectrum +2, gwo: £60. Postage extra. Phone (North Wales) 0745 888736.

YAESU FRG7700 Rx, 0.15-30Mhz, 12 chan Memory, handbook: £235. FRT7700 Antenna Tuner: £35. Amstrad PCW8256 Word Processor, bargain: £125. Peter. (Cambridge) 0223 350554.

YAESU FT101Z, WARC bands, FM, CW filter, Fan, Desk Mic, spare valves, boxed: £375 plus carriage. Tatung Einstein TC01 Computer, 40/80 twin Drives, Mono VDU, Duff machine included for spares, set of manuals, lots of software, inc, packet, GWO: £75, plus carriage. Microwave Module 2m Linear Amp, 10w - 40w, similar to MM144/100L: £35 plus carriage. G3VKM, QTHR. (Norfolk) 0502 77622.

YAESU FT101ZD Mk 3 FM, Kenwood AT230. Both mint: £500. Peter, GM0HWB, QTHR. (Motherwell) 0698 746217.

YAESU FT209RH 5W 2m FM Handy, 144-148MHz, M/mount MMB21, car adaptor/charger PA3, Desk charger/PSU NC15, Spkr/Mic MH12 A2B, Rubber Duck, soft/case, manual: £205. Yaesu FT230R 25W 2m FM Mobile Tcvr, Mic YM47, M/mount, manual, boxed, vgc: £150. (Axminster) 0297 35131.

YAESU FT290 R2 with matching FL2025 Linear Amp, full set Nicads, Charger, soft case. Hardly used hence: £395. No Offers. G0MLY (Walsall) 0922 683877.

YAESU FT77 100W CW/SSB/FM, mint condx, instr, box, little used: £350. Buyer to collect or will deliver 60 miles radius Glasgow. (Glasgow) 041 942 2224.

YAESU FT780R, mint, no mods, orig pack, manual: £275. 40ft Galv Steel Lattice Tower: £50. Buyer collects. G8BCA. (Mildenhall) 0638 714051.

YAESU FT980 extra filters, as new: £750. GEC RC410R Rx 19inch Rack Mount hence no cabinet, gc: £100. Diamond DP-GH72 70cm Antenna: £18. Diamond X300 2-70 Colinear Antenna, unused: £85. Icom IC215 15 chan FM H/held, gc: £55. 18inch HD wall brackets, unused: £12 pair. Icom R70 with FM, gc: £300. All ono, collect or carriage extra. G3OBX. (Romford) 0708 748146.

WANTED

405 LINE STUDIO Equipment; Cameras, Monitors, Waveform Monitors, etc (Not TV Receivers). Andrew Emmerson, 71 Falcutt Way, Northampton, NN2 8PH. (Northampton) 0604 844130.

ANY OTHER Musicians/entertainers, etc, intersted in meeting on say 40 metres. Contact Terry, G4BCR, 35 Harveys Way, Hayle, Cornwall, TR27 4PE. (Hayle).

AP1086 ISSUE 1 (RAF Radio Stores Ref No's) Also Air Publications relating to Radio, Radar Equipment. Exc prices offered. Would purchase Post-War to current Magnetrons, Klystrons, T/R Cells, Photo-multipliers, Microwave and special CV types. Required; static or rotary inverter, AC or DC i/p with o/p of 80/115 volts 1500/2000 Hertz. Also Rx type R1355 (10D/13032) Unmodified. Please phone anytime. (London) 071 511 4786 or 071 790 2846.

AT940 FOR TS940S Generous offer for GWO unit. Also Eddystone 640 Mains Transformer replacement wanted. G4NDF, QTHR. (Thornbury) 0454 415768.

BOOKS WANTED; Handbook of Antenna Design, - Rudge. TV and Other Receiving Antennas, - Bailey. Planning and Engineering of Shortwave Links, - Braun. Any other Books on Telecoms, Propagation, Antennas etc. DSIR reports, no matter how old. G3REP, QTHR. (Worthing) 0903 879083.

KVG 9MHz SSB, CW Filters. XF9A, XF9B and matching CW filter XF9NB. Tom, G3RCA, QTHR. (Up Holland) 0695 623315.

NON-WORKING Collins 30L1 Linear for spares to rebuild mine. G0HIN, QTHR. (Camberley) 0276 24482.

TRIO/KENWOOD VFO 700 to suit TR700 and TR7010. Details to G4CTE, QTHR. (Louth) 0472 840367.

VIBROPLEX Lightning Bug. Vibroplex Champion Bug. CW Enthusiast seeks well loved example of each. Please don't let your Bug die in a Collectors cabinet. Let it live on in the hands of a caring user. All replies answered. John, G3JVC, QTHR. Or please phone after 6pm. (Surbiton) 081 398 0939.

6M, 2M, 70Cm Multi Mode in VGC at very reasonable price or exch FT102, manual, vgc, value to £350. Len. (Plymouth) 261269.

ANY INFO on Alphameric Keyboard Teleprinter Type 76A (BT Leopard) - Handbook, Circuits, Anything. Brian Hodgson, G3YKB. (St Albans) 0727 852552.

ATLAS 180 or 215X, must have 160 metres (Working or not) Mobile Mount Base Console. Dave, G3RCQ, QTHR. Evenings weekends. (Romford) 0708 374043.

CODAR T28 Receiver, prefered working, but consider non worker. Also Circuit diagram of AT5 Transmitter. G4EHT, QTHR. (Litchfield) 0543 251133.

COLLINS KWM2, KWM2A with AC PU, with plug in relays, must be in first class condx. Also 30L1 Linear, 30S1 Linear. Please call with any Collins gear for sale. Day 0284 753049, evenings and weekend (West Suffolk) 0379 783657.

CORSAIR II, Dual Padle Memory Key model KR1B/603 or model 604. G4RWL. (Carlisle) 0228 513227.

CW FILTER for Yaesu FT101E type XF30C 3179.3kHz. G4UUB, QTHR. (Norwich) 0493 700775.

MEMBERS' ADS

DRAKE R4B or C with all major Parts in reasonable order. G3DJK. (South London) 081 679 2717.

EDDYSTONE MODELS Receivers 880, 880/2, 960, 1995, plus any 1000 series. Speakers Diecast 688, 697, 698, small 652. General purpose 935, 899, 899/F, Plinth 906. S.S Meter, Edometer ED902, ED902 Mk2 for Cash. Collection possible. Peter Lepino. FAX 0372 454381, Tel 0374 128170 or Tel: (Surrey) 24593.

EPROM CHIP or ROM image (BBC) for Microwave Modules Morse-Talker type MMS1. Chip version MMS1.0. Good price paid. G6MMG, QTHR. (Merseyside) 051 430 9167.

FRONT PANEL Assembly for Eddystone 730/4 or faulty Eddystone at reasonable price. EMERS for WS22, complete WS52. Please phone Jim. (Kidderminster) 0562 823674.

FT207R WORKSHOP Manual or inter board wiring diagram required. All expenses met. GM4IAO, QTHR. (Jedburgh) 0835 862015.

FV102M External VFO, gwo with manual and leads. Cash waiting. G4SKX, QTHR. (Stockton, Cleveland) 0642 676477.

GDO IN WORKING Order - Trio, Kenwood, Leader or Heathkit. Please state price incl post/packing. G3DYY, QTHR. (Nr Huntingdon) 0487 841558.

GRID DIP Meter, must be GWO. G3AGZ. (Chesham) 0494 782604.

HYGAIN 14AVQ in good condition. Instr Manuals necessary. G3ETU. (Salford) 061 792 9144.

ISSUE HOLDALL and Users Pamphlet for A14 Set. Also Bendy Aerial Connector. Phone evenings. G0SDP. (Kings Lynn) 0366 500867.

KANTRONICS Weather Node with Anemometer and other options to use with Packet Radio Station on the Isle of Man. (IoM) 0624 624869.

KENWOOD TR851E 430Mhz Tcvr, must be immaculate, no scratches or dents. Must have original box and manual. G0RAN, QTHR. (Bury) 061 796 5296.

MICROWAVE MODULES 28-432MHz Transverter. Also FT790R. G3BEX, QTHR. (Beaconsfield) 0494 675097.

POCOM FTU2100 Selective Filter Terminal. Your price paid. Also Panadaptor for 1.4Mhz IF. Karl, EI5DPB. (Co Meath) +353 1 852 0392.

R1155 or R1154, must be in good condx. Would collect from London and South East area. Gary, G0BKR. (Uxbridge) 0895 813373.

RACAL 1779 Receiver. Any 1792 Rx parts. Filters 2.7Khz ITT BD81085, BD81084 and 16Khz BD81057, 0.15Khz BD81067. Any Drake rack mounted equip. Also looking for Drake CW75 Keyer. Thanks G3YFK. (Shrewsbury) 0743 884858.

RTTY DEMODULATOR Unit CMH530 for NRD525. G4MH Mini-Beam. Lite-weight Rotator. Log Periodic Beam. HF Vertical. Disabled OAP, reasonable price please. (Kettering) 0536 522007.

STANDARD AX700 Panoramic Scanner. Any condition considered. G2AFD, QTHR. Call (Malvern) 0684 573242 anytime.

STILL NEEDED: Elstone output Transformer and LF Chokes. Bernard Litherland, G4IMT, QTHR. Telephone any time. (Chippenham) 0225 891254.

VERSATOWER 60-80ft Post Mount, 17 ele 2m Tonna, big Rotator. Setting up large VHF Station WHY? G0GXT, NOT QTHR. (Gloucestershire) 0594 544409.

VIBROPLEX BUG Key wanted by CW enthusiast. Also Mutek TVVF50a 6m Transverter. G4UDT. (Wembley) 081 902 5995.

WANTED FOR Icom IC290D 2m M/mode Transceiver, Memory backup DC power cord, model No. IC-CK1. John, G0JUQ, QTHR or phone (Stratford upon Avon) 0789 740511.

WIRELESS SET 18 or 62 still sought, even incomplete. Anthony, GW4RYK. (Montgomery) 0686 630255.

WORKSHOP MANUAL for Tentec Corsair 2 or information where obtainable. G3DVV, QTHR. (Chipping Norton) 0608 644371.

WOULD THE Next person selling a Trio MC50 Mic 'as New: £30' (June RadCom p86 col 4) Please contact Keith, G0OZK first. Still also want 2 mtr Collinear, YK88C, FT227R Mobile Brackets + wire support, Advance TC12/12A info etc, as per my June advert. (Stockport) 061 477 5303.

YAESU FRDX400 Accessories; FM Detector Unit, 2 Metre Converter, 6 Metre Converter. (RS94839) (Hemel Hempstead) 0442 256632.

EXCHANGE

ALINCO 2m/70cm Dual Band H/Held with case, charger, nicads, Speaker, Mic FOR FT290R Mk2, if Linear clip on type + Cash adjust. Terry, G4OXD. (Hitchin) 0462 435248.

BBC MICRO, 2 complete systems, disk drives, Colour Monitor, books, software, bits, Daisywheel Printer. Want PC Compatible (286 HDD min) Alan, G0IFG. (Farnborough, Hants) 0252 549175.

FT726R 2m, 6m and 70cm plus Satellite modules fitted, perfect working cond, exchange for TS711E, IC275H. Any offers considered. Please phone evenings. (Glocestershire) 0594 542146.

GIFTS TO Vintage Enthusiast or Museum. Collins TCS 8/12 Rx and partner Tx, no accessories. Marconi TV5 Convoy Bridge R/T, 240v AC working. Cossor Marine VHF Handbooks Circuits. All Pre or Circa 1950. Wanted Good Long Arm up/down Morse Key, Admiralty pattern, Sailor AB or similar. Deliver 50 miles. G4EUW. (Brightlingsea, Essex) 0206 305851.

KEYBOARD YAMAHA. As New, Full size Keys, 22 Rhythms, AC Power supply. 100 voices, Pre-recorded Tunes, books. Exchange 2m Tcvr or GC Rx. G3XBE, QTHR. (Bradford) 0274 728219.

TONO 7000E Rx/Tx Terminal Unit as new, boxed, leads. Wanted Yaesu 747. Cash adjustment. Phone anytime. G6XHQ, QTHR. (Richmond) 081 876 1108.

YAESU FT290R with charger, case, mobile mount and MM 30W Linear FOR 2m M/mode Base Transceiver, digital tuning, at least 25W o/p. Paul, G8KDQ. (Coulsdon) 081 645 0714.

EVENTS DIARY

CLUB NEWS

DEADLINE - Items for inclusion in the October 1993 issue must be sent to HQ marked "Club News - DIARY", to be received by 19 August latest. If news is received by the published deadline, it should appear in the listing. It is your responsibility to ensure that items are sent DIRECT to HQ in good time. News items should be sent in writing, preferably typed or written legibly, and be signed by the club secretary or the person responsible for publicity.

NOTE: This is primarily a service for clubs affiliated to the RSGB, to whom priority will be given.

AVON

SOUTH BRISTOL ARC - 4, 70cm Activity evening +Comm meeting; 11, Computer s/ware; 18, Soldering Iron Competition; 25, Magazine Exch; Sept 1, Prep for Bristol Rally. Details 0275 832222 Wednesday eve only.

BEDFORDSHIRE

BEDFORD ARC - New Venue, now meets at The Barn, Ravensden, Bedford. Details 0234 365660.

BERKSHIRE

BRACKNELL ARC - 11, Talk 'Use of Oscilloscopes' by G3HS. Details 0344 420577.

MAIDENHEAD & DARC - 5, Barbecue at G7DXC's QTH. Details 0628 25952.

NEWBURY & DARS - 25, Talk 'the dBW explained' by John McGinty. Details 0635 863310.

READING & DARC - 12, HF SSB Contest & Discussion; Sep 9, Internal Quiz. Details 0734 476873.

BUCKINGHAMSHIRE

MILTON KEYNES & DARS - 9, Talk by G4NUG on RAYNET; Sep 5, Annual A R Car Boot Sale Cranfield Airfield. Details 0908 501310.

CAMBRIDGESHIRE

CAMBRIDGE & DARC - Meets every Friday evening. Details 0763 243570.

CHESHIRE

MID-CHESHIRE ARS - 4, Equipment Night; 11 & 18, No meeting; 25, On-Air Night. Details 0606 331210.

STOCKPORT RS - 11, Talk 'Multi-track recording', by Howard Gregory; 25, talk 'Non-packet data system' by Bill Green; Sept 8, talk 'Pulsars - time keepers of the Universe' by G0DMU. Details 061 439 4952.

CLWYD

WREXHAM ARS - 3, Equipment testing; 17, Field evening. Details 0978 845858.

DERBYSHIRE

BUXTON RA - 10, Aerial topics; 24, Video night; Sep 14, Amateur Radio Licence Discussion. Details 0298 25506.

DERBY & DARS - 4, Rally preparation evening; 11, Satellite TV a practical demo of the latest equipment by Paul, G8JGF; 18, Visit to Carsington reservoir - meet at 7.30pm at Visitors centre; Sep 1, Junk sale. Details 0773 856904.

DEVON

EXETER ARS - 9, BBQ. Details 0392 214204.

SOUTH DEVON RC - 7/8, SES GB4SR at Torbay Steam Rally; 18, Project night; 22, 432MHz Contest; 25, Pre Rally planning meeting. Details 0803 522995.

EXMOUTH ARC - 4, 2m Fox hunt; 18, talk 'The Novice Licence' by Steve, G0GHO. Details 0395 279574.

PLYMOUTH RC - , Details D C Perryman, G7NMA, 50 Bellingham Crescent, Plympton, Devon PL7 3QP.

DORSET

DORSET POLICE ARS - 5, Evening on the Air/social; 17, Evening on Air/ Committee meeting; Sept 2, Barbecue & evening on Air. Club meets at the Bar and Social club at Headquarters on the first and third Tuesday of every month. Membership is open to Police officers, both serving and retired. Special constables, Civilian staff and the immediate family of these people. Details from PC 915 Richard Newton on 0202 229351 or Fax 0202 229342 or from Pc 818 Bob Knight at Bournemouth Control room 0202 552099 x2031.

SOUTH DORSET RS - 3, Talk/demo on ATV by G4NTS; Sep 7, Talk/video 'RAYNET' by G8RXA. Details 0305 773860.

EAST SUSSEX

CROWBOROUGH & DARS - August ***NO MEETING***. Details G6UUO 0892 661807.

SOUTHDOWN ARS - 2, Talk 'Radio in Air Traffic Control' by G6HXR; Sep 4/5, Exchange weekend with Radio Club de Normandy. Details 0323 412699.

ESSEX

BRAINTREE & DARS - 2, A visit from the Marconi Fire Engine; 16, Hobbies evening. Details 0376 327431.

CHELMSFORD ARS - 3, Talk 'Gliding Experiences' by Brian Thwaites, G3CVI; Sep 7, Talk 'Latest propagation information from Space' by Pat Gowen. Details 0245 260831.

DENGIE HUNDRED ARS - Meets 1st and 3rd Monday each month. Details 0621 783629.

LOUGHTON & DARS - August ***NO MEETINGS***; Sep 3, CW operation from Lancaster bombers in WW II by G4PSY. Details 081 566 3434.

VANGE ARS - 5, Junk sale; 12, Round table discussion on CW; 19, Loading & setting-up the FT101 by Roy, G3ASH; 26, Rally Update. Details 0268 552606.

FIFE

DUNFERMLINE RS - 5, Barbeque at Outh; 12, VHF evening; 19, HF evening with Class B Supervised Operating; 26, Video evening at Outh. Details 031 331 4340.

GRAMPIAN

BANFF & DARC - 3, Preparations for Castle Gala Day; 13, Talk 'Modifying PMR equip for Amateur use' by GM6VXB; 27, Pre HF field Day preprapations. Details 03465 82061.

MORAY FIRTH ARS - Club meets every Thursday at 7.30pm. Details 0343 86395.

GREATER LONDON

ACTON, BRENTFORD & CHISWICK RC - 17, Discussion 'Communication Receivers'. Details 081 749 9972.

BROMLEY & DARS - 17, BBQ/Calibration/Operating Evening. Details 081 777 0420.

COULSDON ATS - 9, Visit to 'Jazz FM' - tentative, limit 16; Sep 13, Talk 'Test Equipment and its applications' by G3OOU. Details 081 684 0610.

CRAY VALLEY RS - 19, discussion; Sep 2, Talk 'Military Radio - Part 2' by G7KOQ. Details 081 850 1386.

EDGWARE & DARS - 26, SSB Field Day briefing. Details 081 204 1868.

KINGSTON & DARS - 18, Technical discussion. Details 081 398 1128.

SURREY RCC - 2, Basic Electronics by Daniel Burchett; Sep 6, Fiber Optics. Details 081 660 7517.

SUTTON & CHEAM RS - 5, Informal; 19, Video evening. Details 081 644 9945.

WHITTON ARG - ***NEW Secretary*** Roy, G0RNW, QTHR. Club meets at Whitton Community Centre Friday evenings. Details 081 995 6553.

WIMBLEDON & DARS - August ***NO MEETINGS***; Sep 10, Surplus Equipment Sale. Details 081 397 0427.

GREATER MANCHESTER

ECCLES & DARS - 3, Discussion 'SSB Field Day contest'; Sep 7, Lecture 'JOTA and Radio Scouting' by G7ELA. Details 061 773 7899.

MANCHESTER & DARS - New Novice course starts on August 10 and another on August 24. RAE course and Morse tuition at 5 & 12 WPM is also free to members. For details visit the club at Simpson Memorial Hall on a Tuesday evening or contact Steve, G7JTL tel: 061 330 0914 or Kevin, G0TOG 061 720 6839.

SOUTH MANCHESTER RC - 6, Talk 'Packet Radio' by G6AWD; 13, Visit to Daily Telegraph. Details 061 969 1964.

GWYNEDD

DRAGON ARC - 2, talk 'Hidden signals on Short Waves' by GW3VVC; 16, E G Meeting. Details 0248 600963.

HAMPSHIRE

ANDOVER RAC - Meets on the first and third Tuesday of the Month at Tangley Hall, Wildhern, Near Andover. Details Andover ARC, c/o 19 Farrs Ave, Andover, Hants SP10 2AH.

BASINGSTOKE ARC - 2, Talk 'Commercial Satellite Communications' by Jim, G4BEZ. Details 0256 25517.

CHICHESTER & DARC - 3, Talk 'Aerial and Feeder Fundamentals' by G3IJS; 17, Talk 'Simple Amateur band Aerials' by G3IDX. Details 0243 573541.

HORNDEAN & DARC - 5, A talk by Len Newnham, G6NZ; Sep 2, RAYNET - Dick Grindley, G0MNL. Details 0705 472846.

ITCHEN VALLEY ARC - August ***NO MEETINGS***; Sep 10, Open meeting. Details 0703 732997.

SONY BROADCAST ARTG - August ***NO MEETING***. Details 0256 483454 (office hours).

HEREFORD AND WORCESTER

BROMSGROVE ARS - 10, talk 'Safety in the Shack'; 24, HF night on the Air. Details 0527 546075.

HERTFORDSHIRE

CHESHUNT & DARC - 4 & 18, Talk 'Starting up in Amateur Radio' by G3WFM; Sep 1, Chernoble DXepedition - video evening. Details 0992 464795.

DACORUM AR&TS - 17, Talk by G4OBE on WAB; Club meets first (informal) and third (formal) Tuesdays, 8pm at The Heath Park, Cotterells, Hemel Hempstead. Details 0442 259620.

HODDESDON RC - Club meets alternate Thursdays at the Conservative Club, Rye Road, Hoddesdon from 8pm. Details 081 804 5643.

STEVENAGE & DARS - 3, HF/VHF on air & CW practice; 10, Project round robin(bring your latest projects and discuss any problems, advice etc); 17, Discussion for club "Promotional/teaching Video" thoughts & ideas; 24, DF hunt techniques and advice in preparation for the DF hunt by G0OVO; 31, HF/VHF on air. Details 0438 350882.

HUMBERSIDE

GOOLE R & ES - 6, On Air night; 13, Junk Sale; 20, Talk by Andy, G8ZCS; 27, Social eve. Details 0405 769130.

GRIMSBY ARS - 5, Visit to Humberside Fire Brigade HQ, Hessle, Hull at 7.30pm. Wives and older children invited; 19, TV and satellite Entertainment 'update' by G0ATW; Sep 2, (Prov) Visit to RRS James Clarke Ross in Grimsby Dock. Details 0472 825899.

ISLE OF MAN

ISLE OF MAN ARS - Meets on Mondays at the Douglas Motor Boat & Sailing Club, Sout Quay, Douglas and on Thursdays at the British Legion Club, Peel. Details from GD7DPG on 0624 834257.

KENT

HILDERSTONE RS - Starting late September, Canterbury area, RAE course run by G3JIX for Examination in 1994. Details 0843 869812.

SOUTH EAST KENT (YMCA) ARC - Aug, NO Meetings at YMCA, but various outdoor activities will be held. Details from G7NOR on 0304 852030.

WEST KENT ARS - August ***NO MEETINGS***; Sep 3, Informal. Details G3OHV, QTHR

LANCASHIRE

BURY RS - 10, Fox Hunt. Details 0204 883212.

FYLDE ARS - 12, DF Fox Hunt; 26, Informal. Meets 2nd and 4th Thursday at 7.45pm at South Shore Lawn Tennis Club, Midgeland Road, South Shore, Blackpool. Details from G7CUL.

NORTH SEFTON ARC - Meets 2nd Wednesday of each Month. Details 0704 579017.

ROCHDALE & DARS - 16, talk '5 Million volts - aftermath' by G0GNR. Details 0706 32502 or 061 653 8316.

LEICESTERSHIRE

CHARNWOOD ARCC - 1, 20m Nite on Air; 15, Antenna discussion; 22, HF Contest planning; 29, Club Field day. Details 0509 232927.

LEICESTER RS - 2 & 9, HF/VHF on Air Activity; 16, Lecture - subject TBA; 23 & 30, HF/VHF activity. Details 0533 762241.

LOUGHBOROUGH & DARC - 3, talk 'RADAR' G0LCU; 8/13, A week on Air with the Guides & Brownies from Belvoir Castle - Visitors welcome; 10, DF; 17, Wymswold on Air; 24, Barbecue, Coalville; 31, DF. Details 0509 218259.

LINCOLNSHIRE

LOUTH & DARS - Meets on 3rd Tuesday in month at The Wellington, Louth. Details G1XWD, QTHR.

SPALDING & DARS - 13, A talk 'First Aid - particulary Electric shock' by a member of St John Ambulance. Details 0775 750382.

MERSEYSIDE

LIVERPOOL & DARS - 3, Radio in the 1940's; GX3AHD on the Air; 17, Quiz; 24, Talk 'Medical Electronics'; 31 Surplus Sale. Details 051 722 1178.

WIRRAL ARS - 1 to 6, Portable in conjunction with Guide Camp, GB2WGG; 4, BBQ night at site (Hadlow Fields). Details 051 644 6094.

NORFOLK

NORFOLK ARC - 4, HF SSB NFD/Town & Country Rally briefing; 11, 'Real Radio' bring your oldest piece of working equipment; 18, Aerial Workshop by G3XYO; 25, Talk 'Science for All' by G3PTB. Details 0603 618810.

YARMOUTH RC - 5, informal; 12, Debate 'Stronger links between Hams and CBers?'; 19, informal; 26, Club Quiz, organiser G3YYQ. Informal - HF & VHF Operation / Morse practice and some sessions devoted to constructional projects. Details 0493 721173.

NORTHAMPTONSHIRE

NORTHAMPTON RC - Club meets every Thursday, 8pm at 2 Hervey Street, Northampton. Details 0604 401098.

NOTTINGHAMSHIRE

ARC OF NOTTINGHAM - 5, Forum; 12, Visit by Castle Electronics; 19, Foxhunt No 5; 26, Construction activity. Details 0602 501733.

MANSFIELD ARS - 9, Fox Hunt & BBQ. Details 0623 755288.

SOUTH NOTTS ARC - 6, Talk on Mobile HF Aerials & Mobile Fast Scan TV by G0LCU; 13, Site servicing & BBQ; 20, Visit to Nottinghamshire's Traffic flow Management Centre; 22, Fifth Fox Hunt; 27, Junk Sale. All RAE courses start in Sep phone 0602 213606 or 844668 for details. For Club information tel: 0602 211069.

OXFORDSHIRE

OXFORD & DARS - Meets on the 2nd and 4th Wednesdays of the Month at the Littlemore Hospital Social Club at 7.45pm. Details 0865 863526.

SHROPSHIRE

TELFORD & DARS - 4, HF station; 11, DF Hunt & BBQ; 18, talk 'AMTOR' by G0CNG; 25, Rally preparation. Details 0902 372349.

SOMERSET

WEST SOMERSET ARC - 3, Bring & Buy; Sep 7, Talk on QRP operation. Details G4AJU, QTHR.

YEOVIL ARC - 5, Operating and Controlling Nets by G0NMM; 12, Activities for Amateur Radio Clubs by G3MYM; 19, Discussion 'Airing your Problems' by G3ICO; 26, natter night/committee meeting; Sep 2, Getting on the Air for peanuts by G3ICO. Details 0258 73845.

SOUTH GLAMORGAN

CARDIFF RSGB G - 9, Discussion on future Group Activities. Details 0446 773212.

SOUTH YORKSHIRE

BARNSLEY & DARC - 2, Talk on Radio Astronomy, by G8RWN; 9, 'On the Air' with GB4AXR; 16, Talk 'Ex-Military Equipment, by Eric, G3MWN; 23, OTAN with GB4AXR; 30, Talk on real Home brewed Beer, Roy, G4YDI.(SES GB4AXR for Club's 80th Birthday). Details 0226 203448 Mondays 6-7pm, other days 6-8pm.

STAFFORDSHIRE

STOKE ON TRENT ARS - Meets every Thursday at 7.30pm at The White Swan, Honeywall, Penkhull, Stoke. Meeting consists of CW practice, help with RAE and activity on the HF & VHF bands. Details 0782 638801.

STRATHCLYDE

TELEGRAPH RC LONGRIGGEND - Meets every Tuesday 7.45pm. Details 0506 31645.

SUFFOLK

FELIXSTOWE & DARS - 2, Talk 'Amateur TV in Suffolk' by Sam, G4DDK; 15, DF Hunt & BBQ; 31, Quiz versus Leiston RC. Detail 0394 273507.

IPSWICH RC - 25, SSB Field Day Planning. Details 0473 742072.

LEISTON ARC - 3, 'Constructors Nite' make something, bring it along and talk about it informally, even if it does not work! Details 0986 874800.

SURREY

THREE COUNTIES ARC - 4, computer night; 18, video night; Sep 1, Junk Sale - Please arrive early if you wish to book equipment in. Details 0428 642930.

WARWICKSHIRE

MID-WARWICKSHIRE ARS - 10, PMR; 24, Fox Hunt, 7pm start, 145.350MHz FM. Details 0926 424465.

WEST MIDLANDS

SOUTH BIRMINGHAM RS - 4, Demo 'Maxpak' by G1DKI. Details 021 474 3784.

STOURBRIDGE & DARS - August ***NO MEETINGS*** Details G7HEZ 0384 374354.

WORDSLEY RC - ***NEW CLUB VENUE**** The Brickmakers Arms, Mount Pleasant, Brierley Hill. Details 0384 834109.

WEST SUSSEX

HORSHAM ARC - 5, Talk 'Automated TV transmissions' by G3OGP; Sep 2, Talk 'The Night Sky' by G3PYC. Details 073784 2150.

WEST YORKSHIRE

DENBY DALE ARS - 4, Youth in action - meeting; 12/16, Youth in Action - Weekend; 18, Committee 'bash', members comments; Sep 1, Silent key Sale. Details 0484 532371

HALIFAX & DARS - 17, Old & New Equipment by Jim, G4MH. Details 0422 202306.

KEIGHLEY ARS - 5, natter night; 12, Naylor Bros Car restorations visit; 19, Ideas for Club events 1994; 26, Treasure hunt; Sep 2, Packet on the Air. Details 0274 496222.

SPEN VALLEY ARS - 5, Swindon Cup; 19, The Charmans Barbecue (admission by ticket). Details 0532 534437.

WILTSHIRE

SALISBURY R & ES - Meets 7.30pm, Tuesdays. Grosvenor House Centre, Churchfields Road, Salisbury. Tuition all aspects Amateur radio. Details 0722 329481.

TROWBRIDGE & DARC - 4, Family Picnic; 18, TBA. Details 0225 864698 (evenings).

RALLIES AND EVENTS

This is a list of all rallies, hamfests, exhibitions and conventions notified to HQ (as at press date). Items are given in detail for the next three months inclusive and in brief thereafter. Please send detailed information, including contact callsign and telephone numbers direct to HQ and marked 'Rally News - DIARY'.

1 AUGUST

McMICHAEL Rally and Car Boot Sale. - Haymill Youth and Community Centre, Burnham Lane, Slough (near Burnham railway station). Start 10.30am, admission £1.50. Car boot sale (no advance booking) is £6 per pitch on the day. Talk-in on S22. Details Neil, G0SVN or Roy, G4XYN, 0628 25952. (This rally was originally scheduled for 18 July).

8 AUGUST

DERBY & DARS Mobile Rally - Littleover Community School, Pastures Hill, Littleover, Derby. School is on the A5250 just off its junction with the A38 South side of Derby. Usual attractions, including the monster junk sale. Details from Martin Shardlow, G3SZJ on 0332 556875 or via packet @ GB7LTN.

FLIGHT REFUELLING ARS Hamfest'93 - Flight Refuelling Sports Ground, Merley, Wimborne, Dorset. 10-5pm. Usual mix of traders, bring & buy, craft exhibitions, car boot sale and field events. Overnight camping facilities available for Saturday 7th. Talk-in on S22. Details Richard Hogan, G4VCQ 0202 691021.

VALE OF EVESHAM RAC - Annual car Treasure Hunt around the Vale. Start from Evesham Post Office, High Street at 2 to 2.30pm. Details 0386 41508.

WIRRAL AR & Computing Rally - Masonic Hall, Manor Road, Wallasey. Doors open 1100. For further information contact D G Clifford on 051 639 5922 or D Roberts on 061 476 3076.

9/14 AUGUST

WATERSIDE ARS - From Romsey, Hampshire will use the Special Event callsign GB2HWG during International Girl Guides "Discovery 93" week from 9 to 14 August. Details G0IDN, 0703 843491.

15 AUGUST

SOUTHEND & DRS Rally - Rocheway Centre, Rochford, Nr Southend-on-Sea, Essex. Start 10am. Bring & buy, car boot sale - £5 per pitch, ample parking, refreshments. Details G0DFE, 0702 202216.

22 AUGUST

WEST MANCHESTER RC Summer Rally. The "Red Rose Rally" at Bolton Sports & Exhibition Centre, Silverwell Street, Bolton (town centre). Doors open 11.00am, 10.30 for disabled visitors. All the usual trade stands, societies, bring and buy, etc. Refreshments/meals available. Details 0204 24104 (evenings).

28/29 AUGUST

NORTHERN LIGHTHOUSE Weekend. Radio Amateurs in Scotland and the Isle of Man will activate 11 stations at lighthouses through Scotland and the Isle of Man. Details from Mike Dalrymple on 0292 443127.

29 AUGUST

COLERAINE & DARG Radio Rally - New Location - Lodge Hotel, Coleraine. Display of latest amateur equipment, home computer technology and a limited indoor flea market. Refreshments available. Talk in on S22. Details GI4MFM tel: 02665 58230 or GI4ORI Tel: 0265 52393.

GALASHIELS & DARS Open Day - Doors open 11am till 4.30pm. The usual traders, bring and buy, club stalls, raffle, and refreshments. Details John, GM0AMB 0835 22686.

2nd GLOUCESTER Radio Rally Car Boot Sale - Naas Lane, Quedgley, Gloucester. Sign posted from M5, jn 11 and 12. Bring and buy stall by Stroud RC. Talk in on S22. Details 0452 503786.

TORBAY ARS Mobile Rally ***CHANGE OF VENUE*** Due to unforeseen circumstances the venue has had to be changed. ***NEW VENUE: - Audley Park School, Barton Road, Torquay, Devon. Doors open 10am. Many trade stands, bring & buy, refreshments. Details G3HTX 0803 526762.

30 AUGUST

HUNTINGDONSHIRE ARS - Annual Bank Holiday Monday Rally, - New Town centre venue - St Germain Street, Huntingdon. Just off the ring road. Starts at 10am. All pitches and car parking on hard standing. Entry £1, car parking free. Pitch £5 per car, £9 for transit van or car & trailer. Refreshments available. Talk-in on S22, or via GB3OV on 433.125MHz. Details David, G7DIU on 0480 431333.

4 SEPTEMBER

SALTASH & DARC - 'Field Day' Rally at Trebrown Farm, Horningtops, near Menheniot, Cornwall on the A38. Bring and buy stall. Club station, callsigns G4GXK and G8SAL will be operational from 9am to 9pm and all contacts most welcomed, also personal callers. Talk in on S22 is planned. Details 0752 844321

5 SEPTEMBER

BRISTOL Radio Rally (incorporating Bristol Computer & Electronics Fayre) - Brunel Centre, Temple Meads Station, Bristol. Doors open 10.30am, 10.15 for disabled visitors. Forty plus trade stands, large bring & buy, under £25 bring & buy, refreshments. Ample under cover parking. Talk-in on S22. Details G4YZR 0275 834282.

MILTON KEYNES & DARS 7th Annual Radio Boot Sale - Cranfield Airfield, Cranfield, Beds. Off jun 13 or 14 M1. Details Ray, G1LRU, 0908 660798.

TELFORD AR Rally - Telford Exhibition Centre, Telford. Doors open 10.30am. Trade stands, flea market, bring & sel. Talk in S22 and GB3TF RB8. Any disabled person(s) needing parking help, please phone in advance. Details from G7BWQ tel: 0952 770922/ 0836 739903 or G4LSA tel: 0785 284388.

VANGE ARS Annual Rally - Laindon Community Centre. Corner of Laindon High Road and Aston Road. A short walk from Laindon Railway Station on the Fenchurch St/Shoeburyness line. Doors open 10.30am Admission 75p. Many traders, bring & buy, refreshments, free raffle. Talk-in on S22. Approach roads signposted. Details Mike, G4NVT, 0268 543025.

11 SEPTEMBER

SCOTTISH AR Convention (SARC93) - Cardonal College, 690 Mosspark Drive, Glasgow. Doors open 11.00, 10.30 disabled. Over 180 tables for traders and special interest groups, RSGB Bookstall and officials in attendance and a large bring & buy stall. An RSGB Open Forum hosted by RSGB Vice President Ian Suart, GM4AUP and General Manager Peter Kirby. Other open Forums on Digital Communications and Repeaters. Two lecture theatres with full programme of talks. Morse Test - no advance booking, just arrive with 2 passport photographs. Talk in on S22. Details GM3EDZ, 041 882 5753.

12 SEPTEMBER

BARTG Rally - Sandown Exhibition Centre, Esher, Surrey. 10 min from M25, jn 10 and not far from M3, M4 and M40. Doors open 10.30am. Over 250 tables, exhibitors, special interest groups. See latest in radios, computers, computer peripherials, s/w, books, kits, test equipment, a bring and buy plus much more. On-site catering, hot and cold meals, snacks, beverages and bar. Details Peter Nicol, 38 Mitten Avenue, Rubery, Rednal, Birmingham B45 0JB, 021 453 2676.

LINCOLN SWC Hamfest - Lincolnshire Showground and Exhibition Centre. Four miles North of Lincoln on the A15, Lincoln/Scunthorpe road. Doors open 10.30am. All the usual trade stands, large bring & buy stall. Morse tests on demand (2 photographs required of candidate plus fee). Refreshments available. Lots of attractions for the whole family. Caravans welcome by arrangement. Talk in on S22. Details from Denis, G1XZG, 0522 684214.

18 SEPTEMBER

ISLE OF WIGHT - Annual Wight Rally, National CEM Wireless Museum, Arreton Manor, Nr Newport, IOW. Trade stands and a bring & buy stall, also free entry to visitors. Refreshments available. Talk in on S22 by G3IOW and GB3WM. Details G3KPO 0983 567665.

19 SEPTEMBER

PETERBOROUGH R&ES - East of England Rally, East of England Showground, Peterborough. Access from A1, A47 and A605. Doors open 10.30am, 10.00am disabled visitors. Dealer access from 7.30am. Modern hall and large marquee. Traders, large carboot and flea market area. Bring and buy stand. Additional on site attractions. Full catering + bar. Talk-in on S22. Entrance £1. Free car parking. Details from Mike, G0CVZ 0733 222588.

26 SEPTEMBER

HARLOW AMATEUR RADIO RALLY & COMPUTER SHOW - Harlow Town Sports Centre, off Fifth Avenue, Harlow. Easy access off M11 Jn 7 and A414. Doors open at 10.30am Disabled parking and lifts available. Varied selection of traders, both new and old to the event, massive bring and buy stands. Catering and bar within the Sports complex. Talk-in on S22 and SU22 by G6UT. Details from Mike, G7BNF 0850 487863.

THE THREE COUNTIES Rally - The Three Counties Show Ground, Malvern, Worcestershire. ***NEW EVENT***. All trade enquiries and bookings to Eddy Cotton, G4PQZ, 0905 773181.

9th NORTH WAKEFIELD RC Rally - The Outwood Grange School, Outwood, Wakefield. Venue is 1 mile from the M1 & M62. Doors open 11am. Electronic and computer dealers, repeater groups and novice stand also a bring & buy stall. Talk in on S22 with club callsign G4NOK. Details from John, G4RCG, 0924 362144 or John, G0EVT 0924 825443.

3 OCTOBER

GREAT LUMLEY Radio Rally. Details Barry, G1JDP, 091 388 5936.

BLACKWOOD & DARS Rally - Details Norman, GW0MAW, 0495 227550.

WINCANTON RALLY - Details Norman, G4YXX 0749 850432.

8/10 OCTOBER

RSGB International HF Convention: The Beaumont Conference Centre, Old Windsor, Berks. Talks, latest amateur radio software, ladies' programme; Young Amateur of the Year award; invited traders and Special Groups; overseas visitors' reception. Send SAE to: HF Committee, PO Box 599, Hemel Hempstead, Herts HP3 0SR. Details G4BWP, 0638 552080.

9/10 OCTOBER

The ALL IRELAND INTERNATIONAL Radio & Hobbies Exhibition - First Major exhibition of its kind to be held in Ireland, North or South and is hosted jointly by Dundalk Amateur Radio Society and the Armagh & Dungannon District Amateur Radio Club. Trade stand, many from the UK mainland, amateur TV, radio, computers and much more. The Presidents of the IRTS and the RSGB President will attend. Features many side shows and entertainments to cater for all tastes. Details GI8RLE on 0762 870423 or EI4HX on 042 32641.

10 OCTOBER

KIDDERMINSTER & DARS - ***NEW DATE, NEW VENUE***: Stourport on Severn High School. Details: Malcom, G8JTL 0384 894019 or Jeff, G0RJP 0299 822206.

16/17 OCTOBER

36th JAMBOREE ON THE AIR. Details from Activities Office, The Scout Association, Gilwell Park, Chingford, London E4 7QW, 081 524 5246.

17 OCTOBER

HORNSEA (East Yorkshire) RC Rally. Details Duncan, G3TLI tel: 0964 532588.

Sharing a joke at the Grafton Radio Society Dinner are: (l to r) Pat, G1MPU; Will, G4IFH; Martin, G4IOF; John, G0DFZ; and Rod, G0JUZ.

EVENTS DIARY

17/18 OCTOBER

SCOTTISH TOURIST BOARD RG - Launch of 1993 Airdrie MOD - GB2STB. Airdrie MOD is the 101st Annual Gaelic Festival held in a different town in Scotland each year, to promote the culture and heritage of the Scots nation, through its language, drama, music, dance etc.

29/30 OCTOBER(FRI/SAT)

LEICESTER Amateur Radio Show - Granby Halls, Leicester. Details G4PDZ 0533 871086.

31 OCTOBER

BISHOP AUCKLAND Radio Amateur Clubs Rally. Details Mike, G0PRQ, 0388 766264.

6/7 NOVEMBER

7th NORTH WALES Radio & Electronics Show. Details GW7EXH, 0745 591704.

7 NOVEMBER

13th NORTH DEVON Rally - Holsworthy Memorial Hall. Details G8MXI, QTHR.

14 NOVEMBER

BARNSLEY & DARC AR Rally. Details Ernie, G4LUE, 0226 716339 (6pm-8pm please).

BRIDGEND DARC Amateur Radio Rally. - Details Mike, GW7NIS 0656 722199 or GW3RVG on 0656 860434.

MARS/STOCKLAND Radio Rally. Details Norman, G8BHE 021 422 9787.

21 NOVEMBER

WEST MANCHESTER RC Winter Rally. Details 0204 24104 (eves).

4 DECEMBER

RSGB ANNUAL GENERAL MEETING, Manchester Conference Centre, UMIST, Manchester.

5 DECEMBER

LEEDS & DARS (Pudsey Rally). Change of Venue: now Allerton High School, Kings Lane, Leeds 17. Details 0532 552344 or FAX 0532 393856.

12 DECEMBER

CENTRE OF ENGLAND CHRISTMAS Radio, Satellite Computer & Electronics Rally - ***NEW VENUE***. Details tel: 0952 598173.

23 JANUARY 1994

OLDHAM ARC Radio Rally - Details 061 652 8617 home or 061 633 0550 work.

6 FEBRUARY

SOUTH ESSEX ARS Radio Rally - Details G0BBN, 0268 755350.

20 FEBRUARY

TRAFFORD Rally at G-MEX - Details 061 748 9804.

20 MARCH

NORBRECK Amateur Radio Electronics & Computing Exhibition - Details G6CGF on 051 630 5790.

27 MARCH

MAGNUM Rally - Magnum Leisure Centre, Irvine. Details GM0FCI on 0294 72253.

3 APRIL

28th WHITE ROSE Amateur Radio Society Rally - Details G7ELS on 0850 690189

Club Excluded?

NOW AND again, a club secretary will write in to complain that *RadCom* "never publishes anything about my club". Usually there are good reasons for this. The main ones are: received after deadline (published each month), hidden inside a large newsletter (we get several newsletters/mags *every day*!), not enough information given; a non-event (we record only events, not 'natter nights' etc).

Although information is given in *RadCom* about very many events throughout the UK, Secretaries should regard this as additional to, not as a substitute for, informing their members locally. Changes of key officers, meeting day and venue are published in *RadCom*; basic unchanged information is published in the RSGB *Call Book*.

Organising a Rally?

SOME TIME AGO we received correspondence from a trader who attends a number of rallies throughout the year. The trader raises a number of pertinent points which may well be of use to rally organisers. His comments are as follows:

1. A person should take responsibility for stand positions, power supplies, general problems, queries, etc.
2. All non-amateur related stalls (eg, those selling fluffy toys, material, etc) should be located in a different area, and preferably in a different room, than the radio related stalls.
3. Radio related stalls should be placed in clearly defined areas, such as radio equipment and books, computers and data communications equipment, satellite and TV, junk, antennas, bring and buy.
4. Any bring and buy stall should be of adequate length to enable people to see the items for sale.
5. A notice board should be provided at a nominal charge to enable visitors to place 'sale' and 'wanted' advertisements. This could also be used for messages to enable visitors to communicate with others known to be at the rally.
6. Car boot sales should be actively encouraged.
7. Hot food and refreshments should be made available at sensible take away prices.
8. Entertainment and other non-amateur radio attractions should be made available if at all practicable.
9. A well balanced cross section of amateur radio suppliers should be encouraged to attend.

It goes without saying that making a rally into an attractive event will inevitably increase its prestige as well as the number of its traders and visitors. Perhaps the answer may be for local clubs to get together to put on fewer, larger events by combining their resources.

GB CALLS

The list below shows all special event stations licensed for operation this month. It was taken from the HQ computer on 6 July. These callsigns are valid for use from the date given but the period of operation may vary from 1-28 days

AUG 1

GB0CAS	Crown and Sceptre
GB0CDN	Coastal Defence Needles
GB0DC	Durham Cathedral
GB4RM	Royal Marines
GB4SR	Steam Rally Torbay

AUG 2

GB2RST	Radio Scouting Team
GB4WGG	Wirral Girl Guides

AUG 4

GB2MRI	Marconi Rathlin Island

AUG 5

GB2SEG	Scottish Expedition Group

AUG 6

GB2YFT	Yeovil Festival Transport
GB4LBI	Life Boat Institute

AUG 7

GB0EAS	Essex Ambulance Service
GB0TL	Tenby Life Boat
GB2HWG	Hampshire West Guides
GB4CIJ	Cornish International Jamboree

AUG 8

GB2KA	King Arthur
GB2XS	Xray Sierra Square

AUG 10

GB5EM	Erewash Museum

AUG 11

GB0FFF	Fourth Fence Festival

AUG 12

GB2HLS	Humber Lifeboat Station

AUG 14

GB2IRC	Ipswich Radio Club
GB4MNR	Merchant Navy Remembered
GB5GB	5GB Original C/S Daventry Rt
GB5XX	Daventry Radio Stn Own C/S

AUG 15

GB2MKM	Milton Keynes Museum

AUG 16

GB2FSW	Fakenham Splash Week

AUG 20

GB2LL	Lighthouse Lismore
GB5WP	Weston Park
GB2OOO	Manchester's Olympic Bid

AUG 21

GB0CDW	Coastal Defence 'W'
GB0HLB	Harwich Life Boat
GB0LCS	Lairg Crofter Show
GB2LK	Lighthouse Kelso

AUG 22

GB2AGC	Anglian Guides Camp

AUG 26

GB2RCC	Radio Caravan Club
GB4TCF	Town & Country Festival

AUG 27

GB2LA	Lighthouse Ardnamurchan
GB2LG	Lighthouse Mull of Galloway

AUG 28

GB0BCH	Boothall Children's Hospital
GB100MR	Manx Railways 100 Years
GB2LH	Lighthouse Hebrides
GB2LO	Lighthouse Orkney
GB2LT	Lighthouse Turnberry
GB4CRO	Cave Rescue Organisation

AUG 29

GB0HCR	Hemel Carnival Radio
GB0NFD	Normandy Fun Day

AUG 30

GB0RVF	Ruskington Village Fete

SILENT KEYS

WE HAVE BEEN advised of the deaths of the following radio amateurs:

G0EZK	Mr L Wheeler	
G0IOB	Mr E Hughes	
G0NVH	Mr R J MacKenzie	17.05.93
G1UER	Mr R E Morfett	
G2DYZ	Mr R T Jenks	31.05.93
G3AIP	Mr H Hodges	
G3CHN	Mr R V Thorn	
G3CZG	Mr A Couser	
G3DVI	Mr W D Wither	12.10.92
G3ENY	Mr G N Roberts	12.05.93
G3ILM	Mr L Mills	23.05.93
G3LVJ	Mr F Oliver	23.03.93
G3OXM	Mr M Hirst	11.05.93
G3RDM	Mr T Pearson	26.05.93
G3SHC	Mr F W Wood	18.04.93
G4CXB	Mr E W Payne	19.05.93
G4OPF	Mr D Hambleton	31.03.93
G4PYT	Mr P Green	22.05.93
G4UJQ	Mr D Gardiner	08.05.93
G8PTU	Mr P T T Reeves	20.03.93
G8YOS	Mr P Oelmann	18.05.93
GI0MPV	Mr C Shaw	23.05.93
GM2BRA	Mr R Calder	13.12.92
GM6MD	Mr D W R Macadie	23.04.93
GU1DKD	Mr P Rouse	
GW7HOQ	Mr J Heath	28.06.93
RS27833	Miss M A Savidge	
RS91803	Mr H J Moor	
RS94862	Mr F A Staerck	08.05.93

CORRECTION:

G4EIF Mr W R Owen Frame 10.05.93

(not as printed in July 1993 *RadCom*)

Silent Keys Policy

ALMOST EVERY month, *RadCom* lists those radio amateurs whose deaths have been reported to the Society. It can be some time before a callsign appears in *Silent Keys* because all reports (which *must* be in writing, please) are checked by the appropriate Zonal Council Member before publication.

Frequently, we receive full obituaries for publication. There is, unfortunately, not enough space to publish obituaries of all those listed in *Silent Keys*, so it is RSGB policy normally to print full obituaries for only Past Presidents, Members of Council, Committees and Honorary Officers of the Society.

RSGB – at Your Service

SOME OF THE RSGB'S TEAM OF VOLUNTEER EXPERTS — AVAILABLE TO HELP YOU

Committees, Honorary Officers and EMC Coordinators

The Society has a large number of volunteer experts available to help and advise members on a wide variety of subjects. Each month we will be focussing on a different section of the volunteer workforce, whilst still giving brief details of the main office-holders. See also the Information Directory section of the *RSGB Call Book*.

• RSGB Policy Matters (Zonal Council member):-

See *RadCom*, July 93.

• For general advice and details on local clubs, or if you don't know who to contact:-

Your RSGB Liaison Officer. See the *RSGB Call Book*, or *RadCom*, May/June 93.

• Antenna Planning:

Need for permission and how to apply – booklet free to members from the Amateur Radio Dept at RSGB HQ.

Planning application refused – RSGB Planning Panel, via RSGB HQ.

Planning Advisory Committee Chairman: Geoff Bond, G4GJB, QTHR.

• Awards:

For contest awards, refer to the appropriate contest committee.

For other awards, enquiries and applications go to either:

HF Awards Manager – Bill Ricalton, G4ADD, QTHR.

IOTA (Islands on the Air) Awards Manager – Roger Balister, G3KMA, QTHR.

VHF (and Microwave) Awards Manager – Ian L Cornes, G4OUT, QTHR.

• Band Plans and operating practices:

See the *RSGB Call Book* or March 93 *RadCom* for latest bandplans. For policy, contact the appropriate spectrum manager or committee chairman. See *RadCom*, July 93.

• Beacons

HF Beacon Coordinator – Prof Martin Harrison, G3USF, QTHR.

VHF Beacon coordinator – John Wilson, G3UUT, QTHR.

Microwave Beacon Coordinator – Graham Murchie, G4FSG, QTHR.

• RSGB Contests:

First contact the contest adjudicator (see the contest rules). For policy, contact the respective Committee Chairman:
HF Contest Committee – Dave Lawley, G4BUO, QTHR.

VHF Contest Committee – Bryn Llewellyn, G4DEZ, QTHR.

ARDF (direction finding) Committee – Brian Bristow, G4KBB, QTHR.

• EMC:

Advice on solving breakthrough and other electromagnetic compatibility matters:

Committee Chairman: Robin Page Jones, G3JWI, QTHR.

Local EMC Coordinators:

L J Parry, G8AMK, **Bracknell**, 0344 423704

C G Barry, GW3BUT, **Cardiff**, 0222 628430

R P Harrison, G4UJS, **Nantwich**, 0270 627620

R P Smith, G3SVW, **Sale**, 061 9693999

A Armstrong, G0FBW, **Peterlee**, 091 5864500

G Halse, G3GRV, **Hemel Hempstead**, 0442 214972

A D Maish, G4ADM, **Worcester Park**, 081 3372123

R M Allsopp, G1YFT, **Leicester**, 0533 833714

D A Hopkins, G0MXI, **Hull**, 0482 210763

P Daly, G0GTE, **Stevenage**, 0438 724991

L K Ayre, G3DPR, **New Milton**, 0425 615676

K Hendry, G0BBN, **South Benfleet**, 0268 755350

R Sykes, G3NFV, **Leatherhead**, 0372 372587

M Goodfellow, G4KUQ, **Bristol**, 0272 716093

K N Watkins, G3AIK, **Martock**, 0935 825266

S O'Sullivan, G8VPG, **Bristol**, 0225 873098

Mrs S Morley, G0MCV, **Loughborough**, 0533 374999

S M Wood, G4OWI, **Newark**, 0636 72625

G Brooks, GM4NHX, **Caithness**, 084 783570

Rev S Bennie, GM4PTQ, **Stornoway**, 0851 703609

D W Smith, G3LIS, **Ormskirk**, 0695 77960

R Adam, GM4ILS, **Elgin**, 0343 545842

N Carr, G0JHC , **Preston**, 0772 742710

C Barnes, GW4BZD, **Bangor**, 0248 351151, ext 2750

D Morris, GM3YEW , **Perth**, 073 885533

J Lawrence, GW3JGA, **Prestatyn**, 0745 853255

• Emergency Communications:

Emergency Communications Officer – Post Vacant.

• Exhibition & Rally Committee:

Chairman: Norman Miller, G3MVV, Tel: 0277 225563, QTHR.

• Honorary Historian

George Jessop, G6JP, QTHR.

• IEE:

Liaison Officer – Prof Peter Saul, G8EUX, QTHR.

• Licensing:

Licensing Advisory Committee Chairman (RSGB Policy) – John Bazley, G3HCT, 'Brooklands', Ullenhall, Nr Henley in Arden, Warwickshire, B95 5NW.

Renewals – Subscription Services Limited, PO Box 885, Bristol BS2 8RH.

• New Licence Applications:

Subscription Services Ltd, PO Box 884, Bristol BS2 8RH. SSL Help Desk – 0272 258333.

• Membership Liaison:

Membership Liaison Committee Chairman – Clive Trotman, GW4YKL, 19 Park View, Dolau, Llanharen, Pontyclun, Mid Glamorgan. CF7 9RZ. Tel: 0443 226198.

• Morse:

GB2CW Co-ordinator – David Pratt, G4DMP, QTHR.

Chief Morse Examiner – Roy Clayton, G4SSH.

• Novice Licence/ Project YEAR:

Hilary Claytonsmith, G4JKS, 115 Marshalswick Lane, St Albans, Herts, AL1 4UU. Tel: 0727 859318.

N.B. For details of training courses and examinations, please write direct to RSGB HQ, quoting your postcode.

• Packet Radio:

Datacomms Committee Chairman – Ian Suart, GM4AUP, 37 Meldrum Mains, Glenmavis, Airdrie, Lanarkshire, ML6 0QG. Tel: 0236 765937.

• President:

Peter Chadwick, G3RZP, 'Three Oaks', Braydon, Swindon, Wilts, SN5 0AD.

• Propagation:

Propagation Studies Committee Chairman – Charlie Newton, G2FKZ, QTHR.

• QSL Bureau:

Outgoing cards – PO Box 1773, Potters Bar, Herts, EN6 3EP.

Incoming cards – your QSL submanager (see *RSGB Call Book*).

Liaison Officer – John Hall, G3KVA, Corfe Lodge, Ipswich Road, Long Stratton, Norfolk NR15 2TA.

• Repeaters:

Repeater Management Group Chairman – Geoff Dover, G4AFJ, QTHR.

• Spectrum abuse:

Amateur Radio Observation Service Co-ordinator – Geoff Griffiths, G3STG, QTHR.

• Technical queries:

Technical and Publications Committee Chairman: Dick Biddulph, G8DPS, QTHR.

• Trophies:

Trophies Manager – Bob Harrison, G4UJS, QTHR.

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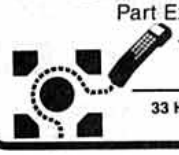

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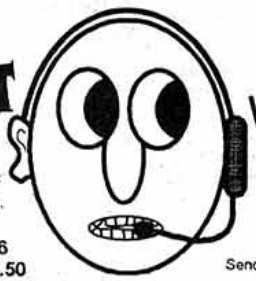

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The LAST WORD

KEEP PACKET IN ITS PLACE 1

I note that we are invited to give our views on the proposals to increase greatly the packet radio allocations on the 2m band (*News and Reports*, June). Our views are to go to the RSGB VHF Committee in the shape of G3UBX, either by post or to a packet mailbox. G3UBX is probably a packet enthusiast, and hardly likely to be anti-packet or even neutral in this matter. I hope other members of the VHF Committee hold such opinions.

I am absolutely opposed to the spread of packet into the 145MHz sub-band. It seems clear to me that all data modes should be confined to the All Modes sub-band, or better, expanded into appropriate parts of the 70cm, 4m or 6m bands. Incidentally, it would also be logical to move the anomalous 145.300MHz RTTY channel into the All Modes section, although RTTY seems to be very little used on VHF and probably only needs one frequency.

The All Modes section could be re-allocated along the following lines:-

144.500	SSTV
144.525 – 575	Narrow band data
144.600	RTTY
144.625 – 700	Packet (4 x 25kHz or 7 x 12.5kHz channels)
144.725	Fax (Is this used much?)
144.750	FSTV talkback (Also rarely used – combine with Fax?)
144.775 – 825	Emergency. Otherwise 'phone

Surely that should be sufficient for all interests.

Having thus tidied up the 2m band plan, it would be highly desirable to make it mandatory via a new version of the Terms and Conditions Booklet *BR68*. The 2m band plan is widely flouted, both through ignorance and by intent, and urgently needs enforcement. The 70cm band-plan also needs revision and enforcement, especially now that the restrictions on 430 – 432MHz have been eased. At least there's plenty of space on 'seventy' – let's use it.

L Bradshaw G0MRL

[The VHF Committee Chairman replies: "First of all thanks to G0MRL for taking the trouble to write in. Some on the VHFC are packet enthusiasts, some aren't, but we are not unsympathetic with the point of view that the part of the 144MHz band allocated to digital communications is not properly related to the number of users of such modes. His suggestions for changing the band-plan are welcome and will be considered carefully.

"Of course we would all welcome more traffic on the other bands and the recent licence changes on 432MHz should help here.

"I must, however, record total opposition to any notion of mandatory band-planning. This would impose an extra load on a hard-pressed regulatory agency, make it very difficult to make any future changes and be quite contrary to the spirit of self-regulation." – G3UBX]

KEEP PACKET IN ITS PLACE 2

Although it states quite clearly in the band plans, packet operators must avoid causing interference to the international beacon network on 14.100MHz, it is very rare to find a time when they are not doing so.

It is very pleasant to leave this particular frequency on whilst being engaged in other activities just to see what is coming through, but these selfish Packet Operators who conduct their dreary and boring experiments at the expense of others, make what should be a pleasurable interlude into an irritating chore.

Packet operators keep away.

Edward H Ball G4UOZ

POLITE AND HELPFUL

I would like to thank the two Morse examiners who tested me and two other gentlemen on Sunday, 13 June 1993 at 1400. The venue was London N22. Their friendly, relaxed manner helped tremendously in dispelling any pre-test nerves.

I am sure it was this which helped me to pass the 12WPM test at my first attempt! I would also like to thank the staff at RSGB HQ who posted my pass slip to me on 17 June 1993 – a mere four days after the test!

I hope other prospective Morse test candidates meet with the same polite, friendly and helpful encouragement it has been my fortune to encounter. I now wait with bated breath for my 'A' class licence to arrive.

*Eddie Graham G1OJN, ex-BRS52087 and soon to be G0 * * **

GOOD NEWS AND BAD

I have been listening to the RSGB *GB2RS* news on 3650kHz every Sunday since about 1969, and have been a member of the pre-news net since obtaining my Class A licence in 1986. I would like to take this opportunity of expressing my thanks to all those who have made this such a pleasure. In particular, my thanks to G2MI, who has read the news for almost all this period, and to G4ARZ and his helpers, who have run the pre-news net in a friendly and efficient way. And with sadness, I must mention the late G4EIF. Owen made such a large contribution to the net, and it will never be quite the same without him.

The choice of a frequency for the news broadcast is perhaps less satisfactory. Even with a modern and highly selective receiver, interference is often a serious problem. However, with simple equipment, such as direct conversion receivers or some older communications receivers, 3650kHz LSB is almost unusable due to the powerful WEFAX transmission from Northwood on 3650 USB. It seems a pity to have chosen a frequency for *GB2RS* that must be render it virtually impossible to receive on simple equipment in many parts of the country. I would suggest that a frequency close to 3600kHz, at the junction of the CW and phone segments of the band, could be a better choice.

Dennis Unwin G0FMT

[3650kHz is an approximate frequency and newsreaders are encouraged to move away from QRM. If anyone else finds this frequency a problem, drop a line to the Chairman of the Membership Liaison Committee, GW4YKL, QTHR – Ed]

CULTIVATE CAR OWNERS

I found the letter of Mr Dainty, G4PDN, one of the most evocative to appear in *The Last Word* (July). *Tempis fugit*; we are all getting older and a large percentage of radio amateurs will eventually face the same problem.

I would suggest that the answer is to keep active on his two metre rig and cultivate as many of the local fraternity as possible, airing his future predicament.

Surely one or more car-owing fellow amateurs will volunteer to transport him to their own shack for regular 'on air' sessions using their or his own gear.

I wish him joy when he eventually does have to QSY.

R J Buckstone G5JR

THANKS FOR 73

I would like, through *RadCom*, to thank the President, Council, Staff and members of the Society for the many kind messages and good wishes received by myself and Eileen, G3WIO, via various routes both before and after my recent heart surgery.

Basil O'Brien G2AMV

Please note that the views expressed in *The Last Word* are not necessarily those of the RSGB. We reserve the right to edit letters for publication. All letters are acknowledged and may be passed to the relevant department or committee.

7F: PROBLEM WITH Z

I read with interest the article *The 7F Miniloop* by G4ZU (*RadCom*, July). Whilst I do not doubt that the aerial described worked when tested by G4ZU, I am unable to follow all his ideas.

Suppose we start with a delta loop made of 10.4m of plastic covered wire, equivalent in effect to about 10.7m of bare copper wire, suspended apex down with the apex 5.0m above ground level and fed at that apex. I have no difficulty in agreeing with G4ZU that the loop, resonant about 28.6MHz, will show an impedance about 120Ω. When the top span is shortened to 3.0m, and raised correspondingly, I have no difficulty in agreeing that the impedance will decrease towards 50Ω.

When the author pulls the two sloping sides together "so as to form a lower apex of around 90°, we then have a loop with one side 3.0m long and two sloping sides each about 2.1m long, followed by a transmission line 1.6m long. this small loop aerial will show a large capacitive reactance.

G4ZU then finally inverts the loop so that the apex is 6.5m agl, with the 3.0m side horizontal and 5.0m agl. The system then consists of this loop, fed at the top by 1.6m of transmission line, a 1:1 balun and an unspecified length of 50Ω coaxial cable. Inverting the loop will make a small difference to the impedance, but it seems likely to be very reactive, say Z = 80 – j900Ω.

With a balanced system, the 1.6m transmission line will not radiate significantly, but will transform the impedance. It can be assumed that the two wires of the line are close together – "no risk of short-circuits ... plastic covered wire". Further assuming the wire to be 1.5mm diameter, 2.5mm over the plastic, it would seem that the average characteristic impedance for the feed line might be in the range 40-300Ω, with a 0.7 – 0.9 velocity factor.

The 1.6m line will transform the aerial impedance so that the impedance seen by the balun will have resistive component less than 8Ω, and a reactive component perhaps about –j20Ω. I agree that, by changing the length of the transmission line, the reactive component can be eliminated at any given frequency, though this may not be regarded as "achieving precise resonance". However we are still faced with matching a resistive component of 8Ω or less, depending on the characteristics of the line, to 50Ω.

The length of 50Ω coaxial line may also be relevant to the impedance as seen by the transmitter. In any case I am still unable to see how "an exact 1:1 SWR" can be obtained by slightly increasing, or decreasing the size of the loop.

Frank Harris G4IEY

BOX OR ZIG-ZAG

The main thing that surprised me about G6CBP's letter (*The Last Word*, July) was that he appeared to believe the 'rectangular resistor' to be a recent innovation. As far as I can remember, the change started to take place, in industry at least, some 20 years ago. I does seem to have taken an appreciable time to percolate through to some areas though!

Most circuit diagrams were drawn by hand when the symbol was first introduced. It was found much easier and quicker to draw a neat rectangle than a neat zig zag, even if stencils were used. The savings were quite significant when you consider that a large complicated circuit diagram can contain hundreds of resistors and take several days to draw. There is also another advantage. It is usual to include both component references and values on circuit diagrams and it is now normal to put one of these, usually the value, inside the rectangle. This does reduce quite significantly the apparent clutter of a circuit diagram.

Like G6CBP, I was not at all enthusiastic about these rectangular resistors when they appeared. Now I find that circuits drawn with zig zag resistors look rather untidy and, dare I say it, amateurish. I have to admit, though, that I still tend to use zig zags when making quick freehand circuit sketches.

Finally, to put G6CBP's mind at rest, whilst the EC's reputation for elevating male poultry may well be deserved, it had nothing to do with this particular change.

Anthony B Plant G3NXC

BAD TO MORSE

I think the electronic music on the RSGB Headquarters new telephone system is awful. I hope it didn't cost much.

Bruce Edwards G3WCE

[The 'music on hold' came free but we hated it too so we've changed it to – what else but the theme from Inspector Morse *– Ed]*

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ADVERTISERS INDEX

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The display advertisement copy date for our October 1993 issue will be 10th August 1993

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